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Applying visualisation to map the innovation ecosystem in identifying product opportunities

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Thesis
Submitted to Flinders University
for the degree of

Master of Science (Computer Science)
Flinders University
30th November 2018

CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

In Australia, with the downturn of traditional manufacturing, most notably the automotive sector, coupled with the end of the mining boom, supporting new industries to replace old ones is important. In high-labour cost economies such as Australia, competing on costs alone is unviable. It tempting to simply buy cheaper products for overseas and therefore a shift towards high-value manufacturing and services is more sustainable. Understanding areas of capability, strength and critical mass among organisations and the underlying innovation ecosystem is vital in developing new industries.

To facilitate this process, the purposes of this study is to examine the effects of using of geo positioning visualisation to map the innovation ecosystem to identify product opportunities. It is significant in helping to boost the visibility of Australian organisations and their capabilities.

The study first implements a visualisation of an innovation ecosystem in Australia using Google Maps. It allows users to view organisations by industry such as defence, space, renewables, health technologies, ICT, food and agricultural-technology and advanced manufacturing. It also categorises organisations by their role in the innovation ecosystem such as business, government, university and research institution, funding and support, precincts, accelerators, incubators and co-working spaces.

The study then undertakes a quantitative survey among organisations to address the research questions: What is the impact of geo-location visualisation in mapping the innovation ecosystem on identifying innovation opportunities? How does it influence visibility, communication, coordination and connectedness among innovation players?

A qualitative approach was developed based on the factors and measurement items in the literature and implemented using Qualtrics along with anonymous online survey conducted of South Australian occupants in universities, businesses, innovation precincts, government and government and business associations. The data was then analysed quantitatively.

The study makes an important theoretical contribution. It advances our understanding on the use of geo-positioning visualisation in mapping the innovation ecosystem in a region by integrating the literatures on innovation and technology adoption. The study found the use of geo-positioning visualisation helps in fostering the development of new relationships. It boosts the visibility of partnering organisations; assists in identifying potential relationships; and exposes the breath of services and support available in the ecosystem. Additionally, it leads to clear and transparent communication. Moreover, respondents see value in it and want to use it.

The study undoubtedly is significant by theoretically contributing to the literature on region innovation systems, and additionally by implementing a model of geo-location relocation visualisation of an innovation ecosystem for translation of research to practice and impact by end users. It not only boosts awareness among innovation players on prospective partners in developing and commercialising new technologies but also shows where connections exist as well as gaps or opportunities in creating new relationships across industries. The project is therefore significant for both businesses in developing their innovation strategies as well as government agencies in developing innovation policies to support industry development of target sectors.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

X

Muhammad Nawaz Shakir
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Signed

Dated: 18th June 2019

ACKNOWLEDGEMENTS

This thesis would not have been possible without the unwavering support and assistance of my supervisor, Dr. Giselle Rampersad. Secondly, I would acknowledge the support of my parents, and that of my colleagues and friends in such an innovative environment as that of Flinders University, which made it possible for me to strive for better learning.

This thesis is the result of collective hard work, co-operation and significant support in overcoming every challenge that came in its way.

1. INTRODUCTION

Innovating and making are two sides of the same coin. As consumers we buy products regularly and if it is not produced locally, our expenditure will go overseas. In a free market global economy, the approach is to focus on areas where a country has comparative strength. Manufacturing products in these competitive areas is a useful strategy. In Europe for instance, a smart specialisation strategy is widely adopted in focusing on high value manufacturing and services in areas of comparative advantage (Evangelista et al., 2018; Foray, 2014).

It is widely accepted that an innovation ecosystem within a country forms the fabric upon which innovation occurs. While the term 'innovation ecosystem' has emerged in the last decade, it has roots in the prior, broader, related innovation literature on innovation networks (Rampersad et al., 2010), triple helix (Etzkowitz et al., 2005; Leydesdorff and Fritsch, 2006), clusters (Manning, 2013); open innovation (Chesbrough, 2010) regional innovation systems (Fritsch, 2010) and national innovation systems (Etzkowitz et al. 2005). Similarly, within the popular press, the World Economic Forum, Global Innovation Index (2018), evaluates the innovation capacity of countries by including an investigation of the strength of their underlying innovation ecosystems. The density and connections between innovation actors are fundamental for innovation to flourish.

Identifying the key actors in an innovation ecosystem is important in helping businesses to identify potential partners and also for industry development in understanding capabilities, areas of strength, weakness or growth. Therefore, this study in useful in investigating the effect of the use of visualisation to map the innovation ecosystem in identifying product opportunities.

1.2. Problem/Research Question/Project Focus

The research questions of the study are: What is the impact of geo-location visualisation in mapping the innovation ecosystem on identifying innovation opportunities? How does it influence visibility, communication, coordination and connectedness among innovation players?

1.3. Significance

This research has both theoretical and practical significance.

1.3.1 Theoretical

The thesis will make a theoretical significance. It advances our understanding on the use of geo-positioning visualisation in mapping the innovation ecosystem in a region by integrating the literatures on innovation ecosystems and technology adoption. The study is targeted to find the key factors involved in use of geo-positioning visualisation which help in fostering the development of new relationships. It boosts the visibility of partnering organisations; assists in identifying potential relationships; and exposes the breath of services and support available in the ecosystem. Additionally, it leads to clear and transparent communication.

1.3.2 Research

To boost research engagement and impact to end users, the researcher implemented a visualisation of the South Australian innovation ecosystem using Google Maps, which was able to be filtered by type of organisation (business, government, university and research institute, funding agency, co-working, accelerator, incubator, innovation precinct) and industry (defence, space, renewables, MedTech, food, ICT and advanced manufacturing) and provided details on each organisation such as capabilities, address, relevant industries in which they operate and a website for further details.

1.3.3 Implications for Practice

The study offers implications for practice for innovation players which not only involves individuals but also organisations including government, institutes and research centres, business, incubators and accelerators. For these innovation players, it boosts awareness among them on prospective partners in developing and commercialising new technologies. It shows where connections exist as well as gaps or opportunities in creating new relationships across industries. The project is therefore significant for both businesses, in developing their innovation strategies, as well as government agencies in developing innovation policies to support industry development of target sectors. It provides increased visibility and efficiency in identifying products and product opportunities as well as boosts their communication and coordination with industries.

The study undoubtedly makes an important theoretical contribution by contributing to the literature on regional innovation systems and extending it by integrating geolocation approaches. Practically, it not only boosts awareness among innovation players on prospective partners in developing and commercialising new technologies but also shows where connections exist as well as gaps or opportunities in creating new relationships across industries. The project is therefore significant for both businesses in developing their innovation strategies as well as government agencies in developing innovation policies to support industry development of target sectors.

1.4. Thesis Structure and Approach

As discussed in this Introduction (Chapter 1), this study is focused on exploring impacts of geo-positioning innovation ecosystem over visibility, communication, connectedness and coordination within and among the innovation network in order to predict product opportunity. Chapter 2 focuses on a Literature Review of the innovation ecosystems and technology adoption literatures. Chapter 3 then discusses the Methodology, consisting of 3 phases. First, interviews are conducted to determine organisations within the ecosystem. Second, by mapping these organisations, a visualisation is developed using Google Maps https://thesis-5081.firebaseapp.com/#!/home. Third, a quantitative survey is undertaken to address the research question by examining the impact of using geo-positioning in visualising innovation ecosystems. Chapter 4, then discusses the results in terms of ease of use, usefulness, attitude to technology and intention to use. In turn, the influence of such uptake on innovation is then determined. Chapter 5 then offers a Conclusion to the thesis on the contribution to theory and practice as well as outlines future research directions.

1. LITERATURE REVIEW

1.1. Chapter Overview

This chapter first discusses the term innovation ecosystem and gives its background, and in-depth definitions of its concepts. It then focuses on the key factors for successful implementation and the outcome of the research. It also discusses current approaches tools used in depicting innovation ecosystems and proposes a conceptual model.

1.2. Definition of Innovation Ecosystems

The term ‘innovation ecosystem’ has enjoyed increased attention among government, academia and innovators. There is widespread recognition that these ecosystems do not only benefit the creator firm but occurs in networks involving knowledge spill-overs to other organisations (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009; Agarwal, Audretsch, & Sarkar, 2010). Given this pervasive benefit, it has captured the imagination of many stakeholders including government, industry and university.

In analysing the term, we can consider both words. Innovation is not only about idea generation, but it incorporates the entire process from ideation through to technology development, manufacturing and use of end consumers. The term, ecosystem, was first introduced by Moore (1993) into the business strategy literature. Offering a biological metaphor reflecting the way living organisms interact with their environment, innovation ecosystems refer to the social context in which innovation occurs through interaction with a community of interdependent players in the external business environment (Stam, 2015).

According to Garnsey (2014, p. 743) the term innovative ecosystems “enriches the concept of open innovation and extends beyond the ecosystem of business participants to include government institutions and policy input. The approach builds on research on partnership and alliances and on open innovation studies exploring how partnerships can compensate for the absence of vertical integration (Chesbrough, 2003). The ecosystem concept goes beyond the conventional industry value chain to include the funders, resource providers, standard setters and complementary innovators who make it possible for participants to generate value together.”

Therefore, we refer to innovation ecosystems as a group of players including businesses, government, university, research institutes and other key factors such as funders, accelerators, incubators and precincts that foster innovation.

1.3. Theoretical Background on the Concept of Innovation Ecosystem

Although innovation ecosystems have become prominent within the past decade, it stems from earlier literature including triple helix (David & Foray, 1994; Etzkowitz, 1994; van den Besselaar & Leydersdorff, 1994), clusters (Saxenian, 1994) and innovation systems (Dosi et al., 1988; Freeman, 1987). The underlying commonality in these terms is that they involve various stakeholders such as business, government and research institutes. There are nuances in extent of industry specificity and geographic reach. For instance, clusters are typically industry specific. Distinctions have also been made between national and regional innovation systems. While generalisations can be made of an innovation ecosystem of a country (World Economic Forum, 2018), in this study, we will examine the innovation ecosystem of a region, the State of South Australia.

1.3.1. Clusters

Clusters can be defined as “a concentration of ‘inter-dependent’ firms within the same or adjacent industrial sectors in a small geographic area” (Isaksen & Hauge, 2002, p. 14). Most definitions characterise them by geographic proximity, networks and specialization (Saxenian, 1994). As such, clusters have been distinguished from industrial agglomerations (such as districts and precincts) as the latter has been defined as ‘clusters without networks’ (Rocha & Sternberg, 2005, p. 268).

Practitioners have loosely used the term, innovation ecosystems, to refer to different geographic frames of reference and there is little consensus in the scholarly literature on its geographic boundaries. For instance, some authors refer to global innovation ecosystems such as those pertaining to the international medical device industry (Australian Government, 2014), while others refer to national innovation ecosystems for instance those spanning the entire United States (Innovate America, 2004); and others refer to State or city specific ones such as the Adelaide ecosystem map (Daly, 2015). Additionally, unlike clusters which are specific to industries, entrepreneurial ecosystems may or may not be linked to various industries.

On the other hand, there are similarities. Both conceptualisations of clusters and innovation ecosystems involve networks of business, government and university. While Broekel et al. (2015) only mention firms, he also discusses subsidies and therefore partnership with government is implicit. Other authors are more explicit in the involvement of the three major groups in clusters. Nishimura and Okamuro (2011) define clusters as industry-university-government networks with support programs including network formation, R&D support, incubation function, marketing support, financial support, fostering human resources. Additionally, Gilding (2008) discuss the Melbourne Biotechnology Cluster and identified partnerships among Melbourne-based organizations such as public research organizations; government organizations; financial institutions; biomedical firms; and big pharma. Similarly, Manning (2013, p. 380) discuss features of high-tech clusters including “a local concentration of technology-specific expertise and talent; universities with related research and education programs; spin-off research institutes and entrepreneurial tech firms; R&D departments of major industry players; numerous research collaborations between firms and universities, and a vibrant community of highly skilled and highly paid tech professionals and university scientists”.

Other authors attempt to classify clusters into different types which may allude to the involvement of different types of players. Iammarino and McCann (2006) provide a classification of cluster types from pure agglomeration with information intensive firms (e.g. Silicon Valley, California), industrial complexes with production intensive firms (e.g. Silicon Glen – Scottish electronics industry, new social network with science-based firms (Silicon Fen – Cambridge UK), old social network with supplier dominated firms(Italian industrial districts – Emilia Romagna). Manning (2013) also discuss knowledge Service Clusters in India, China and Eastern Europe which are characterised by the availability of lower-cost technical and analytical skills and service capabilities; and a strong orientation to global rather than just local or regional demand for such skills and capabilities across industries.

1.3.2. Innovation Systems

Mirroring the similarities with clusters, entrepreneurial ecosystems also share the commonality of involving firms, university and government partners with innovation systems. “The components of an innovation system are the actors, networks and institutions contributing to the overall function of developing, diffusing and utilizing new products (goods and services) and processes” (Bergek et al., 2008, p. 408). Guan and Chen (2012, p. 102) also discuss the physical composition of national innovation systems as “a set of interacting institutions/actors (e.g., universities, industries and governments) that produce and implement knowledge innovation.”

Innovation systems are a type of complex system. Complex systems are characterised by dynamism as constituents interact in non-linear ways, openness across boundaries, emergent patterns and behaviours, processes that span scales, self- organization and composition of complex sub-systems (Katz, 2006) (Katz, 2006). National innovation systems reflect this dynamism and interaction (Lee & Von Tunzelmann, 2005).

Stemming from evolutionary economic theorizing on socio-technical change, the term, national innovation systems, was coined in the eighties (Dosi et al., 1988; Freeman, 1987) and advanced in subsequent years (Edquist, 1997; Nelson, 1993). It has gained much popularity in both policy-making and academic circles, for instance in the UK, EU and Australia (Cutler, 2008; Dodgson, Hughes, Foster, & Metcalfe, 2011; Sainsbury, 2007).

Like innovation ecosystems they have been used flexibly in terms of frame of geographic reference. Although the original term refereed to national innovation systems, later, it evolved into other forms such as regional systems of innovation, sectoral systems of innovation and technological systems of innovation (Edquist, 1997; Markard & Truffer, 2008).

There are also nuances between regional systems of innovation and clusters. While both belong to a specific geographic location and therefore closely related, the former is not limited to certain industries while clusters are characterised by specialization within an industry (Asheim & Coenen, 2005).

1.3.3. Triple Helix

The triple helix concept stemmed from institutional analysis of knowledge infrastructure and evolutionary economics (David & Foray, 1994; Etzkowitz, 1994; Nelson, 1993; van den Besselaar & Leydersdorff, 1994). It is broadly defined as university–industry–government relationships (Kim et al., 2012; Leydesdorff & Fritsch, 2006). More specifically, it involves ‘(1) wealth generation (industry), (2) novelty production (academia), and (3) public control (government)’ (Leydesdorff & Meyer, 2006, p. 1441). Additionally, Etzkowitz et al. (2005) provide case studies that more elaborately detail the components including industry (firms, incubators, legal firms, venture capital firms, accountability firms); university (entrepreneurs) and; government (local and state government).

The concept of the triple helix overlaps closely with innovation ecosystems as both includes government, firms and university partners. The flexibility in which innovation ecosystems has been used to refer to regional and national systems, also mirrors the versatility that the triple helix concept has been used. Leydesdorff, Dolfsma, and Van der Panne (2006) overlayed the triple helix concept with national, provincial and regional maps.

1.4. Key Success Factors

Innovation Ecosystem can be defined through several success factors, while some key factors that were in focus under this research are highlighted as below:

1.4.1. Connectedness

Connectedness forms an essential element of innovation ecosystems. It has deep roots in the innovation networks literature (Rampersad et al., 2010) and well as business to business marketing literatures, specifically in the industry marketing and purchasing group (IMP) (Hakansson, 1982; Hakansson and Snehota, 1995). Traditionally, within these streams, inter-organisational networks have been understood as a set of actors and the connections between them. Much is this literature have focused increasing connectedness and harnessing benefits from them (Moller & Rajala, 2007; Rampersad et al., 2009).

More recently, in this era of digitisation, being able to connect with people is what proves to be a key success factor especially in marketing. Applying visualisation to map the innovation ecosystem could improve the connectedness among actors. This study will therefore examine the impact of geo-positioning visualisation on the connectedness within the innovation ecosystem.

1.4.2. Visibility

Visibility refers to the transparency, clarity, efficiency and effectiveness of communication and has featured in the innovation networks literature (Moenaert et al., 2000; Rampersad et al., 2010). Visibility can serve in boosting the interaction between organisations leading towards a successful communication and thus making product identification easier. Time efficient and user friendly apps are more preferred nowadays and effective visibility is preferred. For businesses to be effectively able to convey their product across to clients and partners, a key factor is visibility so that collaborators efficiently understand their message and easily identify the purpose thereby boosting successful interaction between the two. Thus, applying visualisation to map the innovation ecosystem would undoubtedly increase product identification as visibility is a key factor in successful identification and successful interaction among ecosystem participants.

1.4.3. Coordination

Another important factor from the innovation ecosystem literature is coordination.

Coordination has a long history in management research including streams on inter-organisational networks and the supply chain (Mohr et al., 1996). From a network perspective, some argue that no one actor controls the network (Ford et al, 2002; Ojasalo, 2004), yet some may mobilise around areas of shared interest and to achieve specific goals (Moller and Rajala, 2007). Within innovation ecosystems, coordination does not refer to rigid control by one party. However, it refers to moderate orchestration whereby some collective goals can be achieved among interested parties, but organisation does not impose excessive requirements on members (Rampersad et al., 2010). Coordination is a key factor to boost communication and interaction among actors of an innovation ecosystem. Applying visualisation to map the innovation ecosystem would therefore boost coordination.

1.5. Outcomes

1.5.1. Industry Development

If the visualisation of the innovation ecosystem is effective, one potential outcome would be industry development. As more and more businesses would find a means to be identified and successfully portrayed to potential partners, this should facilitate industry development. Communication and coordination would drive awareness of capabilities and pave the way to identify common areas of interest and goals that form the basis of collaborations. This should lead to industry development as players form technology partnerships, supply and client relationships as well as identify funding opportunities and other support. Thus, applying visualisation to mapping the innovation ecosystem would consequently foster industry development.

1.5.2. Product Opportunity Identification

New products are a key outcome of innovation networks as collaboration between actors in the innovation ecosystem assists in the development and commercialisation of new projects (Rampersad 2015). The visualisation of an innovation ecosystem that shows key organisations and their capabilities should boost awareness of how each party can potentially contribute to new products.

1.5.3. Technology Development

Industries would, after its development and the increased product opportunities to workers, focus on conveying more enhanced versions of products to the masses thereby bringing about a historical change in the technological era by increased technological development. Industrial investment to technological development would contribute in the advancement of modern world as well as in modernised technology. Thus, when industries would be able to successfully convey their products to the related workers and the clients would be able to efficiently identify the products with increased visibility, connectedness and coordination, industrial advancement and increased products opportunities would consequently lead to a boost in the technology development as well by applying visualisation to map the innovation ecosystem in identifying products.

1.5.4. New Partnerships

New partnerships are also an important outcome of innovation ecosystems (Rampersad, 2015). Using geo-positioning of the entrepreneurial ecosystem will increase the visibility of the capabilities of potential partners with a view to identifying product opportunities. It also helps the industries identify other similar industries in the vicinity and consequently lead to developing partnerships across industries. This would inevitably lead to increased product opportunities as innovation occurs at the boundary of technology areas, thereby leading to new partnerships.

1.6. IT Tools for Decision Support

The information systems literature has long explored the adoption of various information technology (IT) tools to support decision making. The most widely used of model in this study has been the Technology Acceptance Model (TAM) (Davis, 1986). As illustrated in Figure 1, the model includes key factors that drive the adoption of IT tools including the perceived usefulness, ease of use, attitude to technology and intention to use the tool.

Perceived usefulness refers to the extent that the user thinks that the system will improve his or her performance (Davis, 1986). Perceived ease of use pertains to user's view that the system would be effortless (Lai 2017). Attitude to technology reflects one's perception about technology's role in decision making (Kim, 2009). In identifying product opportunities, there are other mechanisms that feed into innovation decisions such as experience, knowhow, views of other stakeholders such as customers, suppliers and other departments, competitor actions and regulatory, technology and social trends. The visualisation does not aim to address a broad range of factors as it focuses on identifying potential partners and visibility of related capabilities to foster collaborations.

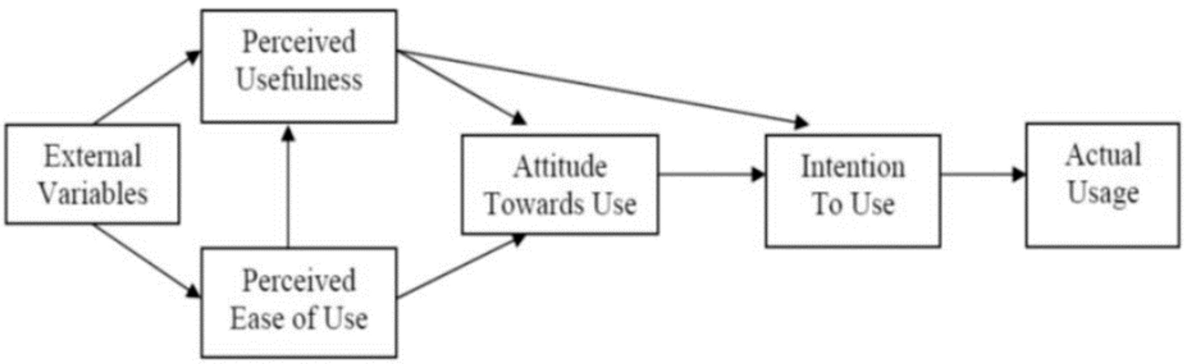

Figure 1: Technology Acceptance Model

1.7. Conceptual Model

Based on the literature, the conceptual model developed for this study is shown in Figure 2.

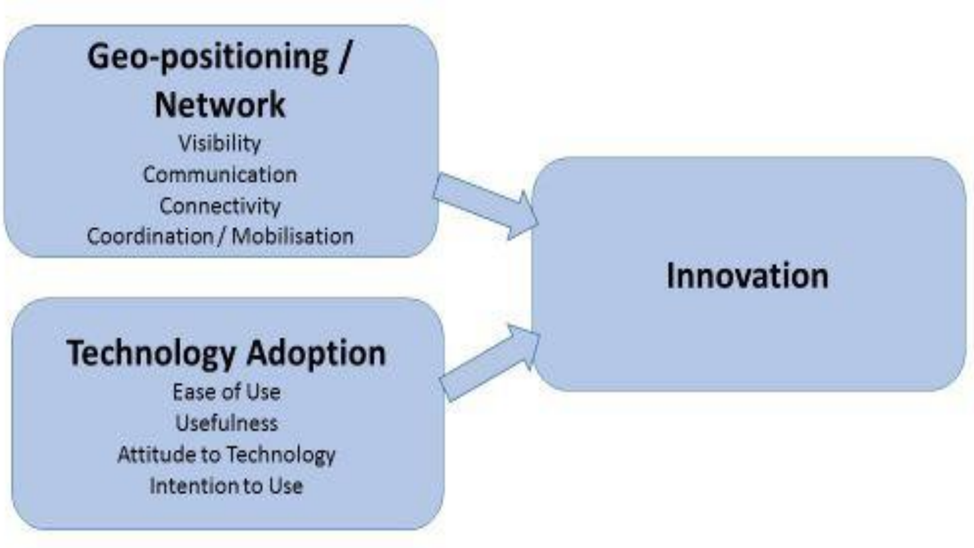

Figure 2: Conceptual Model

The conceptual model is an integration of the network, technology adoption and innovation literatures (as explained in Sections 2.4-2-6). As shown in Figure 2, the study explores the impact of geo-positioning on the visibility, communication, connectivity and coordination within the innovation network. It then examines the adoption of such tools in terms of ease of use, usefulness, attitude to technology and intention to use. In turn, the influence of such uptake on innovation is then determined. Therefore, the conceptual model of this study provides a cross-fertilisation of these literatures to inform our understanding of impact of geo-positioning visualisations on innovation.

2. METHODOLOGY

2.1. Chapter Overview

This chapter discusses the methodology undertaken for this research. Qualitative research via in-depth interviews were first undertaken to understand the composition of the innovation ecosystem and its key players. A visualisation of the innovation ecosystem in South Australia was then implemented using Google Maps. A quantitative approach was then taken to research user perceptions on the use of geo-positioning to map the innovation ecosystem and identify innovation opportunities. An ethics application was developed and approved, the study administered, and results analysed to assess the effectiveness of the approach.

2.2. Research Design

The research design guides data collection and analysis in addressing the research questions (Cooper et al., 2006; Ghauri and Grønhaug, 2005; Robert, 2003). In this study, the research design included three phases: qualitative research, visualisation development and quantitative research, as shown in Figure 3.

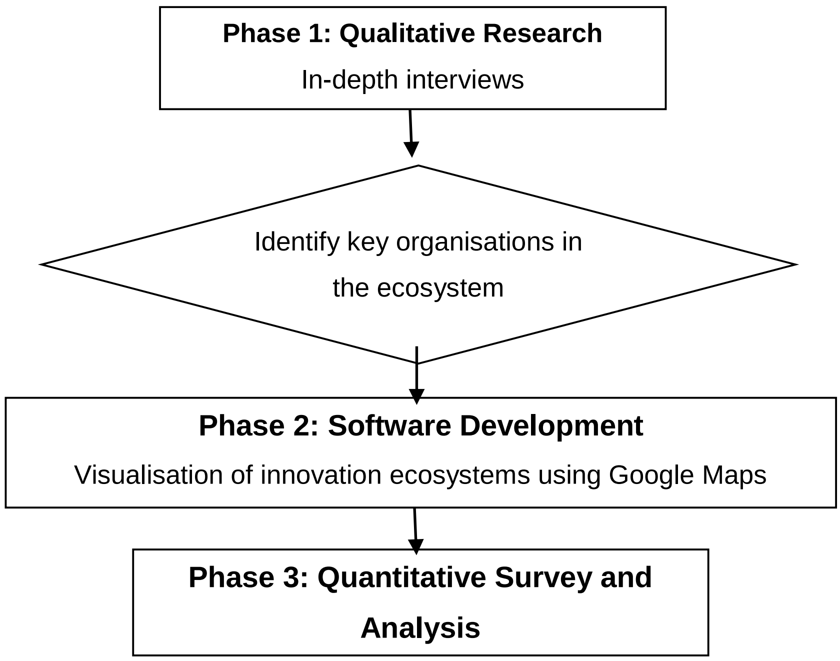

Figure 3: Flowchart on research design

2.3. Phase 1: Qualitative phase

The first phase, the qualitative phase consisted of 25 in-depth interviews with key innovation informants. This phase was exploratory and necessary in identifying key organisations in the innovation ecosystems in each industry. Qualitative, exploratory research is useful when investigating abstract and complicated phenomena and applying new approaches. Defining the composition of ecosystems is complicated as some view networks as boundary less (Ford et al., 2002) while others argue that selecting actors involved in a particular issue is an appropriate approach (Moller and Rajala, 2007). In this study, key actors involved in the 'issue' of innovation ecosystems in specific industries in South Australia were identified.

The study used this dimensional quota sampling (Sarantakos, 1998) to select interviewees of key informants from each of the main industries under investigation – defence/ ICT, renewables, food and agri-tech and advanced manufacturing, health and medical technologies. These industries were deemed appropriate as they were consistent with Australia's national priorities (Government of Australia, 2016). This form of sampling was useful in choosing interviewees knowledgeable of the innovation ecosystem and its actors in particular industries and also more broadly across the state of South Australia. These included key Directors within Government responsible for industry development as well as CEOs and Managing Directors of businesses who were the leaders in their industries and aware of other key ecosystem participants. Table 1 provides information on the interviewees in this study.

Industry	**Nature of Organisation**	**Position**
ICT/ Defence	Business	Chief Operating Officer
	Business	CEO
	Business	CEO
	Government	Manager
	University	Research Centre Director
Renewables	Business	General Manager
	Business	CEO
	Business	CEO
	Government	Director, Department Energy and Water

	University	Professor and Research Centre Director
Food and Agri-technology	Business	CEO
	Business	Chairman
	Business	Managing Director
	Government	Sector Director – Food and agri-technology
	University	Research Centre Director
Advanced Manufacturing	Business	CEO
	Business	CEO
	Business	CEO
	Government	Executive Director – Procurement and Supply Chain
	Government	Manager – Industry Participation
Health and medical technologies	Business	CEO
	Business	Manager, Product Development
	Business	Innovation Director
	Government	Director
	University	Research Centre Director

Table 1: Interviewees in this study

2.4. Phase 2: Software Development – Visualising Innovation Ecosystems

The second phase focused on software development of the visualisation of the innovation ecosystems using Google Maps. This is applicable given the focus of this study on digital transformation in innovation management and the use of visualisation in innovation ecosystems. It was deemed essential is creating a common frame of reference among respondents to guide subsequent data collection. Additionally, implementing a system is seem as instrumental in facilitating a pathway for research impact on end users as the online visualisation can be used into the future.

Findings from the first phase, the interviews, were used to feed into Phase 2. Visualisations of innovation ecosystems were developed for various industries. Organisations identified from the interviews were triangulated with industry reports and associations to confirm the list of key ecosystem actors. Triangulation of data is important in ensuring validation (Robert, 2003), in this case of network composition. Once the list of organisations was developed, their websites were searched to confirm organisation-specific data such as the industries that they operate in, their capabilities (which was displayed on the tool) and their addresses, which provided the geo-positioning data – longitude and latitude needed to develop the visualisation.

2.5. Phase 3: Quantitative Research: Survey and analysis

The third phase involved a quantitative survey to examine user perceptions on the impact of geo-positioning to map the innovation ecosystem in identifying innovation opportunities. A quantitative approach was deemed suitable for this study to confirm the significance of each factor as outlined in the conceptual framework (Sarantakos, 1998). A questionnaire was developed based on the factors and measurement items in the literature (See Table 2).

Factor	**Measurement items**	**Source**
Visibility/ Usefulness	▪ The geo-positioning visualisation of the ecosystem is useful in contributing to the visibility of participating organisations ▪ The visualisation helps in identifying potential relationships with others ▪ The visualisation is useful in highlighting capabilities among participants ▪ The visualisation contributes to exposing the breadth of services and support available in the ecosystem	(Davis, 1989; Moenaert et al., 2000)
Ease of Use	▪ I feel that the tool is easy for me to use ▪ The tool is flexible to interact with ▪ The interface is intuitive and user friendly ▪ I could easily find the information that I am looking for using the tool	(Davis, 1989)
Attitude to technology	▪ I believe that the tool is a good idea	(Davis et al., 1989)
Communication	▪ The visualisation helps in communicating innovations associated with my organisation ▪ Communication in the ecosystem is transparent ▪ Communication in the ecosystem is clear and accessible ▪ Geo-positioning visualisation of the ecosystem may lead to secrecy problems	(Moenaert et al., 2000)
Connectivity	▪ We are connected with other people and organisations within the ecosystem ▪ We acquire assistance and information from others in the ecosystem	(Hakansson, 1982; Moller and Rajala, 2007;

	▪ We perform cooperative and connected activities with other people and organisations within the ecosystem	Rampersad et al., 2010)
Mobilisation/ Coordination	▪ The ecosystem is well coordinated ▪ Our organisation's activities is well coordinated with the ecosystem's activities ▪ There is effective mobilisation of activities in the ecosystem ▪ There was an individual, group or organization (either existing or new) that takes responsibility for the ecosystem and arranged activities in the ecosystem ▪ A coordinating body is designated or identified that includes input from key ecosystem players	(Moller and Rajala, 2007; Rampersad et al., 2010)
Innovation	▪ Visualisation of the ecosystem helps in identifying new product and service opportunities ▪ Visualisation assists in innovation within the ecosystem ▪ Visualisation fosters the development of new relationships	(Harmon et al., 1997; Perkmann et al., 2013; Rampersad et al., 2010)
Intention to Use	▪ Assuming that I have access to the tool, I will use it	(Venkatesh and Davis, 2000)

Table 2: Questionnaire measurement items and sources

2.6. Research Ethics

An Ethics application was submitted to the Human and Ethics Committee for conducting the survey and approved in August 2018, as required by The Flinders University Human Research Ethics Committee. (Ethics ID 8151, approval date 03/09/2018). Copies of the ethics information sheet and questionnaire are shown in Appendices A and B.

2.7. Survey administration and analysis

An online survey was conducted of South Australian organisations including universities; innovation precincts such Tonsley, Waite, Technology Park; entrepreneurial programmes such as the New Venture Institute (NVI), Entrepreneurship Commercialisation Innovation Centre (ECIC); technology commercialisation centres such as ITEK, businesses, Cooperative Research Centres, Australian Wine Research Institute (AWRI), South Australian Research and Development Institute (SARDI), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Defence Science and Technology Group (DSTG) and members of business associations.

The questionnaire started by first asking the name of the organisation and its type i.e. business, university/research institute, government, incubator, accelerator, co-working, funding and support or other. It then asked the sector of the organisation i.e. defence, medical technologies, food and agri-tech, ICT, renewables, space or other. It then provides a 5-point Likert-scale ranging from Strongly Agree to Strongly Disagree for a sequence of questions (Table 2), reflecting the factors that emerged from the literature as outlined in the conceptual model (Figure 3). 5-point Likert scales are suitable as they are simple and easy of administer (Kinnear et al., 1993).

The survey was administered online using Qualtrics. Using stratified sampling, organisations were first shortlisted according to their sector (e.g. businesses, government and university) and industry (i.e. defence/ ICT, medical technology, food and agri-tech, advanced manufacturing, renewables). After obtaining responses, software package SPSS was used to analyse the data. Each factor (connectedness, visibility and coordination) was analysed to obtain the significance of each factor on the impact of the tool on innovation.

2.8. Summary

This chapter provided a discussion of the methodology used to obtain the data required to test the conceptual model. It described the research design which included 3 phases – qualitative, tool development and quantitative. It gave precise information on how both qualitative and quantitative data was collected

3. RESULTS

3.1. Qualitative results

From the interviews, 218 organisations were identified as important in the innovation ecosystem in South Australia (See Table 3).

<table>
<tr><th colspan="3">Innovation Ecosystem actors</th></tr>
<tr>
<td>Precincts
Adelaide BioMed City
Edinburgh Defence Precinct
Lot Fourteen
South Australian Land Systems Precinct
Technology Park Adelaide
Techport Australia
Thinclab Innovation Hub
Tonsely innovation Precinct
Tonsley Innovative Manufacturing Hub
Waite Research Precinct</td>
<td rowspan="2">Businesses
Aerometrex
Airbus Defence & Space
Airbus Group Australia
Alfon Engineering
AMLTechnologies
APC Integrated
Apexus
APS Adelaide Profile Services
Ashton Valley Fresh
Aurecon
Auspace
Austest Laboratories
Australian Submarine Corporation
Axiom Precision Manufacturing
Babcock
BAE Systems
Beerenberg
Beston Pure Dairies
Bickfords Group
Blown Plastics
Boeing Defence Australia
CAE Australia
Charmonix
Chemtronics Biomedical Engineering
Cobham Aviation Services
Codan
Comunet
CoolDiamond DLC by Norseld
Coutts Communications
Cutler Brands
D.S.A. Fresh
Dematec Automation
Detmold Group
Diamond Cyber Security
Dunedin Dental attachments
Ellex</td>
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Philmac
PhoneLabs
PMB Defence Engineering
Priority Health
Prohab
Raytheon Australia
Redarc Electronics
RPC Pipe Systems Pty Ltd
Ruag
SAAB Systems
SAGE Automation
Seeleys
Shoal Engineering
Siemens
Silentium Defence
Skara Smallgoods
Small World Communications
Smart Fabrication
SMR Automotive
Southern Launch
Space Industry Association of Australia
SpeedCast
Starr the Robot Place
Steriline Racing Pty Ltd
Sundrop Farms
Sunfresh Salads
Supaloc
SupaShock
Sydac
Taptu
Technoplas
Tindo Solar
TrewMac Systems
Ultra Electronics
Voxon
Woodside Cheese Wrights
Zen Energy
Zeiss
Ziptrak</td>
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<tr>
<td>University and Research Institute
Airborne Research Australia
Australian Army Research Centre
Australian Industrial Transformation Insitute
Australian Wine Research Institute
Commonwealth Scientific and Industrial Research Organisation
Cooperative Research Centre for Innovative Space Solutions
Defence Science and Technology Group
Flinders Medical Centre
Ian Wark Research Institute
Flinders University
Innovative Manufacturing Cooperative Research Centre
Institute for Nanoscale Science and Technology (INST)
Medical Device Research Insitute
New Venture Institute
Royal Adelaide Hospital
South Australia Food Innovation Centre
South Australian Health and Medical Research Institute
South Australian Research and Development Institute</td>
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<tr><td>University of Adelaide
University of South Australia
Women’s' and Children’s' Hospital</td><td rowspan="4">Ellex Precision
elmTEK
Enzos at Home
Finetech
Fine-tech Electronic Solutions
Fleet Space Technologies
Fleurieu Milk Company
Frazer-Nash Consultancy
Fruitalicious
Fullarton Space Biotech Pty Ltd
Garon plastics
Geoplex
Golden North
GPA Engineering
Heliostat SA
HMPS
Inovor Technologies
Irriscan Australia
IXL solar
Launchbox Australia
LBT innovations
Liberty One Steel
Lightforce
Lockheed Martin
Lockheed Martin Australia
Maggie Beer Products
Maptek Pty Ltd
Meggitt Training Systems
MG Engineering
Micro-X
Milford Industries
Myriota
Naval Group
Navantia
Neumann Space
Nippy's Fruit Juices
Nova Systems
Novita
Nylastex</td><td></td></tr>
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Medical Device Partnering Program
Thinclab Innovation Hub
Innovyz
Adelaide Business Hub
Moonshine Lab</td><td rowspan="2">Funding and Support
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Blue Sky Private Equity
Business Evaluation
Business Growth Grants
Business Research and Innovation Initiative
Cooperative Research Centers Programme
Supply Chain Facilitation
Global Innovation Linkages
Joey Crowd
Next generation fund (DST)
R&D Tax Incentive
South Australian Venture Capital Fund
Space Innovation Fund
Torrens Capital</td></tr>
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South Start
Wotso
Hub Adelaide
CoHab
That Space
DEW
Sass Place
Little City
St Pauls Creative Centre
Intersect
Space SA</td></tr>
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Little City Skyline Accelerator
SouthStart Accelerate
Techstars Adelaide (Defence)
The Centre for Business Growth
Venture Dorm (Flinders University)</td><td>Government
Bureau of Meteorology
Defence SA
Defence Teaming Centre
Department of Industry and Skills
Department of Defence
Department of Education
Department of Environment and Water
Regional Development Australia
South Australian Space Industry Centre
Submarine Institute of Australia</td></tr>
</table>

Table 3: Innovation ecosystem actors

As shown in Table 4, these were grouped via sectors and industries. Some actors operated across multiple industries while others were not industry specific, such as various incubators, accelerators and co-working spaces.

Actor	Defence	Medtech and health	Food and agri-tech	Advanced manufacturing	ICT	Renewables	Space	Other
Precincts	5	3	1	5	2	2	1	
Universities and research institutes	7	11	5	7	7	5	4	
Businesses	31	12	17	60	24	10	29	
Incubators		1		1				5
Accelerators								6
Co-working								13
Funding and Support	5	6	4	4	5	4	4	7
Government	5	1	1	3	5	2	7	2

Table 4: Key innovation ecosystem actors identified from interviewees

3.2. Visualisation developed in Google Maps

As this thesis is part of a requirement within a Computer Science master's degree, the researcher implemented and developed a fully functional tool using Google Maps' API, as the implementation of a system is consistent with expectations of this degree. It is currently available on the following link: https://thesis-5081.firebaseapp.com/#!/home

3.3. Tool Development

The selection for platform of the provided tool was made on the basis of portability, where all the respondents may not have to attain access to a certain device or an operating system. Hence the production in a web-based environment was found suitable.

3.3.1. Front End

This tool follows the structure of Model-View-Control using Cascaded Style Sheets (css) for the design perspective HyperText Mark-up Language (html) under Angular JavaScript framework to provide user friendliness. Moreover the libraries from Angular Material are attached for the look and feel which is intended to bring a clear view for mobile devices.

3.3.2. Back End

All the data is kept on Google Firebase Cloud Service. The service provides a NoSQL database under the name of real time database providing immediate triggers on data set changes. Most importantly a 24 hour uptime is guaranteed with Google's cloud service.

Furthermore, an option for filtering by industry is also available for the user, whereby the tool identifies sub-ecosystems for various industries including advanced manufacturing, defence, good and agri-tech, ICT, match and health, renewables and space.

The visualisation tool implemented makes it easier for the user to be increasingly connected to the organisations around them and be aware of the product opportunities. Filtering the visualisation by industries or simply selecting the required organisation in any sector also narrows down the results and provides better and enhanced visual representation of potential partners.

Once the user clicks on any icon associated with an organisation, further information is displayed such as the industries that it operates within, capabilities, address and website for further info as illustrated in Figure 5.

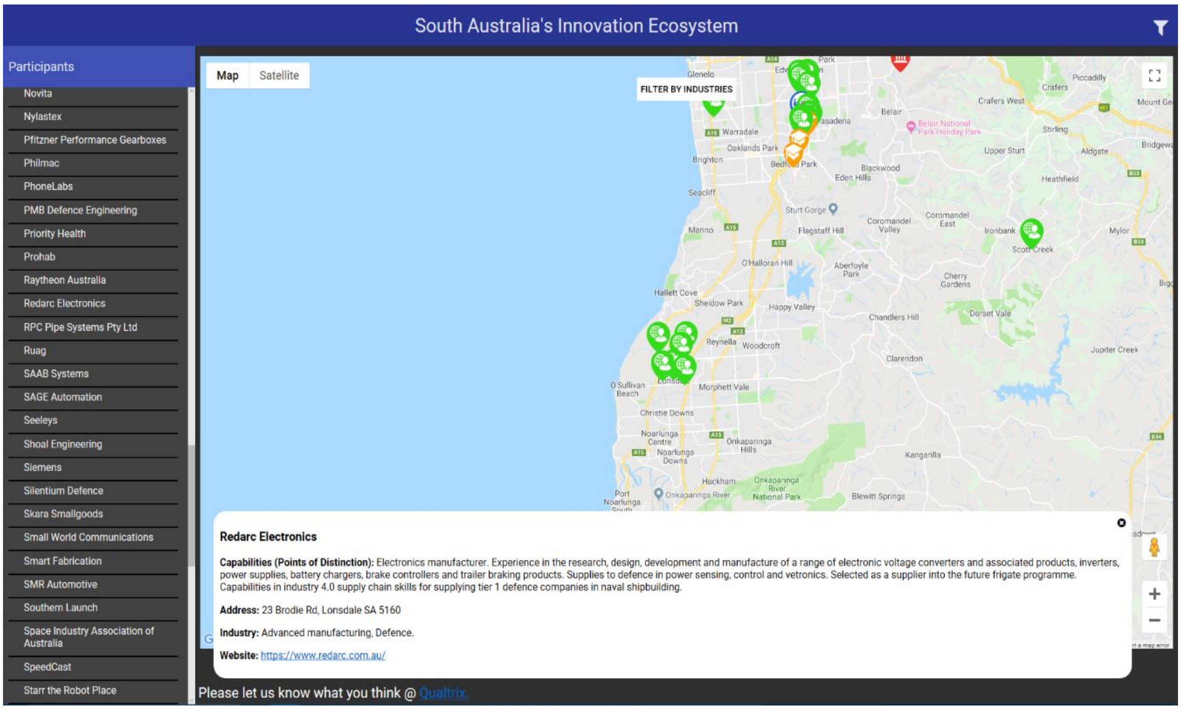

Figure 5: Demonstration of capabilities, industries and info on each organisation

3.4. Quantitative Results

Of the respondents of the quantitative questionnaire, 70% were from business, 20% from government and 10% from universities. The greater proportion of businesses was deemed appropriate as businesses are the drivers of innovation and the focus of this study is about identifying product opportunities which is an activity undertaken primarily by businesses. In terms of industries, 70% of respondents came from advanced manufacturing which is useful given the focus on product opportunities, while the others came from Defence/ ICT (10%), medical technologies (10%) and other (10%).

3.4.1. Intention to use to tool

Conclusively, the overall results of the study displayed a positive attitude of the people who completed it. As mentioned before, the largest response was obtained from the institutes and research centres, followed by businesses and then the government sectors. The general population who filled the questionnaire seemed enthusiastic about using the app thereby decisively concluding that implementing visualisation in mapping the innovation ecosystem in identifying products along with geo-positioning is an effective way for related workers to be able to identify opportunities effectively and efficiently. Figure 5 shows the feedback of the general population who undertook the questionnaire on whether they would find the tool proposed in this thesis useful for identifying product opportunities and whether they would use it for their endeavours or not if it were made available for occupants of South Australia.

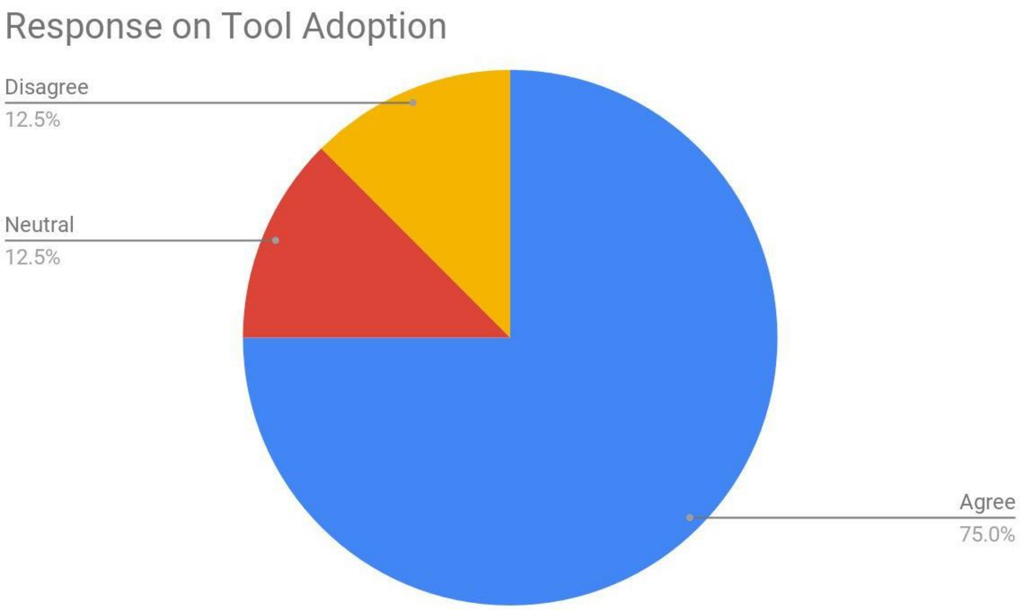

Figure 6: Response on Tool Adoption – Intention to use the tool

3.4.2. Impact of Visualisation and Geo-Location on Innovation

As discussed earlier, visualisation is a key success factor in successful business development and enhanced communication. The results confirmed that respondent found the visualisation of the innovation ecosystem useful in identifying the product and service opportunities and innovation within the ecosystem. Most importantly, people felt that it fosters the development of new relationships as shown in Figure 6. It therefore shows that the use of the visualisation can boost industrial and technological development, increased product identification and new partnerships amongst industries and businesses.

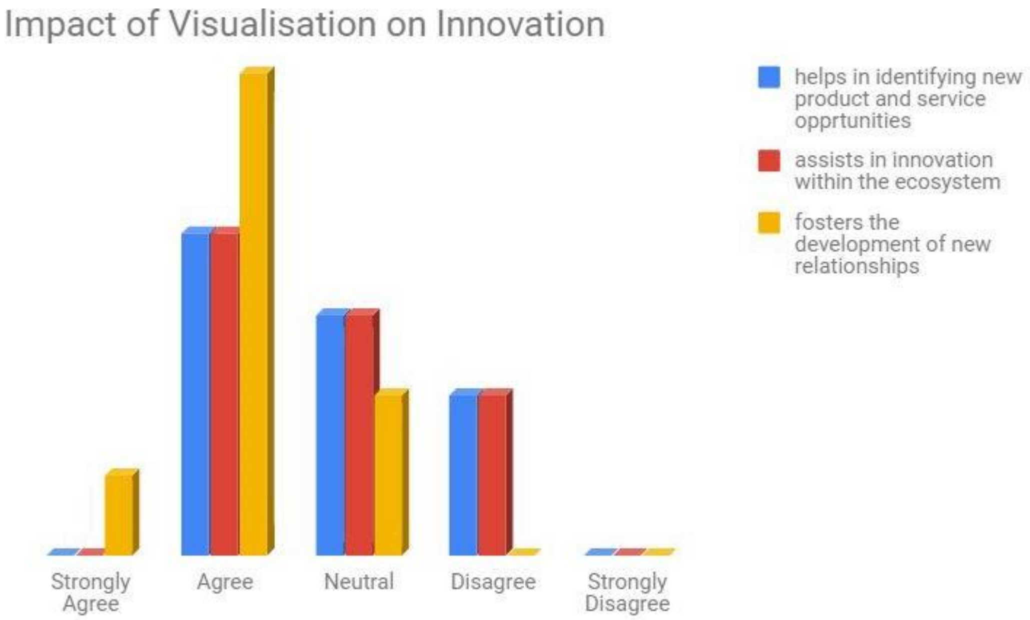

Figure 7: Response on Impact of Visualisation on Innovation

3.4.3. Influence on Innovation Players through Communication

The quantitative data also confirmed communication as an important effect of the visualisation tool. As shown in Figure 7, respondents felt that the use of geo-positioning visualisation leads to transparent, clear and accessible communication in the ecosystem. Respondents disagreed that the visualisation would lead to secrecy breaches. Overall, the results demonstrated that the visualisation is an efficient and effective means of communication.

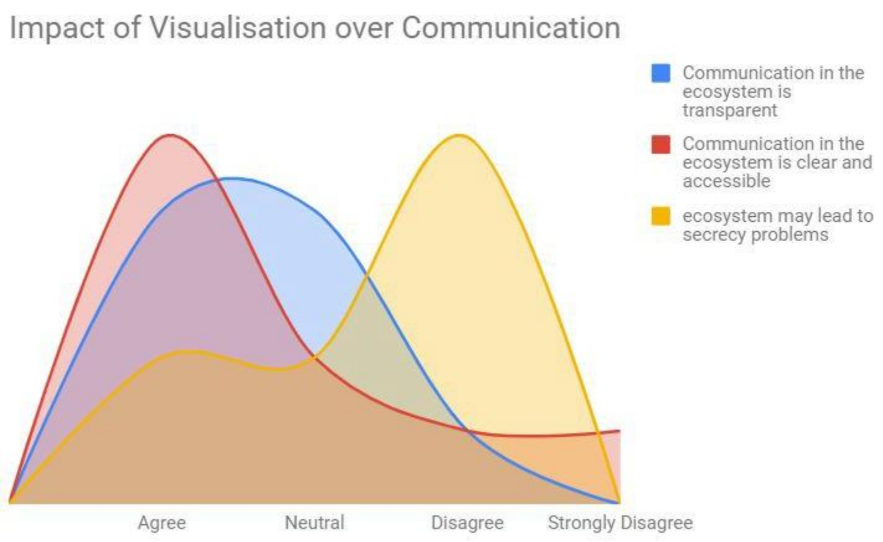

Figure 8: Response of Impact on Visualisation on Communication

3.4.4. Impact of the tool on Visibility

The questionnaire also tested the effects of implementing a geo-positioning tool on the visibility within the innovation ecosystem. Figure 8 shows a summarised result of the responses and reflected that respondents felt that visibility is an important effect on the tool. The results show that the population believes visualisation to be useful in contributing to the visibility of the participating organisations as the most responses were Agree and Strongly Agree. The second question answered in this aspect also had a very positive feedback with the participants agreeing that visualisation helps in identifying potential relationships with other organisations as partners along with being useful in

High-lighting capabilities among participants. This leads to effective and efficient identification of product opportunities thereby making the application of visualisation in mapping the innovation ecosystem impactful. Respondents also confirmed that visualisation would contribute to industry and technology development, particularly in exposing the breadth of services and support available in the ecosystem.

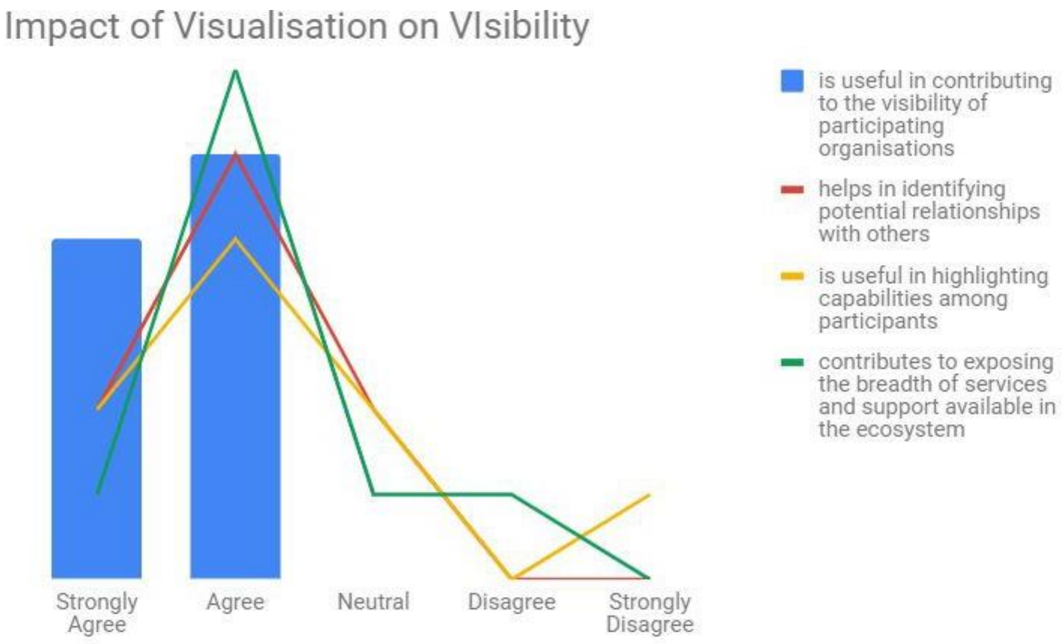

Figure 9: Response of Impact of Visualisation on Visibility

3.5. Summary

This chapter presented the results of the study. First is provided the qualitative results – the identification of organisations in the innovation ecosystem which then fed into the development of the visualisation using Google Maps. The output of the tool was displayed and then the quantitative results presented.

4. CONCLUSION

This research studies the effects of implementing geo positioning visualisation to map the innovation ecosystem in identifying products.

4.1. Revisiting the Research Aims/Questions

The research aimed to identify the effects of implementing visualisation and geo positioning to map the innovation ecosystem in identifying products.

The first research question was "What is the impact of geo-location visualisation in mapping the innovation ecosystem on identifying product opportunities?" and in answer to this statement we applied quantitative methodology and concluded that the visualisation leads to clear, accessible and transparent communication, and increased visibility by exposing users to the services and support available in the ecosystem and highlighting capabilities among actors, thereby resulting in identification of product opportunities.

For the second research question, i.e. "How does it influence innovation players?" it was concluded by evidence that it provides increased visibility to the innovation players, makes them more connected to the industries and organisations as well as provide efficient coordination between them. Thus, it influences the innovation players by providing better means of communication along with increased feasibility of identifying new products and product opportunities.

4.2. Research Contributions

This research has contributed both theoretically and practically.

4.2.1. Theoretical Contribution

The thesis has made a theoretical contribution. It advances our understanding on the use of geo-positioning visualisation in mapping the innovation ecosystem in a region by integrating the literatures on innovation ecosystems and technology adoption. The study found the use of geo-positioning visualisation helps in fostering the development of new relationships. It boosts the visibility of partnering organisations; assists in identifying potential relationships; and exposes the breath of services and support available in the ecosystem. Additionally, it leads to clear and transparent communication. Moreover, respondents see value in it and want to use it.

4.2.2. Implications for Practice

To boost research engagement and impact to end users, the researcher implemented a visualisation of the South Australian innovation ecosystem using Google Maps, which was able to be filtered by type of organisation (business, government, university and research institute, funding agency, co-working, accelerator, incubator, innovation precinct) and industry (defence, space, renewables, MedTech, food, ICT and advanced manufacturing) and provided details on each organisation such as capabilities, address, relevant industries in which they operate and a website for further details.

The study offers implications for practice for innovation players which not only involves individuals but also organisations including government, institutes and research centres, business, incubators and accelerators. For these innovation players, it boosts awareness among them on prospective partners in developing and commercialising new technologies. It shows where connections exist as well as gaps or opportunities in creating new relationships across industries. The project is therefore significant for both businesses, in developing their innovation strategies, as well as government agencies in developing innovation policies to support industry development of target sectors. It provides increased visibility and efficiency in identifying products and product opportunities as well as boosts their communication and coordination with industries.

4.3. Research Strength and Areas for Future Research

In the future, regions such as local government councils may be more interested in developing maps in smaller finite regions in targeting economic development strategies on a local level. Second, the focus was on specific industries such as advanced manufacturing, defence, food, ICT, space, medical and health technologies. This was deemed appropriate as these are priority industries for South Australia and Australia. However, future research can span additional industries. Finally, future research can go into greater detail on individual industries, for instance defence and focus on key components in major infrastructure projects such as shipbuilding.

4.4. Final Remarks

By implementing visualisation and geo positioning to map the innovation ecosystem in identifying products and putting the theory to test through technological adoption, this thesis provides an important theoretical contribution in understanding the underlying factors on the impact of use of visualisation. It identifies that the implementation of visualisation helps in fostering the development of new relationships, boosts the visibility of partnering organisations, assists in identifying potential relationships, exposes the breadth of services and support available in the ecosystem, leads to clear and transparent communication as well as shows that the respondents see value in it and want to use it, in South Australia.

APPENDICES

Appendix A - Information Sheet

Flinders
UNIVERSITY
ADELAIDE • AUSTRALIA

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College of Science and Engineering
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Tel: +61 8 82015746
Email: Giselle.rampersad@flinders.edu.au
Web: http://www.flinders.edu.au/people/[illegible]
CRICOS Provider No. 00114A

INFORMATION SHEET

Title: Applying visualisation to map the innovation ecosystem in identifying product opportunities.

Researchers:

Mr Muhammad Nawaz Shakir
College of Science and Engineering
Ph: +61 424 615 104

Dr Giselle Rampersad
College of Science and Engineering
Ph: +61882015746

Description of the study:

The Project is aimed focus on the ideology to map the innovation ecosystem on geo location that should identify product opportunity on individual basis. Mapping on geo location has not only proved to be an advertisement of product availability but it has also been a great practise of ubiquitous computing supplying awareness of product opportunities. Therefore, mapping the innovation ecosystems on geo location can and will help identifying the opportunity availability on several possibilities. Hence, this research project is focused on the visualization of such mapping. Mapping the innovation ecosystem is the best way to determine whether you have set realistic performance expectations for your innovation strategy.

Purpose of the study:

inspiring achievement

The purpose of this study is to investigate the result of providing product opportunity awareness through geo-location and its impact on individuals.

What will I be asked to do?
You are invited to complete a questionnaire about the methods of mapping the innovation ecosystem on geo-location influencing the product opportunity. The survey will take about 10 minutes.

What benefit will I gain from being involved in this study?
Note that the participants may not have direct benefit from participating, however their responses will contribute to greater awareness of the situation. This will lead to greater exposure of innovation ecosystem. You may become more attune to questioning the method of mapping, and therefore your awareness may be enhanced via this research.

Will I be identifiable by being involved in this study?
Be assured that any information provided will be anonymous and will be treated in the strictest confidence. None of the participants will be individually identifiable in future publications.

Are there any risks or discomforts if I am involved?
No, there are no risks and this study will result in no disadvantage to you.

How do I agree to participate?
You can participate by completing the online questionnaire. You are, of course, free to decline to answer any particular questions.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project number 8151). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

Appendix B - Questionnaire

Innovation Ecosystem Survey

This survey explores use of geo-positioning visualisation (for instance Google Maps) to map the innovation ecosystem in South Australia. Please select your answer for each of the following questions.

Your details

1. Your Organisation (optional)								
2. Type of organisation	Business	University of research institute	Government	Incubator	Accelerator	Co-working	Funding and support	Other
3. Sector of organisation	Defence	Medtech and health	Food and agri-tech	Advanced manufacturing	ICT	Renewables	Space	Other

Visibility / Usefulness

4. The geo-positioning visualisation of the ecosystem is useful in contributing to the visibility of participating organisations	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. The visualisation helps in identifying potential relationships with others	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6. The visualisation is useful in highlighting capabilities among participants	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. The visualisation contributes to exposing the breadth of services and support available in the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Ease of Use

8. I feel that the tool is easy for me to use	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. The tool is flexible to interact with	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

10. The interface is intuitive and user friendly	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11. I could easily find the information that I am looking for using the tool	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Attitude to technology

12. I believe that the tool is a good idea	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Communication

13. The visualisation helps in communicating innovations associated with my organisation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
14. Communication in the ecosystem is transparent	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
15. Communication in the ecosystem is clear and accessible	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
16. Geo-positioning visualisation of the ecosystem may lead to secrecy problems	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Connectivity

17. We are connected with other people and organisations within the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18. We acquire assistance and information from others in the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
19. We perform cooperative and connected activities with other people and organisations within the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Mobilisation/ Coordination

20. The ecosystem is well coordinated	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
21. Our organisation's activities is well coordinated with the ecosystem's activities	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
22. There is effective mobilisation of activities in the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
23. There was an individual, group or organization (either existing or new) that takes responsibility for the ecosystem and arranged activities in the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
24. A coordinating body is designated or identified that includes input from key ecosystem players	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Innovation

25. Visualisation of the ecosystem helps in identifying new product and service opportunities	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
26. Visualisation assists in innovation within the ecosystem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
27. Visualisation fosters the development of new relationships	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Intention to use

28. Assuming that I have access to the tool, I will use it	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Optional: Please suggest up to five organisations that you have relationships with in the ecosystem. You can suggest those already displayed in the visualisation or new ones that can be added potentially.

Name of organization:

1.____________________________

2.____________________________

3.____________________________

4.____________________________

5.____________________________

Any further comments that you will like to add

____

____

Thanks for your valuable input to this research.

Appendix C - Ethics Final Approval

FINAL APPROVAL NOTICE

Project No.:	8151
Project Title:	Applying visualisation to map the innovation ecosystem in identifying product opportunities
Principal Researcher:	Mr. Muhammad Shakir
Email:	shak0054@flinders.edu.au

Approval	3 September 2018	Ethics Approval Expiry Date:	30 December 2019

The above proposed project has been approved based on the information contained in the application, its attachments and the information subsequently provided.