



**A case exploration of the critical success factors of
innovation labs: implications for the UAE**

دراسة حالة لعوامل النجاح الحاسمة لمختبرات الابتكار: الآثار المترتبة على
دولة الإمارات العربية المتحدة

by

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Abstract

The dissertation study was conducted to arrive at in-depth understanding of the concept of innovation in general and innovation labs specifically, the different challenges that face innovation labs and the factors that lead to successful delivery of innovations. The dissertation aims at improving the level of performance of the newly set innovation labs in the United Arab Emirates. This can be achieved through the understanding of the key elements that enable innovation labs to successfully deliver innovations in UAE organizations. Considering the need to investigate and analyse existing innovation labs within UAE, a case study following qualitative approach was selected for this dissertation. The research findings revealed the importance of innovation and the significant role innovation labs play to support organizational growth strategy. The research discovered several challenges that face innovation labs in UAE, such as people's mind-set and resistance to accept change and financial limitations. The proposed factors that lead to successful delivery of innovations are diffusion of innovation, adoption of open innovation, flexible strategy and well-defined processes. Overall the study was able to make contribution to the existing literature by providing the essentials for innovation labs in UAE that help to increase their effectiveness and enable them to deliver successful innovations.

ملخص

تستهدف هذه الأطروحة للوصول إلى فهم متعمق لمفهوم الابتكار بشكل عام ومختبرات الابتكار على وجه التحديد، والتحديات المختلفة التي تواجه مختبرات الابتكار والعوامل التي تؤدي إلى نجاح تنفيذ الابتكارات. تهدف الرسالة إلى تحسين مستوى أداء مختبرات الابتكار الحديثة الولادة في دولة الإمارات العربية المتحدة. ويمكن تحقيق ذلك من خلال فهم العناصر الرئيسية التي تمكن مختبرات الابتكار من النجاح في تقديم الابتكارات في مؤسسات الإمارات العربية المتحدة. وبالنظر إلى ضرورة التحقيق في مختبرات الابتكار الحالية وتحليلها داخل دولة الإمارات العربية المتحدة، تم اختيار دراسة حالة باتباع النهج النوعي لهذه الرسالة. كشفت نتائج البحث عن أهمية الابتكار والدور الهام الذي تلعبه مختبرات الابتكار لدعم استراتيجية النمو في المنظمات. واكتشف البحث العديد من التحديات التي تواجه مختبرات الابتكار في دولة الإمارات العربية المتحدة، مثل عقليات الناس ومقاومتها للتغيير والقيود المالية. العوامل المقترحة التي تؤدي إلى نجاح تنفيذ الابتكارات هي نشر الابتكار، واعتماد الابتكار المفتوح، والاستراتيجية المرنة، والعمليات المحددة جيداً. وبشكل عام، تمكنت الدراسة من المساهمة في الدراسات الموجودة بتوفيرها الأساسيات اللازمة لمختبرات الابتكار في دولة الإمارات العربية المتحدة التي تساعد على زيادة فعاليتها وتمكينها من تقديم ابتكارات ناجحة.

Dedication

This dissertation is dedicated with deepest love to my parents. Their unconditional love, warmth, affection, endless support and encouragement are my strength in life which always inspire me to give more to this world. I love you my mother, Amina Mohammed, and my father, Abbas AlBalooshi, and no words can describe the depth of my love to you. I miss you my beloved mother.

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Chapter 1: Introduction

In this chapter an overview about innovation is provided and the concept of innovation lab is introduced and its main attributes are examined. Then, the topic background is presented as well as the need of this dissertation is highlighted, followed by aims, objectives and research questions of the dissertation. At the end of the chapter, the overall structure of the dissertation is outlined.

1.1 Overview

The concept of innovation suggest ‘newness’ causing “operational departure from existing traditional practices” (Levine 1980). Innovation is one of the key driving forces behind organization’s advancement. It is commonly known as enhancement to an existing product or an absolutely new offer for consumers (Vaughan 2013). In today’s extremely challenging business environment, innovation must run in organizations’ veins for them to sustain the dynamic growth in the industry. Jones (2002) confirms that ‘Innovate or die’ has been the path for many top organizations’ in the past two decades following it to generate revenues and sustain competitiveness. Rosenbusch et al. (2011) adds that innovation has great impact on firms in terms of increasing their performance. In order to improve organizational productivity, innovation is required (Crespi & Zuniga 2012).

For any organization to innovate successfully it requires strong vision at the top and the right mix and match of attributes to run innovation intensive business successfully. It is the role of the organization to integrate the right set of components that work together to form and reinforce the sort of environment which allows innovation; and one of those key components is selecting effective individuals who are capable to solve problems and participate in the on-going improvement program (Tidd & Bessant 2013). Additionally, Puttick (2014) suggest that innovation labs “come in a variety of sizes, use a range of techniques, are equipped with different resources, and try to tackle different issues and challenges”. A flashback to the past would help us draw an understanding that early inventors brought together researchers to work collaboratively in R&D laboratories and accordingly were able to produce more inventions in smaller period of time (Mann 2005). A great insight into this as described by Hargadon (2003) is Menlo Park laboratory built by non-other-than the legend Thomas Edison, hundred years ago, remaining a model for modern firms to give birth of successful innovations. Moreover, Bell Labs one of most innovative labs of its time produced many breakthroughs and was rewarded 8 Nobel prizes for innovative work done (Watzinger et al. 2016). Among many other

top innovation-intensive corporations today, Intuit was able to reach its rivals by forming an innovation catalyst to encourage experimentation, develop better ideas and as a result delight customers by innovating (Martin 2011).

On the other hand, there are several challenges that organizations oppose when it comes to setting up innovation labs and operating them. As described by Carstensen & Bason (2012), skills and mind-set required for innovation are not similar to the ones needed for daily operations; compelling organizations to create dedicated labs with the right approaches, skills and tools to enable innovation to function appropriately. Moreover, from Carstensen & Bason (2012) perspective, Kao (2002) believe that innovation unlike other initiatives in the organization, requires a home for creative process enabling people to meet, work together, generate ideas, experiment and prototype new solutions. From an organizational structure perspective, practitioners suggest that keeping innovation lab in sync with other units within an organization is a challenging fact but it is a must (Kanter 2006, Martin 2011, Carstensen & Bason 2012).

Understanding the role of innovation labs and the effective set of attributes that foster successful delivery of innovation is important. Forming and launching real performing lab that is structured well, directed clearly, coached by experts and supported by the organization is significant to ensure productivity (Hackman 1998). In order to embed innovation culture and deploy successful innovations, there is a strong need for organizations to identify the key characteristics that qualifies an innovation lab to deliver successful innovations and apply them effectively.

1.2Background

The significance of innovation is evident globally. Many cultures flourished through innovation and many nations prospered thru introducing breakthrough innovations. UAE one of the key players in the regional economy, since a decade, realized the need to deeply invest in the innovation locally and enter the world of innovation from its toughest doors by reducing dependency on oil further and spurring and diversifying innovation in new segments and reach the utmost global benchmarks for innovation. To enhance the economic performance, it is very crucial to improve global competitiveness by continuing to grow and develop to be able to rank among the top 10 countries on the Global Innovation Index in the future (Rashid 2013). Today UAE rank is 47, among 141 countries, in the Global Innovation Index (GII) as declared in September 2015. The basis of ranking nations, according to GII, is how effectively innovation

is mobilized to contribute to the local economic growth and how strong is the established environment of the national innovation. Hence, there is a strong need to invest in the national resources to introduce innovation in various arenas in UAE.

In 2015, the federal government announced 'Year of Innovation' under the directive of His Highness Sheikh Khalifa, President of UAE. H.H. Sheikh Mohammed Bin Rashid, Prime Minister and Ruler of Dubai, strongly believes that he who adopts innovation today, will have his seat reserved in the future, adding that "We want our public and private sectors to explore new horizons to develop our economy. Innovation is our only way to build a great history of the UAE" (The National Staff 2014). According to Pervan et al. (2015), Dubai 2020 Expo (2014) suggests that the key reason behind this move is linked to the strategy of Dubai to position the city as a world hub through commercial, produce and service innovation and focusing on transitioning from economic growth based on oil infrastructure to knowledge infrastructure. The strategy encouraged both government and private sectors in the country to pledge their full support and establish innovation labs to work on introducing innovative processes, services and products that supports the local market initially and contributes to the global market in the long term. Some key organizations which have existing innovation labs started collaborating with government sector to enable innovation in different fields such as technology, transport, water, energy and space. As a result many smart innovations and initiatives were delivered in the first year of innovation in UAE. An international expert on innovation applauded that UAE has successfully adopted innovation and engrained it in the culture (Aamir 2015).

However, the journey does not stop here, in order to become the most innovative nation in 2021; UAE has to fill some of the common gaps of innovation to be able to reach the targeted results effectively and in a short period. The objective is to omit the barriers that hinder innovation labs to deliver successful innovations. This is only possible if a surrounding understanding is made upon effective innovation labs and how this learning can be embedded into the reality to form an excellent innovation lab that can deliver smoothly and quickly keeping in mind the environmental conditions within UAE. Most of the government sectors in UAE have newly established innovation labs in 2015 to enable everyone work with the spirit of innovation as directed by Sheikh Mansour Bin Zayed Al Nahyan (Gulf Business 2015).

On the other hand there are large and leading organizations in UAE who established innovation labs since a decade and more and have been able to promote innovation culture within their

organization and delivered breakthrough innovations to both internally and to the world. For example, Organization X established innovation lab in 2008 and has been partnering and collaborating with leading global companies such as Apple and Google to engrain innovation into the culture of the organization and deliver up-to-date solutions to end users and worldwide. Likewise, Organization Y established Innovation Centre in association with a local University in 2008 to deliver innovative solutions, which add benefits to UAE society and beyond. Additionally Institute A in Abu Dhabi launched in 2009 is world-class research-driven graduate-level university aims at delivering real-world innovations to issues of sustainability. Furthermore, Organization Z established first live operations Innovation Lab in Middle East, which is fully equipped to test devices, which will help the organization to accelerate testing process, reduce time to market and accordingly reach high quality standard and attain customer satisfaction.

One of the above-mentioned leading organizations in UAE, which is Organization X, is selected to perform this research due to rich experience of this organization in the field of innovation, strong international partnership and immense knowledge on the global innovation and large investment in innovation. The purpose of this study is to evaluate the role of the selected innovation lab in running innovation in its respective organization, examine the culture established for the innovation and identify challenges that innovation lab face to analyse and compare them with existing empirical research and as a result draw a picture of an ideal innovation lab that can deliver successful innovations under the various industrial and economic conditions in UAE and a world that constantly changes.

1.3 Research Problem

As reported by Carstensen & Bason (2012), public sectors are constrained with set of barriers constraining them from innovating. Those barriers appear in the form of lack of internal co-operation amongst various divisions, restricted standard policies enforced by political entities, lack of interest in performing experimentations to identify the right solutions, disengagement of citizens to address the real issues, unavailability of proper system for innovation, focus on current situation and lack of future vision and inability to scale the effectiveness of innovations. Hence, public organizations tend to divert their focus on improving internal processes and blindfold their eyes on generating breakthroughs that can result into positive impact on society (Carstensen & Bason 2012). It is common that sustainable development requires innovative

societies that can tackle existing problems and generate new products and services for future advancement (Smink et al. 2016).

In the UAE, the situation of innovation few years back was not satisfying the future agendas and accordingly the leaders collaboratively agreed to inject the public sector with innovation and establish the right environment in the form of innovation labs to start the journey of generating breakthroughs in line with 2020 vision. Towards boosting the nation's capabilities, establishment of a successful nurturing environment in the public sector and delivery of successful innovations, this study is conducted under the intention of contributing to the national society by developing a theory encompassing successful innovation labs, their role and contributions towards overall organizational innovation objectives.

Based on findings from literature many research conducted to identify challenges face innovation generally (Stoker et al. 2001, Proudfoot et al. 2007, Tidd & Bessant, 2009, Govindarajan & Trimble 2010, Tidd & Bessant 2013), however, there are limited studies conducted to examine the challenges face innovation labs specifically. There is a need to link the available research with a case study to outline possible key challenges that may affect innovation labs in general, and innovation labs in UAE in specific considering the fact that the subject of investigating the challenges that face innovation labs is not been addressed within UAE.

There are various attributes and settings, such as establishment of the right environment and availability of the required resources, that enable innovation labs to successfully generate ideas, perform experiments and conceptualize solutions to scale up innovation. There is a strong need to examine the key success elements and factors that enable innovation labs to deliver successful innovations through examining literature perspective and comparing them with real life examples helping to build up a benchmark that can be referred by organizations tending to innovate in UAE.

1.4 Aims and Objectives

The study focuses on investigating the concept of innovation labs, examining the key challenges that innovation labs face which will help to draw the key factors for the delivery of successful innovations.

The objectives of this dissertation are:

- To examine the concept and role of innovation labs; to understand how they are best established and how they may contribute to overall strategic organizational objectives relating to innovation.
- To facilitate a detailed understanding of the challenges that face innovation labs.
- To explore basis for the delivery of successful innovation through establishment of comprehensive understanding of the challenges that face innovation labs.

1.5 Research Questions

The questions triggered the research are:

1. What are innovation labs, what are their roles, how are they best established and how do they contribute to overall strategic organizational objectives relating to innovation?
2. What are the challenges that face innovation labs?
3. How can the challenges of innovation labs be overwhelmed in order to deliver successful innovation?

1.6 Research Map

#	Research Problem	Research Objectives	Research Questions	Research rationale	Research Structure	Data Collection Techniques	Example of Data Analysis Procedures	Underlying theory
1	The literature appears to suggest that innovation opportunities are not being optimised because of the lack of appropriate environments and institutional capabilities that can sustain the generation, testing, conceptualisation and scaling of innovation that is neither ad-hoc nor fragmented.	To examine the concept and role of innovation labs; to understand how they are best established and how they may contribute to overall strategic organizational objectives relating to innovation.	What are innovation labs, what are their roles, how are they best established and how do they contribute to overall strategic organizational objectives relating to innovation?	There is a need to understand the concept of innovation labs, how they are established and how they help in achieving organizational innovation-related objectives.		Literature Review	Review of Literature	Diffusion of Innovation
2	Organizations face various challenges with innovation labs especially as relates to how to ensure that innovation labs do successfully act as a conduit between project teams (responsible for the generation, testing and conceptualisation and scaling of innovation) and the actual emerging innovation.	To facilitate a detailed understanding of the challenges that face innovation labs.	What are the challenges that face innovation labs?	To identify the challenges the face innovation labs	Data case	Interviews	Manual coding	Open Innovation Theory – The Living Labs
3	Organizations need to realize the success factors that enable innovation labs teams to successfully generate, experiment and conceptualize solutions.	To explore basis for the delivery of successful innovation through establishment of comprehensive understanding of the challenges that face innovation labs.	How can the challenges of innovation labs be overwhelmed in order to deliver successful innovation?	To measure the success factors that enable successful delivery of innovations	Data case	Interviews	Manual coding	Open Innovation Theory – The Living Labs

Table 1: Research Map

1.7 Scope of Work

The dissertation expands on our understanding of innovation labs by presenting an in-depth layout of the concept and role of innovation labs and key elements of forming effective innovation labs. The research intends to outline the challenges that face innovation labs seeking to facilitate delivery of successful innovations. The focus of the research is on the innovation labs based in UAE, which is intended to encourage organizations within UAE to form effective innovation labs under the ample innovation climate that delivers breakthrough innovations in UAE and beyond.

1.8 Dissertation Structure

The dissertation structure is as follows. Chapter 1 is intended to introduce the topic of innovation, sheds the light on the importance of innovation in general and the need for innovation labs, the plea of the dissertation, the research problem, the aims and objective, the research questions and finally the scope of work. Chapter 2 is meant to provide in-depth literature review surrounding the topic. Chapter 3 outlines the conceptual framework in sync with the findings from literature. Chapter 4 provides details on the methodology used and the data collection method followed. Chapter 5 presents the analysis conducted under the dissertation qualitative study. Chapter 6 shapes the findings and implications from the research. Finally, chapter 7 concludes the overall dissertation and proposes a set of recommendations for UAE organizations to setup effective innovation labs to deliver successful innovations by overcoming the addressed challenges in relation to research findings.

Chapter 2: The Literature Review

Preliminary research was performed and literature was critically reviewed to establish adequate understanding of the current state of knowledge in the innovation labs subject. The sources of literature review were based on academic journals, books and online publications. There are two main approaches for critical literature review, which are deductive and inductive approach. According to Saunders et al. (2009), the purpose of deductive approach in literature review is identifying theories and developing theoretical framework, which is tested using data, while inductive approach aims at using existing knowledge and developing theories accordingly and then relating them to literature. This research used deductive approach where literature is reviewed to investigate theories and ideas are identified to develop the research conceptual framework.

The purpose of this literature review was to establish a theoretical proposition through reviewing and examining the most significant research on innovation labs concept and role, innovation lab contribution in achieving organizational innovation objectives, challenges innovation labs face and key factors that contribute to the success of innovation labs. In addition, two relevant theories have been investigated including diffusion of innovation and open innovation. Understanding diffusion of innovation helps establishing a link on how organizations participate in the process of adopting innovation and diffusing them. Whilst open innovation theory is explored to explain how innovation labs are operating in the recent days. Moreover, the literature review glanced at innovation process and innovation lab features providing significant insight on these aspects of innovation.

2.1 The Concept of Innovation

What is the meaning of innovation? Why it is important to be innovative? How innovation is processed? Certainly, there is a strong need to build a foundational understanding about innovation, the need behind it, and the overall process followed to innovate; and the same is analysed in this section.

2.1.1 Defining Innovation

The concept of innovation has been discussed in the extant literature. There seems to be a common agreement on the way innovation is defined in general (Thompson 1965, Levine 1980, Damanpour 1996, Vaughan 2013). Usually it is described as anything new or different as long as it causes operational departure from existing traditional practices (Levine 1980). According

to Vaughan (2013) innovation is “an idea or concept; fulfilled, it’s the idea realized, the end result, an effected change meant to make something— or introduce something—better”. Those enhancements or new changes could give birth of new types or ranges of products, services and processes (Damanpour 1996).

On the other hand, Adams et al. (2006) claim that the definition of the word innovation is vague and difficult to measure. Moreover, Damanpour & Evan (1984) clarify that the term ‘innovation’ is defined variously reflecting the requirement of a particular study. Accordingly, Baregheh et al. (2009) examine around 60 various definitions of innovation, discussed in disciplinary literatures between 1934 to 2008, to arrive at a collective description of innovation regardless the area, which is stated as “multi-stage-process that transform ideas into new/improved products, services or processes to successfully advance, compete and differentiate”. To guide this study Baregheh et al. (2009) definition is adopted because it covers all ranges of innovation types (products, services and processes, etc.) that reasonably can be achieved in an organization.

2.1.2 Importance of Innovation

Although many organizations do not achieve successful innovation, researchers over decades would not deny the importance of it to maintain organizational competitiveness and success. In fact the importance of innovation has been emphasized in the literature (Rousseau et al. 2016, Zaefarian et al. 2016, Rubera et al. 2016). Amabile (1988) reports that corporation have to be innovative to survive and stand strongly in the face of rapid shifting market conditions, changing government policies and regional and global competitiveness. After three decades, CEOs of top performing global companies such as Microsoft Corp., Ford Motor Co. and General Electronic Co. still collectively agree that innovation is critical to corporate success and they practically agree that it is the only way (Sawhney et al. 2006).

In addition, Tidd & Bessant (2009) explain that innovation matters for the reason that it increases organizational profit margin and share prices, improve business performance, declines competitive risk and open doors for new advantage opportunities and provision of better services. Generally, organizations, which do not capitalize in innovation, put their future at risk. Moreover, if firms are not willing to seek innovative solutions to overcome their existing problems, they are unlikely to survive in the market. Big firms like Apple, Nokia and Adidas managed not only to generate increasing share price for the year 2006, through

producing innovative solutions, but had guaranteed share price growth for following seven years (Tidd & Bessant 2009).

Furthermore, Hildrum (2014), under the context of society, confirms that there is nothing more important to the long-standing economic evolution and wellbeing of a society than innovation. He describes innovation as the creation of low cost products and services with high quality. Innovation is equally important for both rich societies and least developed parts in the world. The rich societies require innovation to sustain the wealth and least developed societies require it to reduce the gap between them and the rich societies (Hildrum 2014).

2.1.3 Importance of Innovation in the Public Sector

While private sectors maintain innovativeness to generate profitability and maintain competitiveness in the market, public sectors intend to innovate to improve effectiveness of public services, meet public needs and expectations, minimize cost and improve outcomes in diverse fields (Mulgan & Albury 2003, Hartley 2005). According to Mulgan & Albury (2003) considering the fact that public sector firms do not expire if they do not innovate, they are inherently less innovative, unwilling to change and lack competition spirit. Borins (2002) add that public sectors are bureaucracies formed to accomplish their primary tasks consistently and repel changes or disruption of these tasks. However, the ultimate benefits and public value added through innovation, motivated many public entities to enter the field of innovation from its roughest doors and yield great innovations such as Internet and World Wide Web which are the major technological breakthroughs in the world.

Besides, in the 21st century, the public sector innovation has gained its importance in many countries. In order to overcome particular challenges faced in the public sector such as high cost and debt liability; innovation became the only way out (Borins 2002). As reported by Borins (2002), award systems were introduced to encourage diffusion of innovation in the public sector and as result innovation emerged in many areas for instance police, education and civic environmentalism. Further research in the subject matter confirm that there are historical barriers within innovation in the public sector, multifarious failure risk attached and inherited issues linked to time, vision, skill, persuasion and education factors to produce fruitful innovation in the public sector to attain public value (Borins 2014). However, as clarified by Borins (2014), those obstacles did not stop public sector to continue paving the innovation path and try new ways to achieve public value. Therefore, it is absolutely confirmed that innovation is still and again an undeniable pillar for organizations to attain value.

2.1.4 Overview on Innovation Process

In order for innovations to come to life, there are strategies defined, vast efforts spent behind the scenes and particular processes followed to ensure that the end-result is a successful addition to the world. As reported by Desouza et. al. (2009), the successfulness of innovation in an organization is interrelated with the availability of a defined innovation process.

To start with organizations must ensure the adoption of a clear innovation strategy to innovate effectively (Tidd & Bessant 2009). Markides (1997) cannot agree more that organizations which defined their own innovation strategy and established different line of businesses are more successful than others which innovated through attacking competitors. Moreover, Sawhney et al. (2006) confirm that it is critical for companies to broaden their perspectives to identify different opportunities and avoid being vulnerable to competitors.

Early studies suggest that innovation process consist of four core steps which are conceptualizing the idea, proposing it, making decision to adopt it and then finally implementing it (Daft 1978). Moreover, Daft (1978) advise that administrative innovation ideas are generated by management and on the other hand technological ideas are originated by experts at the bottom of the organizational hierarchy. However, the most influential group in the process of innovation is the management team, which can approve an idea for implementation or prevent it from happening depending on the overall organizational strategic goals (West & Anderson 1996).

Innovation process is described more comprehensively in the recent days; however, the intended target remains same, which is to innovate. For example, Desouza et. al. (2009) indicate that the process of innovation commences with the generation of the ideas, followed by screening where ideas are evaluated and shortlisted, then selected ideas are experimented to explore if they are executable, after that they are commercialized through engaging target audience and verifying their responses and finally they are implemented (See Figure 1).

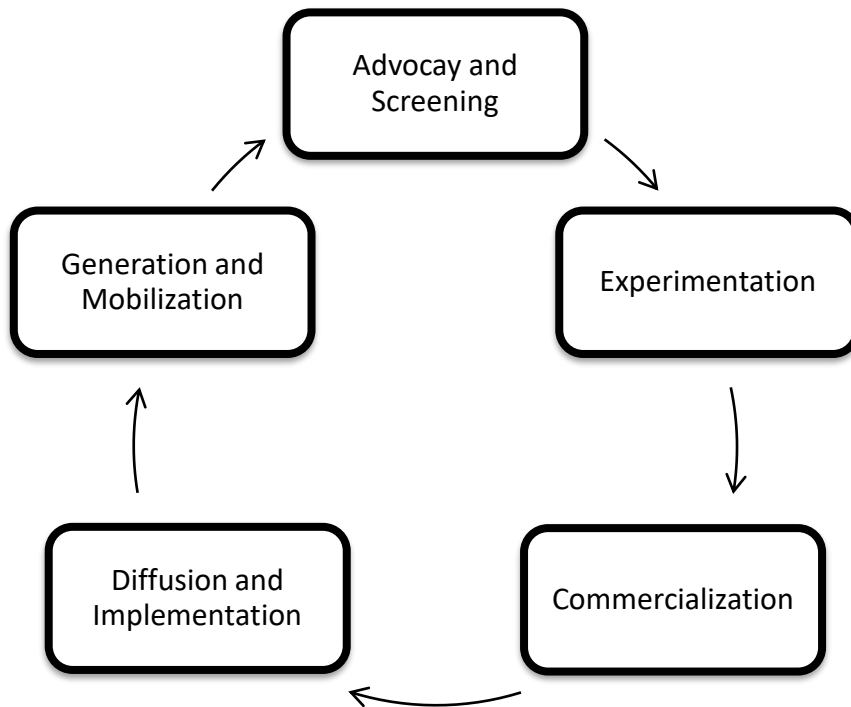


Figure 1: The Innovation Process (Desouza et. al. 2009, p. 10)

Conversely, Powell & Anderson (2010) describe the four stages of innovation process quite differently. It is agreeable that the idea generation is the initial step followed by evaluation, however, the business case presentation is defined as third stage where financial model and benefits are proposed and once approved testing, piloting and launching take place as the final stage (Powell & Anderson 2010). Multiple sources in the literature suggest an alike set of stages of innovation process, followed by businesses of all sizes, with slight variations in the terms used to describe each phase and in the position of the proposal stage. However, it is commonly agreeable that the process of innovation is a composition of four key elements, which are define, discover, decide and deliver (See figure 2).

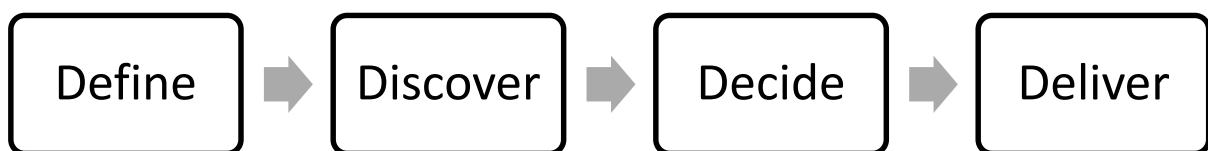


Figure 2: The Innovation Process – Simplified

2.1.5 Conclusion

In principal, innovation is the process of introducing something new of value. Organizations including public sector realize the importance of innovation. Overall, the innovation process consists of four major phases, which are: define, discover, decide and deliver.

2.2 Diffusion of Innovation Theory

The previous chapter dealt with the importance of the innovation and why organizations adopt it to create value. It is highly important to establish a surrounding understanding over the innovation theories that contribute to the research topic. In this chapter, the innovation theory of diffusion is examined and its key aspects are reviewed.

2.2.1 Concept Overview

Diffusion of innovation is a widely discussed theory in the research area (Wenjert 2002, Valente 2003). Valente & Davis (1999) explain that the theory of diffusion describes how new ideas and practices get distributed amongst communities. Diffusion is a process, in which according to Roger (1983) “innovation is communicated through certain channels over time among the members of a social system” and add that communication implies creation and distribution of information between participants to arrive at a common understanding. The key principal behind diffusion is the spread of innovation from innovators to adopters in a flow manner through communication and influence (Rogers 1995). Valente & Davis (1999) agree that communication is an important influencer on the adoption of any new behaviour where information is fairly disseminated under an interpersonal communication environment between various entities. Wenjert (2002) believes that the flow of communication affects adopters’ possibility of adopting the innovation. Accordingly, innovation can be decided to be adopted or abandoned.

In addition to communication aspect, other elements of diffusion of innovation can be driven from the definition provided by Roger (1983) described above. Those elements, as well, define how an innovation can be spread amongst adopters including innovation itself, time and social system (Roger 1983). Roger (1983) further suggests that innovation newness and desire level by social system, time period spent to gain knowledge, assess and reframe innovation and the structure of the social system and how it is integrated to solve problems and attain goals, are elements that contribute to the diffusion process. All these elements consist of boundaries within which innovation diffuse.

Diffusion is linked with a degree of uncertainty. This is because innovations are new and the element of newness introduces uncertainty. Roger (1983) explains that the newness aspect of innovation requires establishment of right knowledge that ultimately can persuade the adopters and help them make decision towards adopting it or not. According to Roger (1983), the amount of information associated with the innovation can reduce the degree of uncertainty and improve the level of predictability. For example, technology innovations typically embody rich information and as a result, uncertainty declines around cause-effect relationships while solving problems (Roger 1983).

2.2.2 Rate of Adoption

The rate of adoption defines the speed of adopting an innovation by participants (Roger 1983, Roger 1995). It is normally dignified as the number of participants adopting innovation over an identified extent of time (Roger 1995). Innovations are usually adopted by different adopters and then disseminated to other adopters at different rate (Greenhalgh et al. 2004). Generally, innovations that do not have clear-cut advantage are not considered for adoption (Rogers 1983). Moreover, Meyer at al. (1997) figures out that innovation that are easily adopted are the ones which have unblemished benefit in terms of effectiveness or cost-effectiveness.

Generally, various innovation diffusion variables define the rate of adoption of innovations. Adopters are normally impacted by the perceived attributes of innovations, which are relative advantage, complexity, compatibility, trial-ability and observability (Roger 1983, Roger 1995, Greenhalgh et al. 2004). Moreover, type of innovation decision, communication channels, nature of the social system and extent of change agent promote efforts are other innovation diffusion variables that are used to decide degree of adoption (Roger 1983, Roger 1995, Valente & Roger 1995). Table 2 represents an explanation against each attribute based on findings from literature.

Attribute Determining the Rate of Adoption	Description on Rate of Adoption	Reference
Relative Advantage	The degree of the perceived advantages an innovation can generate to the adopter determine the rate of adoption. Innovations with clear relative advantages are easily adopted.	Roger (1983) Roger (1995) Greenhalgh et al. (2004)
Compatibility	The rate of compatibility of an innovation defines how readily an innovation can be adopted. If the innovation is compatible with the adopter's norms, practices and	Roger (1983) Roger (1995) Greenhalgh et al. (2004)

	experiences, it can be successfully assimilated. Incompatible innovations require time and adoption of new social system.	
Complexity	The level of difficulty to understand and use the innovation affects the rate of adoption. Simple and manageable innovations are easily adopted. Innovations that require adopters to develop new learning and skills are adopted slower than the simple innovations.	Roger (1983) Roger (1995) Greenhalgh et al. (2004)
Trial-ability	The degree to which an innovation can be experimented with minimum preparations encourages adopters to try it. Innovations which can be tested on existing environments are more likely to be adopted compared to the divisible ones.	Roger (1983) Roger (1995) Valente & Roger (1995) Greenhalgh et al. (2004)
Observability	The degree to which an innovation benefits can be seen by others. If the results of an innovation can be observed easily, the more likely it would be adopted.	Roger (1983) Roger (1995) Greenhalgh et al. (2004)
Innovation Decision	The more people involved in the process of innovation-decision making, the slower the rate of adoption.	Roger (1983) Roger (1995)
Communication Channels	Some communication channels such as interpersonal channels used to spread knowledge amongst adopters, may slow down the rate of adoption. The communication channel is normally decided based on the complexity of the innovation.	Robertson (1967) Roger (1983) Roger (1995) Valente & Roger (1995)
Nature of Social System	The social system norms and the structure of communication network that increase interconnectedness amongst participants, increase the rate of adoption.	Roger (1983) Roger (1995)
Extent of Change Agent Promote Efforts	The relationship between change agent efforts and rate of adoption is not direct, however, once opinion leaders favor innovation, rate of adoption is expected to increase.	Roger (1983) Roger (1995)

Table 2: Description of attributes that affect the rate of adoption of innovation

Attributes elaborated in Table 2, are set of variables used to diffuse innovation and ultimately donate to the adoption process. Accordingly those variables could lead us towards an understanding whether an innovation can be adopted or not and the degree of its adoption by individuals and organizations. In line with our research, those diffusion variables contribute

directly and indirectly in influencing individuals and organizations in making decisions about adoption of innovations. It can be drawn that leaders do have great authority in the process of innovation adoption especially if they favour it as well as organizational practices, environment available and relative advantages of innovation play critical role in the adoption related-decisions.

2.2.3 Characteristics of Adopters

Diffusion of innovation has been a common interest of many innovation adopters because of its difficulty (Roger 1983). According to Greenhalgh et al. (2004), Ferlie et al. (2001) confirm that innovation adopters take lengthy time discussing and assessing an innovation before adopting it, which apparently decreases the advantages of the innovation over the spent period. Generally, the adopters' of innovation varies in terms of their characteristics. Those characteristics have strong influence on the decision of adopting an innovation or abandoning it. Wenjert (2002) highlights the importance of paying attention and understanding how characteristics of actors influence the various components of diffusion.

Before understanding the characteristics of adopters that affect innovation, it is quite necessary to learn about the various categories of adopters. Valente & Roger (1995) suggest that time of adoption and techniques used are the main categories that classify the innovation adopters. Robertson (1967) lists the categories of adopters as innovators, early adopters, early majority, late majority and laggards. Roger (1983) confirms that these are the ideal types of adopters based on abstractions from empirical cases and proposes them as a guide for empirical investigations. Figure 3 stimulates the five ideal types:

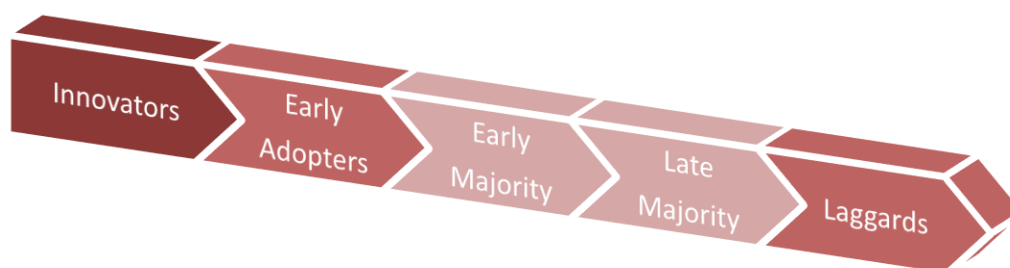


Figure 3: Ideal types of adopters

Apparently, the classification of adopters is guided by the time of innovation adoption. Firstly, innovators appear in the top of list as they are obsessed about trying new ideas, followed by early adopters who are opinion leaders in the social system contributing strongly in speeding

up the diffusion process, next come the early majority who are mediators that have deliberate willingness to adopt innovations, then late majority are positioned due to their sceptical mind about adopting new innovations leading them to wait for most others to adopt; and finally the laggards are located as they are always the last to adopt an innovation because of their comfortability with traditional approaches and preference to live in an isolated environment (Roger 1983).

Based on the various types of adopters, characteristics have been concluded (Roger 1983, Wenjert 2002). Some of the key characteristics can be determined including socioeconomic characteristics, personality traits and communication behaviour (Roger 1983, Wenjert 2002). Socioeconomic characteristics define the level of education and social status of the adopter (Roger 1983, Wenjert 2002). With regards to personality traits, according to Wenjert (2002), Weimann & Brosius (1994) suggest that self-confidence and independence are core traits that control the degree to which an adopter adopts an innovation. In addition to that, Roger (1983) think that the personal trait of empathy which is the capability of an individual to project oneself into another character to be imaginative, think counterfactually and communicate effectively with others; is key player in the adoption process. Moreover, communication behaviour such as communication channels, interpersonal contacts and knowledge determines how connected the various entities within the social system are (Roger 1983).

2.2.4 Conclusion

Diffusion of innovation process defines how innovations get distributed between communities. There are various variables of innovation diffusion that influences the adoption of innovation. Adopters are integral part of innovation diffusion. Different types of adopters and their various characteristics determine degree to which an innovation could be adopted.

2.3 Innovation Labs

This chapter examines the first objective of the research. It provides an overview on innovation labs concept highlights the role of the innovation labs and describes how innovation labs contribute to achieve organizational innovation-objectives.

2.3.1 Innovation Labs – The Concept

In the literature, wide range of resources touched base around the concept of innovation lab and innovation teams but practitioners did not agree on a concrete definition or term to describe

‘Innovation Lab’ and they rather settled for describing the role and objectives of innovation lab and the teams running and working in it. On the other hand, few researchers defined the concept according to the context of their own expertise, for example Puttick (2014) in his practice guide, define innovation lab as “Innovation teams – often referred to as innovation labs, funds or units – come in a variety of sizes, use a range of techniques, are equipped with different resources, and try to tackle different issues and challenges”. Puttick (2014) add that what differentiate innovation teams and labs from other defined teams in an organization is that they follow experimentation approach to resolve issues.

As reported by Lewis & Moultrie (2005), innovation labs are physical research environments established for executing specific experimentations. The way innovation labs are setup is mainly for removing barriers amongst participants, encouraging group creativity and support innovation initiatives (Lewis & Moultrie 2005).

According to Bloom & Faulkner (2016), innovation labs are spaces for creative problem solving through range of activities. Moreover, UNICEF (2012) defines innovation lab, as “A lab is a space and set of protocols for engaging young people, technologists, private sector, and civil society in problem-solving”. This also help us draw that various innovation labs in the world have different specializations such as ‘Research at Google’ focuses on computer research while Bell Labs focuses on network infrastructure whilst CERN establishes world-class physics research (Bedell 2014).

Generally, it can be drawn that innovation labs are spaces for innovative people to solve problems in the presence of the right processes and tools.

2.3.2 Features of Innovation Labs

Going back to one of the definitions of innovation labs that is described in one of the Oxford English dictionaries, it specifically mention that innovation labs could either be a room or building that is equipped to allow experiments and research for the purpose of products development (Lewis & Moultrie 2005). Two key aspects can be drawn as basis of innovation labs from the description that they are a sort of a facility and have been armed with equipment.

Generally, innovation labs have common features. Although the design of innovation labs is usually personalized fitting the owning organizations, many share similar characteristics (Magadley & Birdi 2009). For instance, innovation labs share a similar structure that consists of multiple working rooms, round tables and exhibition spaces to allow group creativity and

encouraging innovative thinking by removing traditional atmosphere (Magadley & Birdi 2009). In addition, innovation labs usually contain high and low-tech tools, such as whiteboards, pictures and multimedia projection tools, to facilitate group work and support articulation of innovative ideas (Magadley & Birdi 2009).

In the past also innovation facilities use to be equipped with moveable furniture, various write-on surfaces, multimedia tools and research libraries in order to facilitate business growth in a more dynamic, quick, exciting and novel way (Lewis & Moultrie 2005). Lewis & Moultrie (2005) confirm that in the recent days the labs design emerged in the response to business challenges to enable swift decision-making and development of innovation solutions. Today innovation labs are structured as set of rooms that are equipped with moveable barriers, open spaces and cubicles.

2.3.3 Need for Innovation Labs

As highlighted in the previous chapter, innovation is one of the key elements for organizations to succeed and most of arguments proven that innovation is winning. Puttick (2014) highlights that organizations have no choice other than to innovate when faced with complex problems and increasing demand. According to Carstensen & Bason (2012), Kao (2002) think that innovation is an art and just like an artist's home, innovation thrives for a place where creative minds can function adequately. Generally, public organizations are ill suited to develop innovation (Carstensen & Bason 2012). Hence arose the need for establishing innovation labs, in public and service organizations, to become more effective and efficient in the innovation aspect and to respond dynamically to imperceptible and vague problems (Lewis & Moultrie 2005).

It is also important to highlight the learning aspect of innovation labs. Chesbrough (2005) identify that open innovation, type of innovation, key advantage is bringing external knowledge into the firm. Lewis & Moultrie (2005) figure out from multiple case studies investigations that organizations tend to experiment for the purpose of extending the learning and knowledge of individuals and groups using the lab facility. In addition, design and implementation phases add another learning curve to participants on their own (Lewis & Moultrie 2005). Organizations can use this advantage to improve their people's capabilities and widen their horizons.

Carstensen & Bason (2012) confirm that innovation labs provide the right set of attributes including approaches, tools, models different than what usually public servants process. UNICEF (2012) suggests that lab provides a meaningful platform to engage with wide range of people and resources to achieve ultimate objectives. Furthermore, Lewis & Moultrie (2005) explain that innovation labs provide collection of tools and resources that enable organizations to dynamically tackle issues that are under consideration; ultimately allowing organizations to create value.

In order to innovate, innovation labs require competencies and mind-sets which are not similar to those needed for daily operational work and services at the front line (Carstensen & Bason 2012). It also requires establishing teams that are given enough time to generate new ideas and test them rather than focusing only on day-to-day tasks (Puttick 2014). Ultimately, organizations are required to build innovation labs that are composed of the right mix of people, attributes and sufficient environment to achieve innovations.

2.3.4 Role of Innovation Lab Teams

Worldwide breakthroughs are result of immense hard work of the innovators. As described by Thomas A. Edison “I never did anything by accident, nor did any of my inventions come by accident; they came by work” (Tidd & Bessant 2013). The role of innovation lab is highly critical because there is immense of work and time spent by those teams to achieve intended results of a particular innovation. Hence, it is crucial to understand what happens behind the scenes in these innovation labs and reveal the curtains to understand more about their world. Puttick (2014) agrees that it is crucial to setup a platform that encourages innovations to happen through innovation lab which is role is to achieve better outcomes and cost saving solutions, to tackle existing challenges and to provide novel methods (Puttick 2014).

Generally, the role of innovation lab teams can simply be drawn from the description of innovation labs. Commonly described core activity run by innovation labs is experimentations to detect opportunities (Martin 2011, Tidd & Bessant 2013, Puttick 2014, Djellal et. al. 2015). Spotting such opportunities through collaborative and effective role of innovation lab helped many organizations worldwide to breakthrough and stand strong in the face of competition. Bloom & Faulkner (2016) add that innovation labs commonly conjure logic of a safe harbour for experimentation, concentrated problem solving and solutions development.

Carstensen & Bason (2012) one of the main roles of innovation labs is to build a collaborative environment to urge collaboration. Innovations labs principally build a bridge between various stakeholders including end-users, citizens and businesses where they can engage with each other in interaction and solution development activities in the process of constructing new solutions (Carstensen & Bason 2012).

Martin (2011) while analysing Intuit's Software company transformation story realizes that regardless the size of the corporate business, if it really wishes for mass transformation, it can make it. The reason behind the mass transformation of Intuit was far from imitating equivalent software companies and very close to turning direction on design and innovating in this line specifically. This was only possible through creation of innovation catalysts to run various innovation initiatives across the organization, help working groups in creation of prototypes, running experiments and learning from customers. Because of the creative role of innovation catalysts, 32 ideas made it to the market in the first year of the establishment of the platform.

In the banking world, Desai (2015) explains that the main role of innovation lab is to connect between project teams within the organization. Moreover, innovation labs help fast tracking the adoption of latest innovations in the market, establish a culture that is encouraging of innovation and develop capabilities to strategize innovation (Desai 2015). It is clear that innovation lab role is about collaboration between innovation lab teams and staff from various operational areas working together towards solving common client problems with emerging innovations. Furthermore, Desai (2015) adds that innovation lab focuses on field-testing the intended innovation and once proven potentially effective, all required expertise, knowledge and tools are provided to the relevant stakeholders.

It can be drawn that common innovation lab role addressed in the literature are collaboration and experimentation. These cannot function without the availability of the right people, environment, tools and processes.

2.3.5 Innovation Lab Role in achieving Organizational Innovation Objectives

Organizations realize the importance of innovation to continue growing and glowing. Firm innovation is a key element for the growth and survival of organizations (Damanpour & Gopalakrishnan 2001). Magadley & Birdi (2009) believe that the issue that organizations have is not whether to innovate or not, it is how to do so successfully. Due to this, many

organizations tended to adopt varied methods to nurture innovation potential within employees, elevate organizational culture and most recently create innovation labs (Magadley & Ahmed 2009). Innovation labs were intended to create a culture of collaboration amongst various teams within an organization to explore new ideas and to implement them and use creative thinking in solving existing problems (Magadley & Birdi 2009).

Organizations also recognize that innovation team has great role in bringing successful innovations to life. The innovation success depends on innovation teams (Marcati et al. 2008). According to Leenders & Engelen (2016), Kratzer et al. (2004) confirm that creative performance of innovation team is a critical factor for the success of product innovation. Bloom & Faulkner (2016) add that innovation labs are meant to support establishment of innovation culture that help alter bureaucratic stillness within large organizations.

Moreover, the way innovation labs are established can bring ultimate value to organizations. Innovation labs altogether can bring new methods of developing solutions in a world of technology that constantly change, invite great diversity of skillsets creating more opportunities for creativity, encourage collaboration under the setting of a physical environment and finally allow progressive development to solutions following testing and experimentation methods (UNICEF 2012).

Bloom & Faulkner (2016) suggest that innovation labs are generally designed to generate positive change and achieve particular goals that are defined by a community or organization. For instance, The Innovation Labs Kosovo aim at developing solutions to improve their future which goes in-line with their community innovation objective while various UN Innovation Labs aim at resolving respective community pressing problems (Bloom & Faulkner 2016). The existence of innovation labs is important. Bloom & Faulkner (2016) suggest that UN agencies failed in engaging communities in their innovation work however, innovations labs could implement activities that work hand-in-hand with communities to achieve organizational changes. Moreover, innovation labs lean and flexible nature has proven their ability to strengthen relationships with various layers and nurture innovation amongst wide range of stakeholders and participants (Bloom & Faulkner 2016).

The realization of innovation value and strong role of innovation lab made many organizations pay more attention to the human enablers of innovation, which form the innovation teams. For example, Koudelkova & Milichovsky (2014), part of their critical study on Czech national

economy, identify that innovation is a key factor to business growth in many organizations, as well as, they believe that human factor has great influence on business innovation. The availability of personal skills, technological experience and knowledge are basis for the formation of innovation (Koudelkova and Milichovsky 2014). Moreover, Intuit was able to survive and then compete its rivals through forming effective innovation catalysts, which produced various innovations in a short period of time (Martin 2011).

Innovation labs are the enablers of the innovations in the organizations. Realizing this fact made many organizations around the world focus on establishing the right innovation labs and climate to deliver successful innovations.

2.3.6 Open Innovation – The Living Labs

Today's business world is highly dynamic, labour-mobile and knowledgeable across public and private and firms are able to innovate individually anymore (Vrande et al. 2008). Many firms are changing their direction towards open innovation where users are closely integrated in the process of innovation for the intention of learning from them and co-creating value (Chesbrough 2005, Westerlund & Leminen 2011). While closed innovation involves only internal ideas to create new product and services, under open innovation setting firms scan the external environment before intending to innovate (Chesbrough 2005). The concept of open innovation was firstly introduced by Chesbrough (2005) where he defines it as “a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology”. It has then been attracting practitioners from various disciplines (Bergvall-Kåreborn et al. 2009).

The process of open innovation dictates that internal and external ideas are translated into architectures and systems where ideas are business requirements from both inside and outside an organization undertaken to generate ultimate value (Chesbrough 2005). External knowledge generated through involvement of participants from outside supplement organizations with unique value (Chesbrough 2005). This process's ultimate value is that it allows firms to obtain ultimate benefits from a solution through involvement end-users (Bergvall-Kåreborn et al. 2009). Westerlund & Leminen (2011) add that co-creation with users provides opportunities for companies to better tackle their clients' needs and decreases risks of launching a new product or service that has not been integrated with users and as result improving time to market and return on investment.

Living labs is one of common forms of open innovation. Bergvall-Kåreborn et al. (2009) define living lab as “a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values”. Generally living labs focus on getting user-led vision for the innovation process where users and innovators co-produce innovation through real-life test and experimentation (Bloom & Faulkner 2016). Bloom & Faulkner (2016) further add that in the living labs the user input is required for the purpose of improving products and services and growing their diffusion in the market.

Living labs is a form of open innovation however open innovation uses users’ ideas as a resource for innovation while living labs uses users’ ideas and involve various stakeholders to participate in the innovation process in a real world environment (Bergvall-Kåreborn et al. 2009). As reported by Bergvall-Kåreborn et al. (2009), open innovation contrast with living labs in terms of clients, model and focus of external input. Open innovation client base is business-to-business, follows business model and external input focuses on ideas while living labs client base is business to customers, model depends on product and service and external input is used throughout the innovation process (Bergvall-Kåreborn et al. 2009). Living labs is a form of open innovation however open innovation uses ideas as a resource of for innovation while living labs uses ideas and people to participate in the innovation process in a real world environment.

According to Bergvall-Kåreborn et al. (2009), key principles of living labs are openness, influence, realism, value and sustainability. Kusiak (2007) clarify that the strategy of living labs is requirements-driven and implies the establishment of a system that collects customer requirements and process them. The model, widely discussed in the literature and depicted in figure 4, is named as ‘the living innovation laboratory’ and aims providing a platform that involves all stakeholders in the process of developing the requirements through sharing knowledge and allows the customer to generate ideas, validate the design through testing and sharing feedback with the producers (Kusiak 2007).

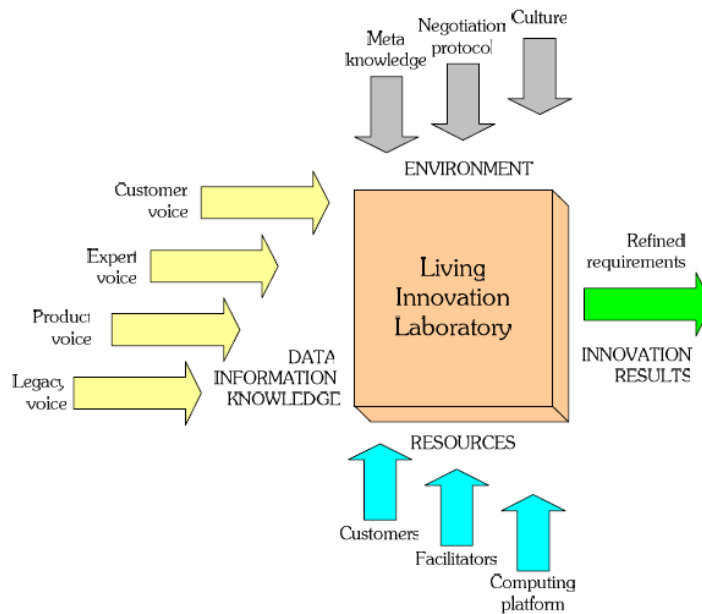


Figure 4: The concept of the Living Innovation Laboratory (Kusiak 2007, p. 870)

The main benefits of living labs approach surrounded around the element of integrating with the customers; ultimately providing value in terms of getting dependable market evaluation, eliminating business risks and reducing cost over development (Kusiak 2007). In terms of living labs activities, they are in line with the original innovation process's activities, starting with co-creation where all relevant users are involved to co-design, then exploration where market opportunities are discovered, followed by experimentation where live scenarios are configured with users and finally evaluation where products and services are assessed against social criterion (Westerlund & Leminen 2011).

Open innovation is all about using a mixture of external and internal knowledge to improve innovation. Living labs is a form of open innovation as it uses users' ideas; additionally, it does involve them in the entire innovation process.

2.4 Challenges Innovation Lab Face

This chapter investigates the second objective of the research by giving an insight on the key challenges that innovation labs face. The identified challenges hinder innovation labs from executing their relevant tasks appropriately and stand in the face of delivery of breakthrough innovations. The challenges are grouped according to most commonly identified challenges in the identified literature under the context of innovation labs as well as the key challenges that confront open innovation and living labs.

2.4.1 Strategy Challenges

Innovation science does not exist and a strategy applicable in a specific corporation cannot necessarily work effectively in another (Kusiak 2007). Todtling & Trippel (2005) believe that there is no one-innovation policy that fits all sizes because innovation capabilities deviate in many aspects from a region to another. On a similar line, Bloom & Faulkner (2016) agree that what works in one place will not necessarily work in another as each lab is expected to have its own relevant needs. On the other hand, there are some common policies and best practices, which can be generalized and accordingly may perhaps determine the progress in innovation (Todtling & Trippel 2005, Kusiak 2007). Organizations like Intuit was going through bitter disappointments before realizing the need for establishing a strategy that fits the nature of the company business and vision without imitating what the rivals are doing (Martin 2011). Magadley & Birdi (2009) clarify that some strategies such as relying on technology completely reduces the advantage of interacting with others and strangles creativity hence adoption of mixed-methods is suggested.

The way innovation labs operate might not fit organizational practices and existing norms. Bloom & Faulkner (2016) think that establishment of innovation labs may force organization to change its culture to achieve better outcome. However, bringing change to organizational culture is not an easy task and causes disruption to status quo (Bloom & Faulkner 2016). It is suggested that organizations change their perceptions about cultural change and by anticipating it as core of organizational change rather than perceiving it as it is injected from outside (Bloom & Faulkner 2016).

Another crucial challenge innovation labs face is implementation of ideas. According to the research conducted by Magadley & Birdi (2009), one of commonly addressed issues that innovation lab face is implementation of ideas and most of the time because of financial limitations. Furthermore, the challenge lies within the immense effort required to evaluate the feasibility of implementing ideas and the focus of stakeholders on generating ideas because ideas implementation require high level of commitment from in-charge personnel (Magadley & Birdi 2009). Moreover, there is common belief amongst innovation labs that they do not have to worry about the future of an idea and constraints linked to it (Magadley & Birdi 2009). Mostly ideas are generated and experimented by innovation labs and implementation part is usually neglected.

2.4.2 Process Challenges

In relation to strategy challenges, process challenges can also hinder operating innovations. Innovation process is difficult to manage (Desouza et al. 2009). Many researchers agree that innovation process is complicated, highly dynamic, non-direct and requires immense knowledge sources (Kusiak 2007). Kusiak (2007) confirms that organizations require establishing intra-organizational functionalities and building firm external relations with various entities to facilitate innovation process. According to Koudelkova and Milichovsky (2013), Pitra (2006) confirm that it is vital for the management to ensure all processes within the company flow smoothly and innovation team collaborates between different departments and establishes internal consistency with no barriers.

Moreover, restricted controls limit innovation where planning, budgeting and review activities can slow down innovation process. Desouza et al. (2009) believe that organizations, which lack of well-defined processes, miss many innovation opportunities and find difficulties in recovering from mistakes and failure. In such organizations innovations steps are overloaded creating a lot of confusion and indecision (Desouza et al. 2009). Clarity of processes, structure and flexibility on the other hand affect innovation team positively.

2.4.3 Resource Challenges

Financial constraint is a disabler of innovations. Innovation labs, which do not have sufficient financial support, cannot function and as a result might be abandoned. In many cases, ideas are not implemented due to unavailability of sufficient funds (Magadley & Birdi 2009). Innovation is addressed to be expensive and usually organizations do not have sufficient fund to support innovation (Lendel & Varmus 2013). Bloom & Faulkner (2016) strongly believe that even innovation labs, which have significant autonomy, are not immune to organization structural and financial limitations. Magadley & Birdi (2009) suggest that financial constraint impedes ideas from being implemented because those ideas normally come with high price tag.

On the other hand, there is high level of uncertainty linked to innovation successfulness and whether it is going to generate sufficient financial value in return and in the long term. For instance, Scherer and Harhoff (2000) believe that spending money on innovation is linked with high level of uncertainty on the return on investment making the decision-making process difficult for the firms to decide which idea to fund. In addition to that, Powell and Anderson (2010) recognize that finance function increases the chances of innovation success through the

involvement of finance personnel during all defined stages of innovation. For example, during the idea generation phase, accountants can identify commercial opportunities and propose new business model accordingly that is not obvious to others who lack commercial expertise (Powell & Anderson 2010). Generally, without sufficient fund innovation, labs cannot function and without financial measurements, innovation might not flourish.

2.4.4 Open Innovation Challenges

Open innovation type of innovation is associated with a number of challenges. From West & Gallagher (2006) perspective, in order for organizations to establish a culture of open innovation, they are required to motivate the generation of external knowledge, incorporate external resources with firms' resources and abilities and maximize use of internal firm capabilities, which could be challenging to some extent. For instance, maximizing use of internal abilities requires firms to produce innovations to be commercialized internally, build capacity to explore exterior innovations and generate innovations that produce revenues via external commercialization (West & Gallagher 2006). Moreover, the integration of external and internal resources is a costly and risky business and innovating firms have to bear the coordination cost and risks attached to it (West & Gallagher 2006).

Open innovation reliance on knowledge from external sources introduces challenges. Firms need to be careful on the aspect of to what extent internal innovation work can be exposed to resources from outside the firm as well as keeping into consideration the inputs of others and the inability of denying their rights over the end-result (Westerlund & Leminen 2011). Westerlund & Leminen (2011) add that organizations are obligated to create an operational culture including open organization and processes to cater to the needs of external resources. The other aspect of knowledge highlighted by Vandre et al. (2008) is the inability of enterprises to innovate on their own due to labour mobility and broadly detached knowledge across several private and public firms. Consequently, the need to involve alternative practices such as open innovation emerged across various fields (Vandre et al. 2008).

Generally, it can be established that the key challenges that innovation labs face are the clash between organizational norms and how innovation labs operate, inability or disinterest in implementing innovation ideas and financial constraints. In addition to that, open innovation builds a set of other barriers in the face of innovation labs including risk and difficulty of integrating external resources with the lab, the need for constant motivation to ensure lab operability and continuous generation of ideas and dependency on external knowledge.

2.5 Success Factors of Innovation Labs

This chapter deals with the third objective of the research through examination of the key factors that enable successful operation of innovation labs. Those factors qualify delivery of successful innovations as a result.

2.5.1 Strategy Factors

To start with, innovation labs strategy is one of the key bricks that pave the way for innovations to occur. For example, Bloom & Faulkner (2016) deeply believe that strategies such mobility enables agility and allows user to work with the lab in a flexible and deeply engaged approach. Moreover, the flexibility of the lab in adapting external changes and altering internal methods while keeping core ideologies and design is significant for the labs to effectively respond to approaches preferred by end-users (Bloom & Faulkner 2016). Such strategies like mobility and flexibility allow end-users to access the lab easily and encourage them to be engaged. Moreover, Lewis & Moultrie (2005) agree that flexibility of innovation workspaces is highly important for large group activities.

From another perspective, proper strategic planning increases effectiveness of the lab (Lewis & Moultrie 2005). Lewis & Moultrie (2005) add that a good strategy reinforces team building, streamlines communication, encourages creativity and supports creative problem solving. According to Puttick (2014), the strategy of the innovation lab consists of a number of key elements that together build a strong team which are leadership, team, partnership, resources, processes and measurements. Leadership defines how team is led, team outlines skillsets and culture, partnership identifies external relationships, resources showcase the funds required, processes demonstrates techniques and approaches and at last measurements represents evaluation framework to measure impact (Puttick 2014). Puttick et al. (2014) outline some of the main advantages of implementing such model which are building strong relationship with partners allow using their resources and insights and accordingly help achieve goals, building a team with a diverse skillset open gates for sharing wide range of knowledge and experiences and regular assessment of impact enable identification of what is not working at an early stage. Corporates should ensure the right set of elements are established within the innovation lab to succeed in the process of innovation in the end.

Besides flexibility, Bloom & Faulkner (2016) suggest that providing innovation labs certain level of autonomy allows the innovation lab to operate in a more responsive manner to instant

needs in an experimental approach. Autonomy is another element that contributes to the success of innovation labs. In addition to that, Magadley & Birdi (2009) suggest the adoption the combination of both technology and tradition in the innovation strategy, which ultimately lead to attaining maximum results and create an environment of enthusiasm and motivation.

2.5.2 Process Factors

Projects in general require well-defined processes to enable smooth operability of its various activities. When it comes to R&D and innovation projects many researchers agree that process of executing such initiatives requires more attention (Kusiak 2007). The nature of innovation is complex and inherent (Desouza et al. 2009). The compound structure of innovation process suggests the allocation of a process manager who overlooks all the aspects of the innovation initiatives financially, technically, and socially and identify their impact (Kusiak 2007). Furthermore, Powell & Anderson (2010) highlight the importance of engaging the finance team in the end-to-end process of innovation to avoid expensive failure. Most importantly, the support from top management throughout innovation process is highly effective (Desouza et al. 2009). Hence, to ensure successful delivery of innovation, the process of innovation should be structured in such a way that allows involvement of key stakeholders and do not bypass them.

If the process of innovation is, well defined, successful innovations can be promised. Organizations having strong processes for innovation will front run their industries (Desouza et al. 2009). Powell & Anderson (2010) believe that innovation process should be schematized using rigorous but speedy innovation approach besides a range of spurs and resourceful tools. Desouza et al. (2009) recommend the 'robust organizations' concept as one of the well-defined innovation processes and precise protocols for the assessment and screening of innovation ideas. Robust organizations are known for their strong capability in establishing solid framework for handling ideas from their birth until commercialization (Desouza et al. 2009). The process starts from generating ideas, mobilizing them, allocating advocates, screening and evaluating, experimenting and ends with commercializing them where all the processes have defined set of protocols that are followed neatly and systematically (Desouza et al. 2009). Organizations have set of pre-defined process and set of protocols to be followed for innovation succeed more compared to organizations which lacking such process.

Another area of focus in the process of innovation is testing and experimenting the ideas. Experimentation allows identification areas of improvements and accordingly product can be

refined before final submission reducing chances of failure (Kusiak 2007, Martin 2011). Desouza et al. (2009) suggest the transparency, availability of the tools and resources for experimentation, creation and documentation of a defined testing process, engagement of external parties and usage of technology are altogether key characteristics of successful experimentation phase under innovation process. Rapid experimentations generate early wins with long-term impact (Puttick et al. 2014).

2.5.3 People Factor

Therefore, organizations should be aware of the various building blocks that are required to construct the team. According to Innovation Team & Lab guide by Puttick (2014), the guide suggests following five major steps; to build a successful innovation lab which are: 1)clarifying the aims and objectives that determines the need for an innovation lab, 2)designing the lab model including external relationships and sponsorship, 3)building your lab team by developing leadership, team skills and culture, 4)implementing and delivering via identifying the methods the will follow 5)measuring impact by quantifying success.

As highlighted by Puttick (2014), focusing on the team skillsets and culture is a core step in the formation of the innovation lab. Knowledge, learning and skillsets of lab team members are necessary elements for innovation (Andres et al. 2015). Fudge & Roca (2012) confirm that having diversity in the team backgrounds encourage them to think bigger than the box instead of focusing on the out of the box theory. The way the box can be enlarged is through increasing the range of experiences, skillsets, academic knowledge and professional networks (Fudge & Roca 2012). The sufficient diversity and a big box are helpful in terms of widening the opportunities of spurring great ideas, identifying undiscovered potentials and addressing the different questioning that may occur during the process of idea generation until implementation (Fudge & Roca 2012).

Puttick et al. (2014) suggest the lab to consist of mixture of members from inside the organization and outside. Sometimes the skills and knowledge of the innovation lab members might not be enough to generate ideas and they might need a wild card entry from outside to help them bring out their spark (Fudge & Roca 2012). The distinctive characteristic of the provocateurs is that they have personality and experiences that are opposite to the original lab members which makes their sheer presence an energy booster to the rest of the team (Fudge & Roca 2012). Additionally, Puttick et al. (2014) support the inclusion of members from outside

into the innovation lab to achieve goals such as government executives, internal and external partnerships.

Building the right innovation lab team and assigning the right combination of people to innovate are not enough for achieving breakthroughs. The journey of innovation is tough and in order for innovation team to continue, being productive organizations should not neglect the rewarding perspective no matter how far they are gone in this journey. Based on Koudelkova & Milichovsky (2015) research, it has been identified that lack of incentives discourages employees from participating in innovations, which ultimately affects the company's business growth. Setting goals, motivating employees on time, offering valuable incentives and keeping up promises can all contribute to motivating employees to continue innovating. Celebrating results and achievements are great energy boosters and satisfactory factors for innovation team members (Puttick et al. 2014).

2.5.4 Open Innovation Success Factors

Generally, innovations following open innovation approach can get the great advantage of this type. Open innovation open doors for firms to broaden their sources of knowledge through learning and involving customers, academics, and other firms, which are using innovative methods (West & Gallagher 2006). For example, living labs principles such as openness support open mind-sets whether on individual or group level and allows knowledge share across various levels in an organization (Bergvall-Kåreborn et al. 2009). Openness provides a platform where multi perspectives are integrated leading development of quick and successful solutions, new ideas and new openings in the market (Bergvall-Kåreborn et al. 2009).

The nature of open innovation in general encourages examination of new products and services by involving users and seeking their feedback. This feature gives great advantage to open innovators for constructing better solutions (Chesbrough 2005).

Another important element in open innovation is motivation. Due to the nature of the model that requires involvement of various users across the process of the innovation, it is highly important to pay attention to the motivation factor to get max out of them (West & Gallagher 2006). In order to encourage the generation of external knowledge and motivating various external sources to integrate with the firm resources, organizations are encouraged to provide rewards and appropriate structure for contribution to succeed (West & Gallagher 2006). If proper reward and recognition system is in place, open innovation will work fashionably.

To sum up, innovation labs success is generated from various attributes. The existence of these attributes allows innovation labs to successfully operate and deliver successful innovations. These elements are setting up the right strategy, establishment of well-defined and structured processes, building the right team, reinforcement of a culture of openness, encouragement of examination of new products and services and development of a culture of innovation.

Chapter 3: Research Framework

The objective of this chapter is to outline the conceptual framework of this research, which is drawn based on the findings from the literature and are developed to address the research questions. The chapter presents two conceptual frameworks that are associated with the research objectives, including the challenges innovation lab face and success factors of innovation labs. The established conceptual frameworks were the basis for developing the interview questions in order to investigate the relationship between the critical literature review findings and empirical research results.

3.1 Challenges Innovation Labs Face

Figure 6 demonstrates the challenges innovation lab face in a list format categorized under five key elements identified from the literature including strategy, process, leadership, team and resources. The outlined challenges are some of the common challenges discussed in the literature and it is presumed that those challenges hinder the innovation lab from operating effectively and may contribute to its failure. It also assumes that figuring out these pain-points and overcoming them can help organizations achieve better innovation outcome through a better-structured innovation labs.

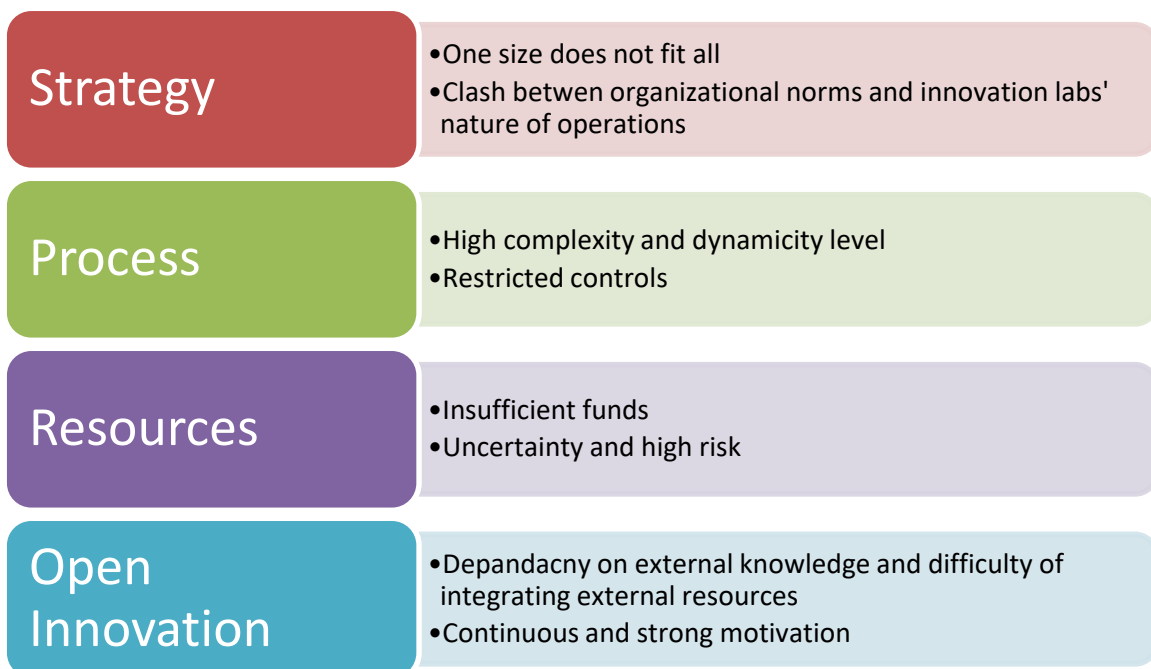


Figure 5: Challenges innovation labs face

3.2 Success Factors of Innovation Labs

Figure 7 depicts the factors that lead to innovation lab success in a cause-effect relationship. Based on findings from critical literature review it is presumed these factors contribute to the establishment and operability of a successful innovation lab. It also presumes that firms, which thoroughly consider these factors in building their innovation lab, they will be capable in delivering successful innovations.

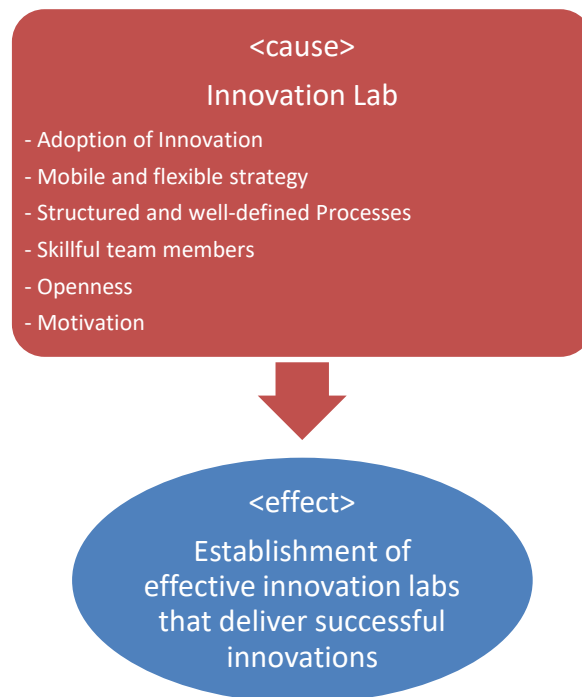


Figure 6: Success factors of innovation labs

Chapter 4: Research Methodology

This chapter aims at articulating the systematic approaches used in building up reliable knowledge part of this study. It presents the relevance, reliability and validity of the implemented approaches in gathering and analysing the research data. It sheds the lights on the research philosophy, outlines the research approaches, and elaborates on data collection methods and data sampling tools utilized to conduct the research.

4.1 Research Philosophy

One of the significant parts of a research is the way the research is designed and the procedures and methods followed to collect research data conduct the research analysis and interpret its findings. It is usually referred as research philosophy and contains various critical assumptions that demonstrates the way the researcher views the world. Saunders et al. (2009) describes research philosophy as the process of development of new knowledge and beneath it lies the research strategy and methods used to form this strategy. The key attributes that contribute to the selection of the relevant approach is the objective of the research and researcher practical considerations. Flick (2009) adds that the key to choosing the research design is its capability to address main elements of the research questions. Generally, the commonly addressed research philosophies are positivist, interpretive and mixed methods. The quantitative research is based on positivist while qualitative research is based on interpretive and mixed methods is a combination of both.

Positivist philosophy involves testing of objective theories that represents the truth to explore the relationship amongst different variables through statistical procedures (Sale et al. 2002, Saunders et al. 2009, Creswell 2014). Saunders et al. (2009) add that positivist philosophy is independent of social actors and mainly focuses on generalizations providing credible data and facts therefore it uses high structured large samples. Pickering (2008) argue that positivist philosophy could be inflexible due to its nature of relying on large sample size with fixed-choices questionnaire and failure in attaining respondents' real thoughts and experiences. However, positivist philosophy is used to conduct factual analysis where respondents' opinions do not affect the facts. In contrast, interpretive philosophy includes examination of the understanding of social actors on a specific world problem through asking evolving questions that enable access to their minds to collect data that helps in comparing claims of reality (Sale et al. 2002, Saunders et al. 2009, Creswell 2014). Saunders et al. (2009) further clarify that interpretive philosophy is subjective and socially constructed which is prone to changes and

multiple views hence it usually relies on smaller samples and uses in-depth investigations. Therefore, interpretive philosophy is followed to gather various opinions where respondents' social perspective influence the type of data being collected. On the other hand, mixed research philosophy involves collection of both quantitative and qualitative data, and integrating them through different designs to arrive at a surrounding understanding of a research problem (Sale et al. 2002, Voss et al. 2002, Creswell 2014). Pickering (2009) add that mixed-method philosophy allow integration of two combinations leading to generation of complementary insights and unique perspectives.

This research requires case exploration and in-depth investigations of innovations labs and considering the size and the nature of the research, which focuses on one particular case; interpretive philosophy has been selected. The interpretive philosophy process involves in-depth and selected groups' interviews and participants' observation as well as samples are not meant to be large populations (Sale et al. 2002). The research is intended to examine the key challenges that innovation labs face which will help to draw the key factors for the delivery of successful innovations, which is a small but relevant population, and compare it with the empirical research findings. Sale et al. (2002) add that interpretive philosophy allows identification of rich and meaningful information. The collection of different perceptions and opinions of the participants should lead to establishment of a roadmap for critical success factors of innovation labs under particular social constructs. For instance, a challenge addressed in the literature might not necessarily be addressed in the selected case due to various perceived assumptions by respondents. Accordingly, using interpretive philosophy, the research will assure that all the needed data to achieve research objectives are obtained and used.

This also means that the research is following qualitative research approach to collect qualitative data to gather respondents' opinions over challenges that face innovation labs in relation to diffusion of innovation and open innovation theories. The qualitative research guidelines established by (Saunders et al. 2009) are followed closely to increase the level of accuracy of this study.

4.2 Research Approach

Research approach is defined based on the process the researcher follows to conduct the research or the type of data being collected. The research approach are mainly classified as either inductive or deductive (Saunders et al. 2009, Creswell 2014). Deductive approach involves drawing a theory and designing a strategy to test it rigorously while inductive

approach includes collecting the required data and outlining a theory as a result of the data analysis (Saunders et al. 2009, Creswell 2014). Therefore, deductive approach allows testing of an existing hypothesis while inductive approach leads to creation of a new hypothesis. This study embark on the analysis of the theories of diffusion of innovation and open innovation. As demonstrated in chapter 2 and 3, the employment of these theories in organizations is emerging. This is based on the understanding that diffusion of innovation allows adoption of innovation in organizations and as result it increases their level of interests in operating innovation labs while open innovation provides opportunities for organizations to explore wider range of innovations in a smoother manner. Both prospects evolves challenges to the organizations and the way they operate their innovation labs. Accordingly, this research study is conducted to identify whether these theoretical foundations in theory are valid in Organization X. Therefore, the research uses deductive approach format to test and validate existing defined theories in an aviation industry.

4.3 Research Method

One of the integral parts of a research study is the identification of the type of the data required to be collected and the process required to conduct the research study. The decision depends on the required level of reliability and validity according to the research objective and scope.

Case research has been widely used in the field of operations management and there are many search (Voss et al. 2002, Barratt et al. 2011) which provide insights on how to conduct case studies in best way. This research uses case study following deductive qualitative approach. While Ketokivi & Choi (2014) generally think that case research could be used for either theory generation or theory testing or theory elaboration, Barratt et al. (2011) believe that deductive qualitative case studies are used mainly for confirmation of existing theories and hypotheses and are viewed as individual studies that are used to approve or falsify a theory. Moreover, Ketokivi & Choi (2014) add that theory-testing case study based research follows conventional deductive approach where the theory provides an elementary logic for the propositions to be examined. The theories reviewed and analysed in this research are diffusion of innovation and open innovation and accordingly two theoretical framework have been articulated as discussed in chapter 3. The interest of this research is in the challenges that face innovation labs in association with these two theories. To maintain objectivity and avoid biasness the conceptual frameworks will be analysed and compared with the data findings from the case study to confirm or falsify them.

Selecting a single case is possible though more cases can enrich the research further (Barratt et al. 2011). On the other hand, a single case study can help in making qualified endorsements as to the most suitable theoretical perspective if its multiple dimensions are considered and analysed (Barratt et al. 2011). Based on the research conducted by Barratt et al. (2011), majority of deductive case studies research use single case while the intention of the research is to either confirm or falsify an existing theory. In this research, the researcher selected one case study, which is innovation lab of Organization X, and the research is considering multiple dimensions of innovation labs, which are strategy, process, resources and type of innovation part of the analysis.

4.4 Data Sampling Technique

After developing the research method for collecting data, the data sampling approach and tools adopted need to be decided. The data sampling approach depends on the need of the research. According to Barratt et al. (2011) common data, sampling techniques for case studies are theoretical, convenience and random sampling. In this research study, the researcher relies on convenience as sampling technique where the selected case study is in the same organization where the researcher works in and it is highly convenient to receive the appropriate data required to conduct the analysis of this research. Moreover, this technique will help researcher to gather data from readily available participants from innovation lab in Organization X with a sample size 12 participants from a population of 80,000 employees.

4.5 Data Collection

There are two key kinds of data in research study, which are primary and secondary. Primary data are data gathered directly from its main source. As reported by Adams et al. (2014) primary data collection is approach of gathering own original data to answer research questions that cannot be answered through existing data. Saunders et al. (2009) add that primary data collections are used when limited data are available hence; the researchers have to rely on collecting data by themselves. The common sources of primary data are surveys, use cases, semi-structured, in-depth interviews and observations (Saunders et al. 2009, Adams et al. 2014). Surveys are usually used when the research addresses large population, while case studies are applied when there is concentration on specific case scenario. Moreover, interviews are used when there is a need to investigate the perspectives for different participants. Lastly, observations are employed when the target aspects of evaluation can be easily observed.

On the other hand, secondary data are existing data that are available to be accessed and used. As noted by Adams et al. (2014) secondary data are data already created by someone else and are available for the researcher's use mostly used to validate researcher's sample. Saunders et al. (2009) add that secondary data allows researcher to reanalyse existing data providing a useful source for answering research questions. Secondary data can be obtained through documentary, survey-based and literature review (Saunders et al. 2009, Adams et al. 2014). There is a common risk linked with using secondary data sources, which is the lack of reliability and validity due to inconsistency, faulty and un-credible sources of data (Adams et al. 2014, Hair et al., 2015).

The research uses secondary data source, which is literature review to draw the conceptual framework and establish theoretical foundation for the research as discussed in chapter 2 and 3. The theory is then tested using primary data source, which is observations and open-ended interview questions of the selected case study. Through the selected case study, which is a pioneer innovation lab in the industry, the researcher was able to effectively explore the varied views of experts in the field of innovation. The number of interviews were made based on extant literature on appropriate sample size for interviews (Holsti 1969, & Guba 1985). More specifically, according to Lincoln & Guba (1985) "a dozen or so interviews, if properly selected, will exhaust most available information" and "to include as many as twenty will surely reach well beyond the point of redundancy" (Lincoln & Guba 1985). Consequently, the researcher conducted 12 interviews in Organization X. The interviewees are members of innovation labs in Organization X who have experienced the execution of real life innovation either as members or as leaders. Moreover, the interviews are used to gather qualitative data from the selected case study to identify the challenges and success factors of innovation lab in Organization X. Generally, interviews are the primary source of data in case study research (Voss et al. 2002).

Voss et al. (2002) add that in order to form the research questions a conceptual framework is required to be outlined to help the researcher pick the relevant constructs and variables and include them part of the study. Accordingly, to develop the interview protocol, a reference has been made to Cooper (2011) and his work on the innovation dilemma. Although his work discusses innovation in mature markets, it was felt that the use of his Five Innovation Vectors serves as an appropriate platform to drive through bold and imaginative innovation as would be expected of innovation labs (refer table 3).

Innovation Vector	Interview Question
<p><i>Vector I: Develop a Bold Innovation Strategy that Focuses Your Business on the Right Strategic Arenas that Will Be Your Engines of Growth (Cooper and Edgett, 2009)</i></p>	<p>Are you able to see a clear relationship between the existence of an innovation lab within your organization and your organizations' growth strategy?</p>
	<p>How does your innovation lab support your organization ability to focus on strategic arenas that will deliver growth?</p>
	<p>What are the challenges that your organization faces entering new and attractive growth areas and how does its adoption of innovation contribute to overcoming these challenges?</p>
	<p>What are the reasons for your organizations exploration of new strategic innovation and what competitive value does such innovation bring to your organization?</p>
<p><i>Vector II: Foster a Climate, Culture, and Organization that Promotes Bolder Innovation (Cooper and Edgett, 2009)</i></p>	<p>Describe the current working culture within your organization.</p>
	<p>Are you of the opinion that the current culture within your organization promotes innovation?</p>
	<p>How has your organization explored the culture of open innovation?</p>
<p><i>Vector III: Create "Big Ideas" for Bold, Integrated Product-Service Solutions (Cooper and Edgett, 2009)</i></p>	<p>How has your organization gone about facilitating the creation of 'big ideas' and breakthroughs in innovation?</p>
	<p>What are the challenges that your organization has faced when facilitating the creation of 'big ideas' and breakthroughs in innovation?</p>
<p><i>Vector IV: Drive these "Big Concepts" to Market Quickly via a Robust Idea-to-Launch System</i></p>	<p>Does your organization make a distinction between "Big Concepts" and 'Innovation'?</p>

<i>Designed for Major Service-and-Product Innovations (Cooper and Edgett, 2009)</i>	How has your organization gone about ensuring that “Big Concepts” are brought to market quickly?
	What are the challenges that your organization has faced ensuring that “Big Concepts” are brought to market quickly?
	How has your organization gone about ensuring that innovation is brought to market quickly?
	What are the challenges that your organization has faced ensuring that innovation is brought to market quickly?
<i>Vector V: Build a Solid Business Case and Pick the Winners (Cooper and Edgett, 2009)</i>	How has your organization gone about ensuring that it is able to build a robust business case to support innovation endeavours and initiatives?
	What are the challenges that your organization has faced ensuring that it is able to build a robust business case to support innovation endeavours and initiatives?

Table 3: The Five Innovation Vectors and Interview Questions

The data to be collected from interviews will be analysed to articulate theories. This may be the identification of key challenges and success factors that innovation labs commonly share. Alternatively, it may be discovered that some challenges exist in some organizations and some others not. Similarly it may be identified some success factors of innovation lab impact some organizations and has less impact on others due to the differences in organizational conditions. To maintain confidentiality the interviews are anonymous to build a trusted atmosphere that encourages the interviewees to share openly and disclose real life scenarios.

The method approach followed while conducting the interview was using the researcher past experience in running effective interviews and using Flick (2009) as a reference while writing the transcripts and observing the interviewees. To facilitate the process of the interview,

questions were shared with interviewees prior to the interview to ensure complete readiness and make maximum use of time, recording was performed upon permission and agreement with each interviewee beside manual note taking and the useful print-outs were handed over during interview for the interviewees to use them as references. Post completion of each interview, the researcher ensured to write the captured information in the research immediately in order not to miss any data.

Chapter 5: Analysis and Discussion

This chapter presents the findings of the research study and their analysis. This is attained through exploring the Five Innovation Vectors earlier drawn from Cooper (2011) as highlighted in chapter 4 by following the thematic analysis model performed manually where interview answers were analysed thoroughly and accordingly patterns were identified and grouped as themes. The use of manual thematic analysis is well recognised in the literature (Attride-Stirling 2001, Fereday 2006, Alhojailan 2011). The Five Innovation Vectors were used to answer the research main questions, which for brevity, we have repeated here:

- 1) What are innovation labs, what are their roles, how are they best established and how do they contribute to overall strategic organizational objectives relating to innovation?
- 2) What are the challenges that face innovation labs?
- 3) How can the challenges of innovation labs be overwhelmed in order to deliver successful innovation?

Each innovation vector was further fragmented to help answer the research main questions and arrive at the intended discussion points. The discussion of the findings are organised in a manner consistent with the Five Innovation Vectors, which had been found to be:

- (1) Develop a Bold Innovation Strategy that Focuses Your Business on the Right Strategic Arenas that Will Be Your Engines of Growth,
- (2) Foster a Climate, Culture, and Organization that Promotes Bolder Innovation,
- (3) Create “Big Ideas” for Bold, Integrated Product Service Solutions,
- (4) Drive these “Big Concepts” to Market Quickly via a Robust Idea-to-Launch System Designed for Major Service-and Product Innovations and
- (5) Build a Solid Business Case and Pick the Winners.

5.1 Vector 1: Develop a Bold Innovation Strategy That Focuses Your Business on the Right Strategic Arenas that Will be Your Engines of Growth

The first theme in the data analysis deals with the need to develop a bold innovation strategy that focuses the business on the right strategic areas that will be the engines of organizational growth. Under this theme, four research questions were presented. It can be drawn from the

responses that there is a positive relationship between the existence of innovation lab and organizational growth strategy and the challenges that faces diffusion of innovation is dependent upon employees' mind-sets and organizational financial constraint mainly.

With regards to the relationship between innovation labs and organizational growth, according to interviewee 1 innovation lab core objective is to work with the different business units to overcome their challenges and identify new opportunities to improve business operations. According to interviewee 2, corporate strategy is aligned with innovation strategy. This view is supported in the literature, which suggests that one of the pillars of organizational growth is its alignment with innovation (Cooper 2011). Interviewees 3 and 4 confirm the importance of the technology and how new technologies worked out by innovation lab contribute to the organizational growth strategy. According to interviewee 9, the growth plan within the organization relies on three key dimensions, which are business model, operating model and culture model, and innovation lab conducts innovations for all three dimensions by conducting pilot tests that looks at the business model, innovating processes that focuses on the operating model and finally bringing innovations that promotes the culture. On the other hand, interviewees 7 and 8 suggest that the relationship between innovation lab and organizational growth strategy is indirect and it will be direct once the organizational transformation mission is completed as transformation is constructed by innovation. Generally, the findings from the interviewees' responses are in line with the literature, which suggests the positivity of the relationship between innovation lab and organizational growth (Magadley & Birdi 2009, Koudelkova & Milichovsky 2014, Bloom & Faulkner 2016,). Moreover, Amabile (1988) and Sawhney et al. (2006) confirm that innovation is critical to corporate success and it enables them to face shifting market conditions and competitiveness strongly. Furthermore, innovation increases organizational profit and enhances business performance (Tidd & Bessant 2009).

In relation to the key challenges that faces the organization when it comes to exploring new strategic areas and adopting innovations, to achieve strategic objectives, is the ability of changing people's mind-sets. According to interviewees 2, 5, 6, 8 and 10 the fear of unknown, change resistance and the current business model which doesn't give people time to look at new things are engrained in the culture, hence, making it difficult to change people's mind-set. Based on the findings from the literature it is identified that innovation labs work in a way that might not be suitable for the organizational practices. According to Bloom & Faulkner (2016), it is difficult to change organizational culture and suggest that organizations change their behaviour and accept disruption caused by innovation labs to achieve better outcome.

Furthermore, it can be outlined that budget constraint is another key challenge that prevents the organization from exploring new strategic areas and adopt innovations that are in line with this. Interviewee 2, 8 and 9 suggest that unavailability of enough funds for execution and implementation prevents organization from exploring new strategic areas at times. Similarly, Magadley & Birdi (2009) thinks that innovation labs key issue when it comes to implementing ideas is the financial limitations.

5.2 Vector 2: Foster a Climate, Culture, and Organization that Promotes Bolder Innovation

The second innovation vectors theme in the data analysis deals with the need to foster a culture that promotes innovation. Under this theme, three research questions were presented. It can be drawn from the responses that the current culture of the innovation lab promotes innovation; its processes are flexible, is driven by passion and supports open innovation.

Generally, all interviewees agreed that the current organizational culture promotes innovation. According to interviewee 3, 4, 5, 6, 7 and 8, the existing culture supports innovation by its entire means. Interviewee 3 adds that representative from every business unit is involved to ensure innovation engages everyone in the organization. Moreover, interviewee 4 believes that flexibility and collaboration are key elements of the lab helping support innovation. On the other hand, interviewee 1, 2 and 9 partially agree on this point because they believe that there are challenges, which have not been overcome yet such as people's mind-sets and the extent of support that needs to be provided by targeted business unit to help promote the innovation. Interviewee 9 adds that innovation lab might take second priority to some people considering the fact that they would be busy in their day-to-day work, which will hinder innovation from being promoted. Based on findings from literature, innovation labs need to have mind-sets, which are not similar to those for day-to-day tasks to support innovation (Carstensen & Bason 2012, Puttick 2014).

Process-wise the lab is mainly described to be flexible. It does follow the common innovation life cycle which is testing the idea, proposing it to a business unit through pilot, deciding whether to adopt or not and then implementing it, similar to what is described in the literature (Daft 1978), but what happens beyond that is highly flexible. Though most interviewees agreed on the flexible and nimble approach adopted by the lab, few of them like interviewee 7 and 10 strongly believe that when it comes to security and quality there is no room for compromising. People-wise what makes people more innovative is passion. Majority of the respondents agree

that the people within their lab are passionate and demonstrate can-do-attitude and those are enough for making things happen. While interviewee 9 think that having the domain knowledge and knowledge about up-to-date technology are required for innovation lab members. On the other hand, literature suggests that the availability of the right tools and mixture of resources are useful to achieve intended objectives (Lewis & Moultrie 2005, UNICEF 2012).

Concerning open innovation, it is drawn that the lab supports open innovation and in fact it is injected in the DNA of the organization. Eventually this enabled the lab to develop strong relationships with a number of academics, start-ups and external vendors. Interviewee 6 adds that when initially the lab was established, it was working as a standalone entity and in the next year it opened up to external entities as it was realized that the innovation lab cannot invent the wheel alone, which is something interviewee 5 agrees on too. Interviewee 1 adds that we support open innovation up to the extent where external exhibitions and competitions are organized abroad to attract people. Furthermore, being exposed and open to external parties is a risky business according to West & Gallagher (2006) but according to interviewee 4, who highlighted the same risk, the organization have legal policies in place to avoid confidential data leakage. Interviewee 4 adds that due to the enforced legal policies the external parties cannot get access to data for integration purposes until unless they are present at the site making collaboration a bit difficult at times. Another challenge posed by open innovation is as described by interviewee 8 that maintaining long-term relationship with vendors becomes difficult especially when vendors start expecting the organization to buy from them.

5.3 Create “Big Ideas” for Bold, Integrated Product Service Solutions

The third innovation vector theme in the data analysis deals with the need to create big ideas. Under this theme, two research questions were presented. Generally, it is evident from the responses that the innovation lab has witnessed the adoption of big ideas that created great value to the organization. For example, Electronic Baggage System, according to interviewee 5, was a great innovation that saved a lot of time earlier consumed to track baggage. Moreover, as per interviewee 7, the customer genome innovation is the greatest as it allows access to all customer social interaction information available in social media and other channels to personalize customer experience. Additionally, interviewee 2 adds that launching of the bar and shower on-board were greatest innovation adopted and increased brand image and customer satisfaction ultimately. Mainly, it can be drawn that the organization does supports,

facilitates big ideas, and uses various channels to attract such ideas and once business case is proven through a pilot test, the big idea is implemented in phases. Interviewee 3 suggests that this is mainly occurring to the open innovation policy that the lab is following which allows recipient of ideas from different channels. Interview 5 seconds this by adding that opening doors for academics helped generation of big ideas and interviewee 6 adds that the various competitions and events that the lab holds worldwide encouraged ideas facilitation too. On the other hand, interviewee 8 is the only interviewee who thinks that the innovation has facilitated the generation of medium size innovation so far and not big ones.

Furthermore, it was drawn from the responses that the key challenges that face the lab when facilitating big ideas are people mind-sets, budget limitations, identification of long-term benefits, dependency on federal regulations and implementation. According to interviewee 2, 3, 4, 5 and 8, people are reluctant to follow any new change because of the fear of the risks associated with it. On the other hands, funding could be another reason for not willing to facilitate or implement a big idea as highlighted by interviewee 1, 5, 7, 8 and 10. In addition to that it becomes difficult at times to identify the long-term benefits of a particular breakthrough making decision on whether to accept it or not more difficult as mentioned by interviewee 4, 5, 7 and 8. As per interviewee 1 and 9 dependency on authorities and federal regulations might stand as a barrier as well which eventually hampers the innovation from seeing the light. Interviewee 1 adds that at time internal company policies and processes can be considered as showstopper in front of bringing new ideas into life. Similarly based on findings from literature, it can be drawn that the main challenges that prevents an innovation from being born are implementation due to financial limitations (Scherer and Harhoff 2000, Magadley & Birdi 2009, Bloom & Faulkner 2016), process due to complexity (Kusiak 2007, Desouza et al. 2009) and change resistance posed by people mind-sets (Carstensen & Bason 2012, Puttick 2014).

5.4 Drive these “Big Concepts” to Market Quickly via a Robust Idea-to-Launch System Designed for Major Service-and Production Innovations

The fourth innovation vector theme in the data analysis deals with driving innovation to market quickly. Under this theme, five research questions were posed to the interviewees. It can be outlined from the answers that the lab does not generally distinguish between big versus small-to-medium innovation based on the size however; it does distinguishes between innovations according to their context. About the process followed to ensure the different types of innovations are implemented quickly, it is commonly addressed that a similar approach is

followed. When it comes to challenges faced while implementing big to small innovations, it can be understood from the responses that the same sort of challenges are faced however the extent of challenge differs.

According to interviewee 2, 3, 4, 5, 6, 7, 8 and 9 innovation lab distinguishes between innovations according to their context. Interviewee 2 mentions that based on the context of the innovation, innovation can be classified either as an incremental or as a transformational innovation that can bring big change regardless the size. Interviewee 5 adds that big versus small-to-medium sizes follow the same process starting from testing to pilot and ending it by implementation if proven workable and approved. Interviewee 9 further clarifies that for certain types of innovations different parameters are set and different approaches are followed to make things happens but the size is not the criteria in this case, it is the context. Interviewee 7 thinks that one of the reasons of not distinguishing between the different sizes of innovations is that big innovation are broken into smaller pieces and then tested and worked on by the lab however the team always keeps the bigger pictures in mind in order to connect the dots at a later stage.

About the process followed to ensure innovations are brought to market quickly, it is generally agreed among interviewees that the ideas are presented to the innovation board initially to keep them in the picture right from the beginning to fast track approval process and piloted immediately rather than conducting a proof of concept, which is time consuming. Interviewee 1 and 8 add that in case a proof of concept is still required, a funding model is introduced by the lab to proof the idea to respective business rather than waiting for the business to fund the idea. According to literature, insufficient funds prevents ideas from getting implemented (Magadley & Birdi 2009). Interviewee 1, 8 seconds the idea of getting the right support from business and involving them throughout the innovation process to bring the innovation to market quickly. As per interviewee 9, the implementation mainly depends on the innovation itself as some critical innovations require thorough analysis and testing and this could be time consuming. Interviewee 5 adds that if the innovation has less impact, it is implemented quickly. Furthermore, interviewee 3 and 6 for certain innovations follow Minimum Viable Product (MVP) agile methodology, which helps innovation to be brought to market with minimum features, and later additional features are developed. On the other hand, security obligations and quality assurance are important elements that may cause delay to implementation of products. As per interviewee 2, security has utmost priority as for every single activity performed, security check is required. Regarding the quality assurance, interviewee 5 confirm that quality cannot be compromised and hence thorough testing is performed to ensure the

product does not fail in the production. Generally the process does require improvement as highlighted by interviewee 10 where criteria of measuring success should be refined, include sponsorship by executive members from all business units and partner with third parties who are external experts to help promote ideas quickly and bring them to life.

Regarding the challenges that faces the lab while trying to bring an innovation into market quickly, it is commonly outlined that financial limitations and lack of support from business are considered as the biggest barriers. As highlighted by interviewee 1, 3, 8 and 10 the initial phases of the innovation are funded by the lab and are usually processed but the implementation phase which is supposed to be funded by respective business unit is usually not processed due to limitation causing delay in the actual implementation of the innovation. While it is addressed by interviewee 1, 2, 3, 4 and 8 that lack of support from top management and respective business units causes delays in implementing innovations. On the other hand involvement of authorities usually delay the process of implementing an innovation according to interviewee 2, 7 and 9 as approvals are required to be obtained and security checks need to be performed especially if the innovation is touching a sensitive area. Moreover, interviewee 5 believes that testing a product thoroughly for security and quality assurance purposes cause delay in implementing it. Interviewee 5 further adds that, this is an area of improvement and the process of involving the community to fast track testing is going to help overcome this challenge. Additionally, interviewee 6 thinks that branding at times causes delay in implementing a product as it should meet the corporate standards in all means. Financial constraint is a disabler of innovation (Magadley & Birdi 2009, Lendel & Varmus 2013, Bloom & Faulkner 2016).

5.5 Build a Solid Business Case and Pick the Winners

The fifth, and final, innovation vector theme deals with the need to build a solid business case and pick the winners. Under this theme, two research questions were directed to the interviewees. It can be concluded from the answers that innovation lab has established an internal process prior to creation of a business case to ensure a strong business case is created. In addition, it can be drawn that the key challenge faced while ensuring a robust business case is created is identification of the real value of the innovation.

In terms of the process followed to ensure a robust business case is built, the lab works under a process that is agreed by the majority of the interviewees. The process dictates that an innovation should be tested and piloted to a particular business unit and audience and once benefits are realized a strong business case can be created. According to interviewee, the

business case is only created when the pilot phase is proven successful and he believes that this is the ideal way to do it because without testing and piloting the innovation, it will be difficult to justify it making implementation almost impossible. Interviewee 2 and 3 add that when the innovation is piloted to business units, a business can easily identify its benefits and how it is going to resolve its existing problems. Interviewee 4 adds that collaboration with business units and linking innovation to particular business areas help in getting business cases approved. Interviewee 5 mentions that pilot phase of an innovation is measured against established Key Performance Index (KPI) and the results of this indicates the strength of the business case. Additionally, interviewee 6 suggests that collaboration with business, design experts and architectures and looking at a particular case from a holistic view together helps improving governance and accordingly strengthening the business case. Interviewee 9 further supports this by giving the example of piloting the Engineering Asset Tracking innovation which helped in analysing the idea, identifying impact and verifying success factors that ultimately helped in building a robust business case.

The key challenge faced while assuring the establishment of a robust business case, is identification of the intangible benefits of an innovation at an early stage. It is challenging because until unless the values are not clear, the sponsors from the respective business units might not approve the innovation. Interviewee 4 and 5 describe the identification of the intangible benefits of innovations is always difficult and if the value cannot be realized the sponsors will not approve the business case. Interviewee 6 explains that some innovations on the other hand might not generate revenue but it might have other values such as increasing customer satisfaction which are not realized at the time of business case creation. Moreover, interviewee 7 clarifies that it is not realistic to predict the return on investment of future-technology type of innovations because technology life cannot be predicted and generally, it is difficult to justify technology related innovations. This is in line with the findings from literature, where Scherer and Harhoff (2000) explain that spending funds on innovation is associated with high level of ambiguity on the return on investment making the decision-making process difficult for the organizations to decide which idea to sponsor. On the other hand, interviewee 3, 5 and 9 see that unavailability of the sufficient fund stand as a barrier in the face of getting business cases approved hence preventing innovation initiatives to see the light. Generally, the interviewee has mentioned the funding challenge multiple times, as they see it as one of the main pain areas when it comes to supporting and implementing innovations.

5.6 Summary

In summary, this chapter suggests a number of findings, including firstly that the innovation lab does contribute to the organizational growth strategy through the adoption and implementation of innovations that generate value to respective business units. Secondly, key challenges that face the innovation lab are people's mind-set to accept the new change, federal regulations and financial limitation to implement the innovation. The third finding suggests that the attributes of innovation lab culture that promotes innovations are flexible processes, collaboration, people's passion and injection the culture of open innovation. Fourthly, adoption of big ideas exists and enabled through various channels and it does have a positive impact on the organization. Our penultimate finding is that the process followed to deliver an innovation is standard and the key parameters set to bring an innovation to market quickly are business engagement from initial phases of the innovation to get their buy-in and piloting the innovation directly without a proof of concept phase. Finally, to ensure a strong business case is created and approved, it is required to run the innovation through a pilot phase to realize its benefits and obtain support from respective business unit.

Chapter 6: Findings and Implications

The overall research aim is to explore the concept of innovation labs, identify the main challenges that innovation labs face which will ultimately help to outline the key factors for the delivery of successful innovations.

In order to deliver the research aim and objectives, specific research questions were addressed:

1. What are innovation labs, what are their roles, how are they best established and how do they contribute to overall strategic organizational objectives relating to innovation?
2. What are the challenges that face innovation labs?
3. How can the challenges of innovation labs be overwhelmed in order to deliver successful innovation?

The first research question was to explore the concept of innovation labs, their roles, how best they are established and how can they contribute to the overall organizational strategic objectives. The understanding is that realizing the importance of innovation and innovation labs will lead to draw the right picture about the ideal innovation lab culture that is aligned with organizational strategy to help achieve its objectives. Through reviewing literature to understand these fundamentals, a proper study analysis background was established.

In addressing the concept of innovation lab, the study posed questions to the participants on the culture and climate of the lab to understand how the lab is structured, how the culture of innovation is promoted from within and how the lab activities are aligned with organizational strategic objectives. Answers established on the culture and climate are considering the innovation lab within Organization X as a positive environment and passion driven. The analysis of the responses indicate that the innovation lab is a separate entity within the organization but it closely collaborates with the rest of the organization to solve problems and experiment, channelled through a very well established innovation board. The innovation board is formed of members from different departments who are key decision makers, sponsors and owners having both power and authority to either support an innovation or stop it. The concept of the board made the innovation process run in a highly smooth manner and enabled sufficient integration between the various entities within the organization. The lab follows the normal innovation life cycle while on the other hand, processes do not restrict it, there is no such boundaries as hierarchy, and every member of the lab has the right to contribute equally. The innovation lab within Organization X works with external entities such as academics and start-ups to bring external expertise in-house and fast track innovations. Based on these findings it is clear that the culture of Organization X supports innovation. Moreover, the responses indicate that the innovation lab is aligned with the organizational strategic objectives and the innovations being worked at and introduced are generally intended to contribute to the organizational growth strategy. Adoption of couple of large innovations such as the on-board shower and bar were considered as breakthrough in the airline industry and increased the organizational brand image. All the participants realize the importance and the value an innovation can bring to the organization.

While comparing above findings with the literature it can be drawn that setting up a platform that supports innovation is important for innovation to survive in the organization. The platform is required to connect between various entities within the organization to enable innovation to operate in the right direction. The role of the lab is to collaborate with other operational areas to solve problems using evolving innovations (Magadley & Birdi 2009, Martin 2011, Carstensen & Bason 2012, Desai 2015). Moreover, the literature suggests that the platform should allow innovation teams to experiment in a flexible manner to be able to detect opportunities and tackle existing problems, which is in line with Organization X innovation lab philosophy of not bounding innovation lab members with processes and opening the arms and welcoming new ideas. According to literature, open innovation adds great value to

organizations, in terms of opening the doors for rich learning and active collaboration to share knowledge, expertise and at times fast track innovation process and advance technologies. Moreover, since decades literature extensively suggests the importance of innovation in contributing towards organizational growth and ultimately allowing it to maintain its competitiveness and remain successful (Sawhney et al. 2006, Tidd & Bessant 2009, Hildrum 2014, Rousseau et al. 2016, Zaefarian et al. 2016, Rubera et al. 2016). The literature also highlights the need for innovation labs as a home for artists to freely use their innovative skills and deliver innovations.

Generally, the findings suggest that Organization X realizes the importance of innovation and accordingly it has been aligned with organizational strategic growth objective. This is evident through the extensive support that the lab provides to the different business units by completely funding the initial experimentation phase to prove the benefits to business. Moreover, the lab adopts open innovation and collaborates with external entities such as academics and start-ups to work on various innovation initiatives and accelerate them. Furthermore, the lab is equipped in terms of resources to encourage the lab members and help them in their innovation journey. The innovation lab follows the normal innovation life cycle and the cycle is not normally interrupted by organizational processes except when external authorities are involved. Overall the responses are in line with the discussion in the literature and it can be drawn that in order to align innovation with organizational growth strategy, an organization should adopt open innovation culture, provide flexibility, funds and support to innovation lab to continue delivering innovations. It can also be noted that it is good to adopt an innovation rapidly to maintain competitiveness but it is vital to deliver a high quality innovation that sustains for longer term and accordingly Organization X spends more time testing innovations.

In terms of the second research question, the objective was to discover the challenges that face innovation labs. Identifying the challenges that face innovation labs can pave the way towards establishing an understanding on how to overcome or avoid them to enable successful delivery of innovations. Through reviewing literature to understand these fundamentals, a proper study analysis background was established.

In addressing the challenges that face innovation labs, questions were posed to the participants on the common challenges that face the lab. Analysis of the responses established that there are various challenges that face the innovation lab. To start with, diffusion of innovation itself is a great challenge because of the nature of the social system that may impacts people's mind-

set and willingness to accept new changes which ultimately can make innovation implementation almost impossible in some areas. Of the interviewed participants, it was clear that lack of support from business units affected the degree of adoption of many innovations. Moreover, the participants commonly agree that open innovation is highly beneficial but poses many challenges to the lab and organization. On one hand, it is risky to expose organizational confidential data to external parties as data leakage or misuse can affect organizational position. Furthermore, it can be established from the analysis that financial limitation can stand as a barrier in the face of innovation and without enough budget, implementing an innovation becomes impossible. It can be drawn that processing experimentation phase usually runs smoothly as it is financially supported by the lab, however, implementation phase of the innovation is usually not processed due to lack of support from respective business units. Moreover, the findings indicate that organizational internal regulations and external authorities' policies can be a challenge to processing innovations. In case an innovation technology does not meet organizational standards, the innovation is expected to be shelved until the specified technology becomes standard. Additionally, in the airline industry any change request within airports and planes are mandated to be checked by authorities for regulatory purposes making innovation implementation age longer than it is supposed to be. Coincidentally the challenges of lack of support, financial limitations, process and regulations altogether contribute to delaying implementation of innovation as highlighted by interviewers. Finally, the findings indicate that creating a business case could be a challenge in the since that it requires to highlight the benefits and return on investment which is difficult in the case of innovations. Identification of tangible benefits can be swift but realizing the intangible benefits requires more time, which accordingly affects the strength of the business case making it subject to rejection by sponsors and senior management.

The above research findings reflect of the assessed and discussed literature on challenges that face innovation labs. The commonly addressed challenges by practitioners, which were outlined in the research framework, are uncertainty associated with diffusion of innovation, adoption of open innovation, insufficient funds, inflexible processes and complex strategies. For example, diffusion of innovation is linked with certain level of uncertainty due to the newness factor attached to it, hence making it difficult for people to adjust their mind-set towards accepting it, as it is incompatible with the nature of their social system (Roger 1983). This leads us to the next point, which is building up the right knowledge before diffusing an innovation, which is most of the time, time consuming. Apart from knowledge and nature of

social system, the literature suggests that innovation compatibility, complexity and trial ability attributes could affect the diffusion of innovation. Hence, arose the need to adopt open innovation to work with experts from different fields and involving external entities to learn and experiment closely with them to accelerate innovation. However, according to literature, the open innovation theory itself is associated with the challenge of exposing confidential organizational data to externals who could misuse them posing a risk to the organization as well as the integration of internal and external resources could be costly (West & Gallagher 2006). Further, the literature emphasises extensively on the availability of the financial support for the innovation to survive in the organization (Scherer and Harhoff 2000, Magadley & Birdi 2009, Bloom & Faulkner 2016). An innovation will not move to production unless all required resources are available to support it. Moreover, literature suggests that complex processes are considered great challenge to innovation (Pitra 2006, Kusiak 2007, Desouza et al. 2009). In line with this literature also suggests that collaboration between different entities is important to smoothen the innovation process as well as innovation requires flexibility because restricted controls usually limit innovation. Finally, it can be drawn from literature that establishing a strong and robust business case is a challenge because realizing the return of investment from an innovation is ambiguous affecting the decision making process (Harhoff 2000). Sponsors and higher management would rather to approve a project that has clear benefits and known return of investment rather than approving an innovation associated with uncertain advantages even if it was a game-changing brilliant idea.

Literature has suggested more challenges that face innovation labs which have not been highlighted by the interviewers. One of the key challenges highlighted in the literature is forming the right innovation strategy within the organization. This is because strategies and policies related to innovation are wide and there is no one standard policy that fits all sizes making it difficult for organizations to identify which strategy to follow and what common best practices that will suit their lab structure. The other key challenge is linked with the adoption of open innovation, as there is immense work required to be handled by organizations to manage it, motivate the generation and integration of internal and external knowledge, and incorporate them within the firm.

The third and final research question dealt with detecting the factors and elements that compose effective innovation labs, which are equipped and supported fully to operate ideas and deliver successful innovations. Understanding those factors will enable organizations to setup the right foundation within the organization to support innovation labs from all angles.

With regards to the success factors of innovation labs, questions were posed to the participants on the common success factors of innovation labs. Analysis of the answers led us to understand that there are various factors that contribute towards delivery of successful innovations. To start with, though innovations are associated with large degree of uncertainty, Organization X does take the risk, adopts innovation quickly, and take them under experiments until they are proven useful to one or more business cases. Welcoming innovations and setting up such mentality are the path towards reaching the peak before rivals. Next, adopting innovation without adopting open innovation concept is not possible as innovation teams cannot work in isolation, hence participants collaboratively suggest that open innovation allowed Organization X to work with various external entities and accordingly got the opportunity to exchange knowledge and adopt and explore wide range of innovations. Open innovation built the bridge and helped the innovation to get sufficient resources to continue experimenting in a very open manner. This lead us to the next described success factors of innovation labs by participants which are flexible strategy and well-defined processes, a strategy and processes that allow innovation lab members to work openly inside and outside the lab with internal and external parties. Additionally, innovation lab relies on experimentation and focus on this to come up with an outcome that is presentable and acceptable to business. Moreover, it can be drawn from the answers that the culture of the innovation within Organization X promotes innovation as there are no hierarchies or barriers that hinder innovation lab members from performing and working with passion. Furthermore, the availability of the funds during the experimentation phase, helped many innovation to see the light in Organization X. Finally, the support from the management and the establishment of innovation lab board helped orchestrating the innovations between the various units within the organization and aligning them with business strategies to deliver successful innovations. The board concept is the key to get innovation business cases approved and without their presence and involvement, an innovation hypothetically may not be born in Organization X.

The literature was reviewed thoroughly to establish a strong analysis background and align it with the research findings from the interviews formed in Organization X. The research framework derived from literature suggested that adoption of innovation, openness; flexible strategy, well-defined processes, skilful team members and motivation are commonly addressed factors for establishment of effective innovation labs that deliver successful innovations. Generally, adopters or organizations which tempt to adopt innovation faster than their rivals do get the most advantage. In reference to literature, Organization X can be

positioned between early adopter and early majority according to the type of innovation, being adopted (Robertson 1967, Roger 1983). For example when Organization X adopted the on-board shower innovation it was an early adopter and when it adopted google glass it was one of the early majority. Being an early adopter increased Organization brand image and enhanced customer satisfaction. Moreover, open innovation provides great opportunities for organizations to master innovations in a quick manner as it acts as a platform for learning and integrating multi perspectives allowing development of quick solutions rather than working in isolation (Chesbrough 2005, West & Gallagher 2006, Bergvall-Kåreborn et al. 2009). Concerning strategy flexibility, literature confirm that flexible and mobile strategy within the lab is important and encourage innovations (Lewis & Moultrie 2005, Bloom & Faulkner 2016). Besides flexible strategy, well-defined processes are important to ensure smooth operability of different lab activities (Desouza et al. 2009, Powell & Anderson 2010). Moreover, innovation lab process that is based on experimentation allowing exploration of ideas and testing them helps in marketing them to business easily (Kusiak 2007, Martin 2011). About skilful team members, it is clear from literature that people factor plays a critical role in the success of innovation in an organization (Puttick 2014). Innovation lab members required to have experiences, knowledge, learning ability and certain skillsets to deal with the adopted innovation adapt and deliver successful outcome to their respective areas (Andres et al. 2015). For ensuring that the lab members perform up to the level or above expectations, literature suggests that constant motivation which can be in the form of provision of certain level of autonomy is crucial (Magadley & Birdi 2009, Bloom & Faulkner 2016). Motivation was not mentioned by participants in Organization X as a success factor and this was expected from them because the lab members are all passionate individuals who are dedicated and self-motivated.

Generally, it can be drawn from thorough literature review in comparison to the case study in Organization X that the key elements that contribute to the delivery of successful innovations are diffusion of innovation, flexible strategy, well-defined processes, open innovation, availability of funds. In addition to this, literature suggests having formed the people in the right way in the lab and having skilful and experienced lab members add greater value to the innovation process. On the other hand, Organization X does not rely on specific skillset or experience and welcome any member who have passion to experiment and innovate because it suggests that passionate individuals are self-driven and motivated and can gain the required skill or knowledge to achieve their intended goals on the go.

Chapter 7: Conclusion

The research topic is of critical value and significance to UAE. Recently, the direction of the country moved towards innovation as a source of economy instead of focusing on oil. Hence, ensuring effectiveness in innovation is critical to UAE. In the past two years, innovation lab establishment in various public entities increased and as of today, there are 20 innovation labs in the government sector. Due to the newness of the innovation labs in the country, there was a need to analyse existing innovation labs and compare them with the literature to come up with implications for UAE. Argument like Carstensen & Bason (2012) pointing at possibility of inability of public sector to develop innovation because they are ill suited. This marked the need to understand the concept of innovation labs, the common challenges that face them and what possibly could lead to delivery of successful innovations.

Accordingly, the research study set three main objectives. The first objective was to explore the importance of innovation and evaluate the innovation labs. This assured that the concept of diffusion of innovation as well as innovation labs is clear in the consequent analysis process. Secondly, the research identified the key challenges that face innovation labs. Finally, once challenges were identified, the study explored the critical success factors of effective innovation labs that lead to delivery of successful innovations.

7.1 Overall Research Findings

In relation to research objective and questions, the study concluded a number of findings. First, it established the importance of innovation in achieving organizational objectives and the role of innovation lab as a hub for delivering the various innovations. Innovation contributes to the organizational growth strategy and preserves its competitive position in the market. Innovation lab in Organization X attributes of flexibility, financial support and adoption of open innovation enabled alignment with organizational growth strategy. Adoption of innovation at an early stage of innovation declaration is a risky business but early adopters are usually the ones who get the most advantage out of it. Innovation labs act as the heart of the organization and synergize with the different units to hunt for areas that can be further improved, become more productive and generate remarkable results.

Secondly, in relation to challenges innovation labs confront, it can be drawn that there are several barriers that hinder innovation labs from performing adequately such as diffusion of innovation and its impact on people's mind-set, open innovation and data exposure to external parties, financial limitations and internal policies and external authorities' involvement. The

commonly addressed challenges in Organization X are people mind-set and financial limitations. The existence of these two challenges affected negatively on the delivery of many innovations.

Finally, in relation to success factors of innovation labs, the study established that availability of certain attributes facilitates the process of delivering successful innovations, which are diffusion of innovation, flexible strategy, well-defined processes, adoption of open innovation, availability of funds, skillset of team members and motivation. The study concluded that for innovation to be accelerated, engagement of sponsors and concerned personnel from the beginning of the process is of value. The study lead us to the ultimate study conclusion which is innovation is important in today's highly competitive world and organizations are required to setup effective innovation labs to achieve its main goals and contribute to the organizational growth through the delivery of successful innovations.

7.2 Distinctive Contribution of the Research

The research distinctively contributed in identifying several significant challenges that innovation lab face and accordingly established the success factors of effective innovation labs that deliver successful innovations in the current world. This is because there were limited research studies conducted for this purpose in the literature as well as no research found discussing innovation labs success factors in UAE. Generally, most of the papers found do not specifically or directly discuss neither the challenges of innovation labs nor their success factors. Majority of the findings were collected from different resources, analysed in-depth and amalgamated to achieve the research core objectives.

7.3 Future Research Opportunities

This research study focused on evaluation of innovation lab in one organization within UAE. However, there is still a need to evaluate other existing and old labs in this context. Through such an exploration, it would be possible to develop more sufficient foundation on the critical success factors of innovation labs in UAE that will help newly established innovation labs in the government sector to innovate effectively. Future research should concentrate on a lab from a different industry to ensure variety of responses that could ultimately add unique value.

7.4 Limitations of Current Work

In spite of the fact that the study attained its overall objectives, it had certain limitations that need to be taken into consideration while analysing the findings and comparing them with the existing literature. One of the main limitations was the sample size of the interview, which included 10 participants as Organization X lab is composed of 10 members. The sample could have been a larger group to obtain more useful information that can add to the research. Another limitation was finding sufficient information from literature on innovation labs specifically as there are plenty of management articles about innovation in general but very limited resources found about innovation labs. This limited the ability to assess innovation labs challenges and success factors.

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