

# **Harnessing the Power of Design Thinking for Open Innovation**

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the degree of

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Under the supervision of

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# Certificate of Original Authorship

I, Areej Fahad A Alqahtani, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Computer Science school at the Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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## **Dedication**

I dedicate this thesis to my son Ali.

## List of publications

The following is a list of publications with outcomes of work during the PhD journey:

1. Alqahtani, A., Hawryszkiewicz, I. & Erfani, E. 2021, 'Capturing Community Needs Through an Open Innovation Process', In *Proceedings of the 22nd European Conference on Knowledge Management (ECKM 2021)*, Academic Conferences International Limited, Coventry, UK, pp. 29-35. **(Conference)**
2. Alqahtani, A., Hawryszkiewicz, I. & Erfani, E. 2020, 'Analysing Citizens' Inputs in Public Online Open Innovation Platforms'. In *Proceedings of the 26nd Americas Conference on Information Systems (AMCIS2020)*, Association for Information Systems. **(Conference)**
3. Alqahtani, A. & Hawryszkiewicz, I. 2021, 'The Influence of Knowledge Creation Tools on Innovation Teams in Learning Organisations'. In *Proceedings of the 26th International Business Information Management Association Conference (IBIMA)*, IBIMA Publishing, Spain. **(Conference)**
4. Alqahtani, A. & Hawryszkiewicz, I. 2020. 'Integrating Open Innovation Process with the Double Diamond Design Thinking Model', In *Proceedings of the 21st European Conference on Knowledge Management (ECKM2020)*, Academic Conferences International Limited, Coventry, UK, pp.1003-1006. **(Conference)**
5. Alqahtani, A., Hawryszkiewicz, I. & Erfani, E. 2022, 'Relationship Between Knowledge Creation and Open Innovation Applied Through Public Open Innovation Platforms', *The Electronic Journal of Knowledge Management*. **(Accepted in journal)**
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# Abstract

Open innovation is a concept through which an organisation taps on the knowledge of external sources and acquires creative ideas for value creation. Open innovation has received high interest from the private sector compared to the public sector. The lack of awareness of conducting open innovation in the public sector has been considered a barrier to applying open innovation in the public sector. To enhance understanding and provide evidence on using open innovation in the public sector drawing from a comprehensive literature review and aspects of the Double Diamond design thinking model, this study proposed an initial conceptual framework that depicts steps, activities and tools applied in the public sector's open innovation process. The conceptual framework was validated through a multi-case study design and interviews with open innovation responsible in different countries and analysis of the content of five open innovation platforms.

The research findings reveal details of the first stage which was missing in the literature that should be added to the open innovation process in the public sector which is problem determination. Moreover, the research findings elucidate that the five cases use design thinking to some extent, however only one case has used design thinking in the whole process and as a result overcome the challenges of the open innovation process compared to other cases which have some limitations regarding delivering the final solution to community, in addition to a lack of collaboration and coordination to implement the solution. Therefore, the best practice of design thinking enhances the practice of the open innovation process.

This study has theoretical and practical contributions by providing insights from the lived experience of those involved in conducting open innovation and content available in open innovation platforms in the public sector. This study enhances organisations' awareness of open innovation in the public sector and guides them on how to benefit from embedding the concepts of the design thinking approach to address the barriers to applying open innovation in the public sector.

# Glossary

## **Closed innovation**

Closed innovation is a concept where innovative ideas are generated within the organisation's boundaries and by people working in the same organisation (Bae & Chang 2012).

## **Community**

In this study, community means people who can benefit from an online open innovation platform managed directly or indirectly by the government. The community can join the forum by posting their innovative solutions for a specific problem or even benefit from public resources about innovation.

## **Community's ideas**

It is when the community starts to post ideas for the problem. It is a suggestion of ideas, not the final solution for the problem.

## **Community needs**

A community's needs mean any requirements that the society needs about public services, such as the need for the best transport service.

## **Community problems**

Community problems mean that there is a problem in a specific public service or product that is already provided for the community.

## **Community's solution**

After the ideas are evaluated and selected, they can be a solution to the problem.

## **Creativity**

It is a generation of novel ideas by individuals (Amabile & Pratt 2016). It is part of individual personality (Janssen 2000; Liu et al. 2020).

## **Design thinking**

It is a human centred approach that searches to find the real needs of people and then finds ways to satisfy solve them and solve their problems (Brown & Katz 2011). It has many models, such as the Double Diamond model and the IBM design thinking model.

## **Double Diamond Model**

It is one design thinking model for solving problems that contains different phases: discover and define the problem, then develop and deliver solutions.

## **Hackathon**

In open innovation a hackathon refers to an event where the community can contribute to solve a problem in a competitive environment (Franco, Presenza & Petruzzelli 2021; Yuan & Gasco-Hernandez 2021).

## **Innovation**

Innovation refers to implementing creative ideas for the purpose of generating value, enhancing value or achieving competitive advantage (Cruickshank 2010; Dewar & Dutton 1986; Hawryszkiewicz 2007; Miller & Miller 2012; Norman & Verganti 2014; Shaukat, Nawaz & Naz 2013)

## **Innovation process**

A series of interrelated activities undertaken to generate new ideas for the purpose of generating value, enhancing value or achieving competitive advantage (Salerno, de Vasconcelos Gomes, et al. 2015).

## **Online open innovation platform (web-based open innovation platform)**

It is a web-based platform which is used for open innovation; external parties can sign in and post their innovative ideas for problems published by the platform to any situation that they face (Milutinović, Stošić & Štavljanin 2018).

## **Open innovation**

Open innovation is a concept through which an organisation acquires creative ideas from external parties (e.g. customers, researchers, or the local community) to generate value, enhance value or achieve a competitive advantage (Chesbrough, Vanhaverbeke & West 2006).



**Participants**

Participants mean the community who have already participated by submitting innovative solutions for a specific problem.

**Problem statement (challenge)**

In the open innovation platforms, a problem statement is the community's problem called a challenge that the community will read before they decide to suggest innovative solutions.

**Public sector**

In this study, the public sector refers to organisations that are managed by the government. All the studied open innovation platforms are run directly or indirectly by the government.

**Wicked problems**

A wicked problem is a very complex problem that has many causes and includes many stakeholders (Zivkovic 2018).

**Winners**

Winners are the participants who pass the evaluation process, and their innovative solutions have been selected for a specific problem.

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# **Chapter 1: Introduction**

## **1.1 Background**

Innovation refers to the concept of implementing creative ideas for the purpose of generating value or enhancing value in society and organisations. There are two types of innovation: “closed innovation” and “open innovation”. Open innovation allows external thoughts and ideas to be included within the innovation process (Bae & Chang 2012; Herzog 2011). In contrast, in the closed innovation process only creative ideas from internal parties are considered (Bae & Chang 2012; Iqbal 2011). Organisations that use closed innovation believe they should control their intellectual property, so competitors do not benefit from their ideas (Chesbrough 2003). However, the advocates of open innovation believe that an organisation’s doors should be opened to external sources that can bring more value to the organisation. The external source of ideas in open innovation can be, for example, customers, suppliers or universities (West & Bogers 2014). While different studies have highlighted the benefits of open innovation in value creation because this approach enables organisations to tap into extensive external and internal knowledge sources, applying open innovation in the public sector has received little attention (Temiz 2021). Previous studies have stated that a lack of awareness of the open innovation process in the public sector is a barrier to adopting such platforms (Mergel 2018).

## **1.2 Significance of this study**

Recent studies have affirmed that more research attention has been paid to implementing open innovation in the private sector, and there is a lack of understanding about the open innovation process in the public sector (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021). Accumulated evidence from the literature showed that little is known about the existence of the problem identification phase, and it was overlooked in previous studies. In addition, there is a lack of understanding and clarification about the solution diffusion phase of the open innovation process in the public sector (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez

2021). Hence, providing a comprehensive picture of activities, tools and techniques applied in open innovation in the public sector is a significant advance that can enhance organisations' awareness about open innovation and guide them to conduct open innovation efficiently in the public sector.

### **1.3 Research aims and questions**

This study aims to provide a comprehensive understanding of the open innovation process in the public sector by exploring the methods to identify a community's needs and problems, select and define a problem statement, and evaluate, determine and implement the community's ideas. The study explores using a design thinking approach through the open innovation process. This study aimed to address the following research questions and sub questions:

RQ1. How is open innovation conducted in the public sector?

Sub questions:

1. How are the community's needs and problems discovered?
2. How is a specific community problem defined?
3. How is a specific solution selected?
4. How is the final solution implemented?
5. How is the final solution delivered to the community?

RQ2. How can concepts of the design thinking approach be embedded to enhance the open innovation process in the public sector?

### **1.4 Scope of the study**

The scope of this research is as follows:

- The research focus is on the area of open innovation, not closed innovation, as the two concepts are in contrast to each other.
- The research studies the open innovation process applied using a web-based platform.
- The research studies open innovation process practices in the public sector.

- The research studies open innovation platforms that governments manage either directly or indirectly.
- The research considers the community as an external source involved in open innovation.
- This research uses the Double Diamond model as a design thinking model to examine the use of design thinking in the context of open innovation in the public sector.

## **1.5 Overview of this study**

A comprehensive literature review was conducted on innovation, different types of innovation (open and closed innovation), open innovation platforms, and open innovation in the public sector, and research gaps were identified.

Open innovation in the public sector has received less attention compared to the private sector (Temiz 2021), and the following concerns have been highlighted in the literature as barriers to applying open innovation in the public sector:

- It is difficult to coordinate community members due to the diversity of a community's background (Bertello, Bogers & De Bernardi 2022).
- Coordination and collaboration between organisations working together to achieve solutions can be time-consuming (Hameduddin, Fernandez & Demircioglu 2020; Mergel 2018).
- There is a lack of awareness about how to implement different steps of open innovation and ambiguity about what tools and techniques are applied in different steps (Criado & Guevara-Gómez 2021; Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Mergel 2018; Mergel & Desouza 2013; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021).
- To address the issue of a lack of awareness which is stated as a barrier to applying open innovation in the public sector, the research decided to tap into the knowledge of parties that have conducted open innovation in the public sector and provide evidence based on the lived experience of open innovation experts involved in the process of driving open

innovation in the public sector to identify how they are implementing open innovation and what techniques and activities they are undertaking in each step.

In addition, to identify how organisations that are applying open innovation deal with the coordination of a multidisciplinary team, informed by our comprehensive literature review, the research proposed that they might be using tools and techniques involved in design thinking in the process of their open innovation.

Design thinking is a systematic human-centric approach that is applied for solving complex problems and value creation (Thoring & Müller 2011). The design thinking approach supports the involvement of stakeholders from different backgrounds and departments with diverse perspectives to define the problem and provide novel solutions for addressing the issues.

Accordingly, to address the gaps mentioned above, drawing from a comprehensive literature review and informed by concepts of design thinking and aspects of the Double Diamond design thinking model, an initial conceptual framework was proposed that depicts steps, activities and tools applied in the public sector's open innovation process. The framework was validated by conducting interviews with open innovation experts and analysis of content available in the open innovation platform.

To undertake the strategy to address the gaps, this study used an interpretivism research philosophy, a qualitative methodology, and an exploratory case study design. A multi-case study strategy is chosen to explore the phenomena and acquire a rich human experience regarding the research topic. Five cases were selected from three countries conducting open innovation in the public sector. All five platforms are web-based and managed by governments. Ethics approval was received from the Human Research Ethics Committee at the University of Technology Sydney, and data was collected by conducting semi-structured interviews and analysing the content and documents of each platform. Member check interviews were conducted in most cases after analysing the data to verify the results of the discussions.

Content analysis was applied as the analysis method for both interviews and the content of web-based platforms and documents provided by interviewees. A deductive content analysis was used for interview content, and an inferential content analysis was undertaken for web content analysis.

Trustworthiness criteria were applied to ensure the quality of the analysis. First, to achieve credibility, data triangulation (interviews and content analysis) were used, and then findings were reviewed by conducting member check interviews with the participants. Second, to achieve dependability, an extensive explanation and justification of the research procedures was provided. Third, the data was safely stored and the full procedure of the results building based on that data was presented to ensure confirmability. Finally, research findings can be transferred to different groups of people or settings by presenting a thick description of the participants, research context and assumptions, allowing readers to assess the possibility of transferring results.

Findings confirmed the proposed conceptual framework, which provides a comprehensive picture of steps, activities and tools used in conducting open innovation in the public sector. The conceptual framework depicts those aspects of design thinking used in driving open innovation.

This qualitative study provided insights into the lived experience of experts conducting open innovation in the public sector. It introduced a validated conceptual framework demonstrating activities, tools and techniques undertaken in the open innovation process that enhances organisations' awareness of conducting open innovation in the public sector and guides them on how to benefit from embedding the concepts of the design thinking approach to address the concerns of complex team coordination.

## **1.6 Overview of research plan**

Figure 1.1 summarises the research design carried out in this research.

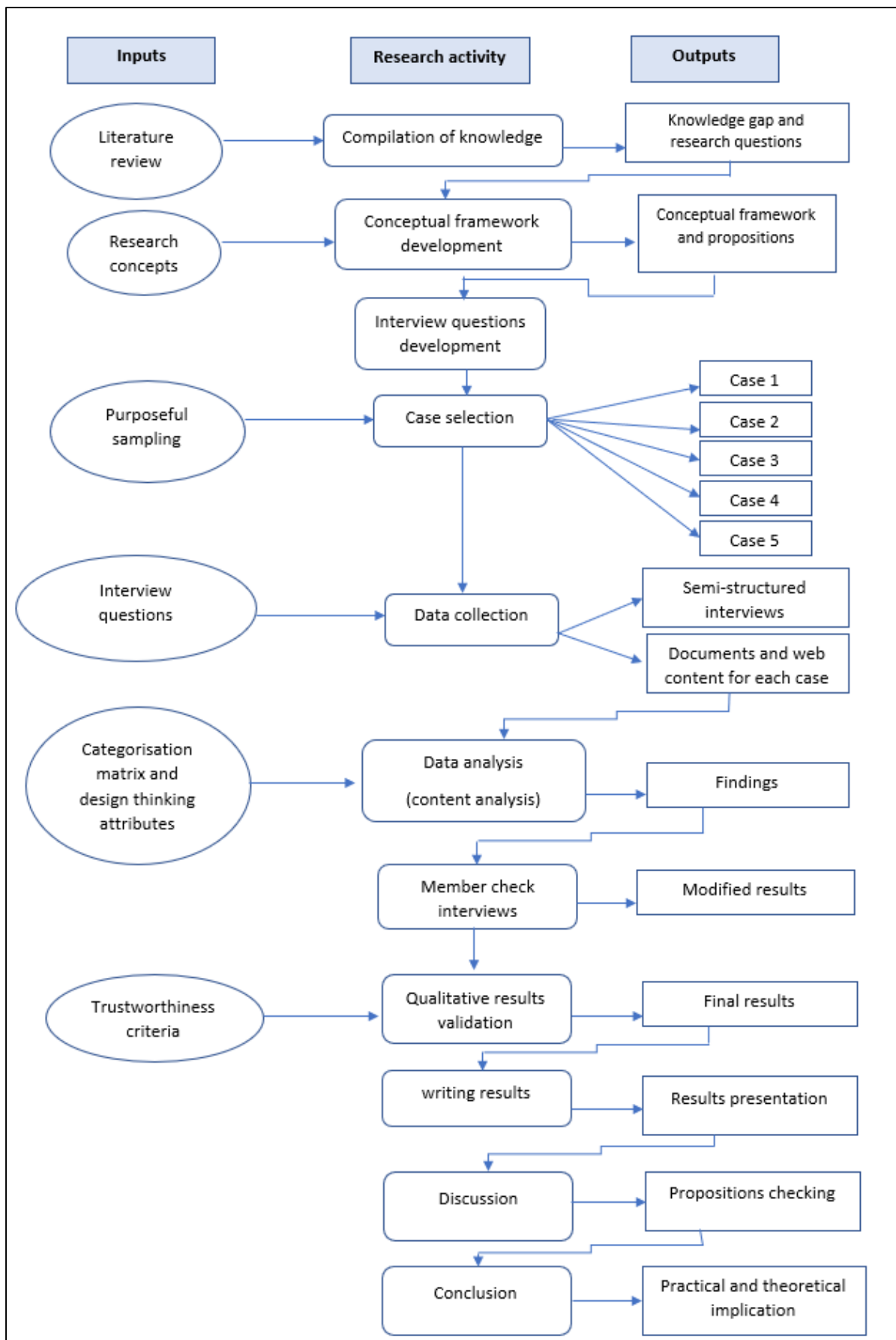


Figure 1.1: Research design

## **1.7 Structure of the thesis**

This thesis has eight chapters, summarised in Figure 1.2.

Chapter 1 is an introduction which presents an overview of the study.

Chapter 2 presents a literature review of the recent studies related to the research concepts such as innovation and creativity, closed innovation, open innovation, open innovation platforms, and design thinking. Finally, a research gap is derived, and research questions are developed.

Chapter 3 illustrates the development of the initial conceptual framework and propositions.

Chapter 4 presents a justification for using the research methodology and presents the procedure for conducting the data collection and analysis process.

Chapter 5 presents the findings of the analysed interviews for each of the five cases.

Chapter 6 shows the results of analysing web content and documents for each of the five cases.

Chapter 7 discusses the findings.

Chapter 8 concludes and describes the theoretical and practical contributions of the thesis.

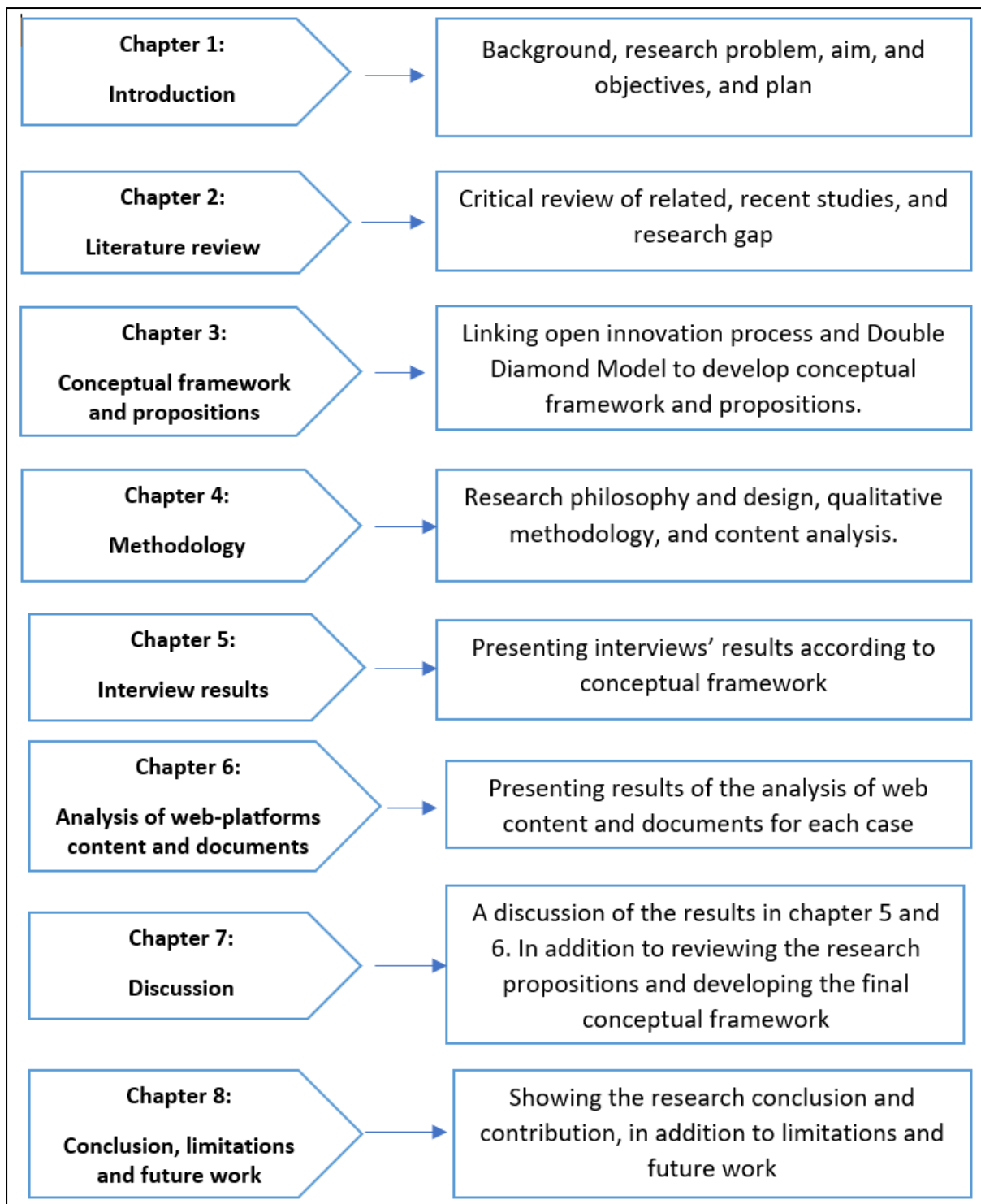


Figure 1.2: Thesis structure



# Chapter 2: Literature Review

## 2.1 Introduction

Chapter 2 presents a solid foundation for the research framework developed in Chapter 3. This chapter reviews recent studies about closed innovation, open innovation and design thinking. First, innovation definition, closed and open innovation, and open innovation process are demonstrated. Then, a broad review about open innovation application and using web-based platforms is presented, and studies about open innovation in the public sector are reviewed. Design thinking definitions, importance, attributes, and models are reviewed. Finally, a summary of the literature review and research gaps is presented.

## 2.2 Innovation

### 2.2.1 Innovation definition

Innovation has become the most powerful word to describe a company's competitive advantage such as marketing for a new product or providing a new service. The term "innovation" has been used in theory since the 1960s; however, it was applied practically in the 1980s and 1990s when the idea of building an innovative firm emerged (Iqbal 2011). In today's world, innovation has become vital to most private or public organisations in different sectors.

Innovation is defined by different scholars:

- Amabile (1983) introduced the componential theory of creativity, which postulates individuals' and groups' creativity in organisations that feed organisational innovation. The latter refers to creativity as generating novel ideas.
- Innovation is "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (OECD 2005).
- Innovation is the process and outcome of creating or inventing some new product or service (Norman & Verganti 2014).

- Innovation is defined as “the successful implementation of creative ideas within an organization” (Amabile & Pratt 2016).
- “The term “innovation” is always linked to the insertion, implementation or development of an idea, product or service for utility in society” (Nakano & Wechsler 2018).
- Innovation is “considered as both the process and outcome of creating or inventing something new and valuable that produces broader effects in the economy and technological advances” (Edwards-Schachter 2018).
- Innovation refers to “new ideas that are applied in fundamentally different ways to generate new and additional value” (Lee & Trimi 2018).
- Innovation is “a term referring to both innovative ideas that are intended to be commercialised in the market and ideas that have already been successfully commercialised” (Dziallas & Blind 2019).
- Innovation is “an outcome of a process rest on two defining characteristics, a degree of newness of a change and a degree of usefulness or success in the application of something new” (Granstrand & Holgersson 2020).

Drawing from the literature, this thesis study refers to innovation as implementing creative ideas for the purpose of generating value, enhancing value or achieving competitive advantage. An organisational and societal culture that promotes creativity supports successful innovation.

There are many innovation classifications according to either the object or the driver of innovation (Norman & Verganti 2014). The most common innovation classifications are discussed below (Miller & Miller 2012). First, product innovation is when changes are made to the product and are related to customer needs (Gunday et al. 2011). Second, service innovation is similar to product innovation, however the innovation focuses on the services that are provided for customers (Barrett et al. 2015).

The accumulated knowledge in the literature shows that innovation could be radical or incremental (Hawryszkiewicz 2007; Miller & Miller 2012). Radical innovation refers to creating an entirely

novel product or service, and incremental innovation refers to improving existing processes (Barrett et al. 2015; Dewar & Dutton 1986; Gunday et al. 2011; Katemukda & Sudasna-na-Ayudhya 2015; Miller & Miller 2012; Norman & Verganti 2014).

### **2.2.2 Moving from closed to open innovation**

Researchers have identified two types of innovation processes: “closed innovation” and “open innovation”. Open innovation allows external thoughts and ideas to be included within the innovation process (Bae & Chang 2012; Herzog 2011). In contrast, the creative ideas from internal parties are considered in the closed innovation process (Bae & Chang 2012; Iqbal 2011).

Closed innovation refers to a process where internal sources are innovators (e.g. people who contribute in the innovation process). Closed innovation is an old practice, specially in large organisations which have a Research and Development (R&D) department. Innovators include the R&D team considered “core inside inventors” and “peripheral inside innovators” (Neyer, Bullinger & Moeslein 2009). Core inside inventors are responsible for generating ideas within the organisation’s boundaries, while peripheral inside innovators are people who are not primarily responsible for developing innovative ideas; however, they can work with R&D to support and contribute to the creative project. Organisations that use closed innovation believe that they should control their intellectual property so that competitors do not benefit from their ideas (Chesbrough 2003).

Then, organisations realised the need for outside knowledge in order to extend the innovation boundaries (Chiaroni, Chiesa & Frattini 2011). In 2003, Chesbrough introduced open innovation as “a paradigm that assumes that firms can and should use external and internal ideas, and internal and external paths to market, as the firms look to advance their technology” (Chesbrough 2003). Another definition by Chesbrough, Vanhaverbeke & West (2006), “The use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation”. The approach of open innovation was applied in 1999 by Procter and Gamble. They established an initiative called Connect and Develop which worked together with the internal

R&D department to obtain external innovative ideas (Lee, Hwang & Choi 2012). According to Brunswicker & Chesbrough (2018) on large firms practising open innovation, “about 20 percent stated they started with open innovation even before 2003, the year Chesbrough published the book that labeled the paradigm”.

Chesbrough argued that the concept of closed innovation should be changed to include external ideas, and listed the implicit points of closed innovation. Firms are keen to get innovative ideas from their internal community in order to be the first to introduce them to the market. Moreover, firms want to keep their intellectual property (Chesbrough 2003). However, this cannot last forever, because workers can simply leave the organisation (Chesbrough 2003). Lee, Hwang & Choi (2012) also agreed that the “increased mobility of skilled workers and expansion of venture capital” are factors that lead organisations to adopt open innovation. Some researchers stated that the successful percentage of innovation in organisations is reduced if they rely on closed innovation alone (Schuurman et al. 2012). Chesbrough (2003) stated that innovators do not have to be within the organisation. Organisations can benefit from external R&D alongside internal R&D.

It can be noted that Chesbrough’s definitions included using external sources of ideas as well as internal sources for innovative firms. Moreover, the definitions include using external approaches for launching the product or service to the market. Therefore, the use of external ideas can occur throughout the first phase of the innovation process which is ideation, in addition to the launching phase when the products or services are launched to the market. However, many studies followed Chesbrough’s definitions, leading to many variations, and new definitions continue to emerge (Hawryszkiewicz & Alqahtani 2022). Since the Chesbrough definition and its publication, all the recent studies about open innovation identify the important points in the open innovation definitions as (Hawryszkiewicz & Alqahtani 2022):

- It includes many stakeholders such as customers, communities, researchers, and the open innovation team (Durst & Stähle 2013).

- It is practised either in public or private organisations. Private organisations are interested in open innovation to increase their income, however in the public sector, the attention is focused on improving public services based on the needs of societies.
- Technology is an important component in providing a platform for open innovation.

The first external source of innovation that can play an essential role in the open innovation process is the customer. Piller, Ihl & Vossen (2011, p. 31) stated that in the context of open innovation “customers become active participants in an innovation process of a firm and take part in the development of new products or services”. Previous studies have shown that the integration of customers and suppliers can generate great ideas that can be considered in the innovation process (Lau, Tang & Yam 2010). Overall, the involvement of customers’ ideas throughout the innovation process can be a valuable external source.

Another external source of ideas is universities and research centres. Perkmann & Walsh (2007) studied the university and industry relationship in the context of open innovation. This relationship has traditionally been studied, but not in the context of open innovation. Perkmann & Walsh (2007) concluded that “in contexts of open and networked innovation, interorganizational relationships between public research organizations and industry play an important role in driving innovation processes”. Citizens also play an essential role as an external source of knowledge for innovation (Lee, Hwang & Choi 2012). Seltzer & Mahmoudi (2013) indicated that the participation of citizens in the innovation process needs to be well-managed and organised, as this involvement can contain a number of ideas.

In open innovation, three methods can be applied: (i) outside-in path, which happens when the organisation allows external ideas to come inside the organisation, (ii) inside-out path, when the organisation grants new ideas outside the organisation; and (iii) the combination of both outside-in and inside-out paths (Chesbrough 2012). Open innovation can be performed through a platform designed specifically for this purpose.

### **2.2.3 Innovation process**

A successful innovation is based on the successful application of an innovative process at an organisation (Conte & Vivarelli 2014). The innovation process refers to a sequence of interrelated activities that should be undertaken for a new or better product or service, including generation, screening the ideas, and development of the idea. In 1971, Utterback developed a process of innovation using “idea generation”, “problem solving or invention”, “implementation”, and “diffusion” (Salerno, de Vasconcelos Gomes, et al. 2015).

The first stage of innovation is idea generation to address users’ needs through innovation in products or services. The second step in the innovation process is screening idea selection which includes idea selection, valuation of the selected ideas and portfolio management. The third step is development and diffusing is the fourth step (Salerno, Gomes, et al. 2015). However, studies such as Gerke et al. (2017) divided the innovation process into only three phases, beginning with the ideation phase, which includes idea selection. The second phase, the invention phase, consists of the implementation process. Finally, the exploitation phase includes launching the product or service. Similarly, Hansen & Birkinshaw (2007) expressed the innovation process as an innovation value chain involving idea generation, conversation, and diffusion.

Table 2.1 summarises the most common innovation processes applied through open or closed innovation with or without online platforms.

**Table 2.1: Common processes used for open and closed innovation**

<b>Reference</b>	<b>Innovation process</b>	<b>Focus</b>
(Bergendahl & Magnusson 2015; Dougherty 1992; Gerke et al. 2017; Roberts 2007)	The innovation process phases are: 1) idea selection; 2) the invention phase, which includes the implementation process; 3) the exploitation phase, which includes launching the product or service.	Closed innovation Private organisations
(Hansen & Birkinshaw 2007)	Innovation process as an innovation value chain: 1) idea generation; 2) idea conversation and idea diffusion.	Closed innovation Value chain
(Yang, Chen & Pavlou 2009)	Open innovation process using online contests having the following steps: 1) posting, when the innovation seekers post a description of the project that they want people to give innovative ideas or solutions for; 2) bidding, when users submit their ideas; 3) feedback, when the innovation seekers give input to the platform users; 4) awarding, when they provide awards for the best selected posted ideas; 5) extending, an optional stage for if the seeker wants to expand the project post for additional time; 6) evaluating, another optional stage where the seekers can leave feedback on all users' ideas.	Open innovation Online contest
(Adamczyk, Bullinger & Möslein 2012; Bullinger et al. 2010)	1) generation of innovative ideas through the platform; 2) selection of the more appropriate ideas by evaluators who are experts in the field; 3) the selected idea is applied, including launching the innovative idea into the market.	Open innovation Innovation contests
(Durst & Stähle 2013)	Open innovation phases are: 1) searching for innovations; 2) selecting the most appropriate one; 3) implementing the chosen innovation.	Open innovation
(West & Bogers 2014)	According to an analysis of many articles about the open innovation process, it can follow these stages: 1) the obtaining of innovation from external sources; 2) integration of innovations; 3) commercialising of innovations; 4) “interaction mechanisms, which may occur at any phase of the innovation process“.	Open innovation Private organisations
(Salerno, de Vasconcelos Gomes, et al. 2015)	Previous innovation models followed a linear innovation process: 1) idea generation; 2) idea selection; 3) idea implementation;	Closed innovation Private organisations

	4) idea diffusion.	New product development (NPD)
(Milutinović, Stošić & Štavljanin 2018)	Online open innovation platforms process: 1) collecting new or existing innovative solutions; 2) choosing the best solutions from experts or community; 3) implementing and launching the selected solution, either product or service.	Online open innovation platforms
(Almirall, Lee & Majchrzak 2014; Kollwitz & Dinter 2019)	1) Preparation: which includes determining the event goal, evaluation criteria, and awards; 2) implementation: prototyping the solution and may use open data, in addition to the evaluation process by experts; 3) following up with participants.	Civic hackathon Open innovation event Private and public sectors
(Franco, Presenza & Petruzzelli 2021)	1) “Technological infrastructure setup”; 2) “Stakeholder selection”; 3) “Awareness creation”; 4) “Technological education”, which means teaching stakeholders about the platform; 5) “Idea (knowledge) cocreation”; 6) “Hackathon hybridisation,” which means operating online and offline hackathons.	Hackathon platforms Open innovation platform

As Table 2.1 shows, most of the innovation processes that studies have proposed were as follows: “idea generation”, “idea selection”, “development”, and “diffusion” (Salerno, de Vasconcelos Gomes, et al. 2015, p. 59).

King & Lakhani (2013) studied how open innovation can assist in the identification of the best ideas. Their discussion was around idea generation and selection, and when managers should decide to open either idea generation or idea selection. Opening idea selection means letting external parties select the best ideas. For example, customers can vote for specific ideas that are either generated by them or the organisation. King & Lakhani (2013, p. 48) concluded that “the key to success is careful consideration of what to open, how to open it and how to manage the new problems created by that openness”. Table 2.2 shows studies that addressed the idea evaluation and selection process. There is a lack of studies that propose a method, process, mechanism, model or framework that describes how the selection and evaluation of ideas occur in the context of open innovation platforms.



**Table 2.2: Studies on the idea evaluation and selection process**

<b>Reference</b>	<b>Paper topic</b>	<b>Findings</b>	<b>Limitations</b>
(Stevanovic, Marjanovic & Storga 2015)	“A model of idea evaluation and selection for product innovation”	Development of evaluation model for product innovation in the context of closed innovation	<ul style="list-style-type: none"> <li>- The paper studies the innovation process in the context of closed innovation</li> <li>- The model is designed to evaluate ideas for product development</li> </ul>
(Montoya-Weiss & O'Driscoll 2000)	“From experience: Applying performance support technology in the fuzzy front end”	A process that explains how the idea is developed and assessed by using technology.	<ul style="list-style-type: none"> <li>- The paper studied the innovation process in the context of closed innovation</li> <li>- The process is designed to evaluate ideas for product development</li> <li>- The study was conducted for the private sector</li> </ul>
(King & Lakhani 2013)	“Using open innovation to identify the best ideas”	When managers should open either idea generation and idea selection	Although this study is in the context of open innovation, it only explains when managers should decide to open either idea selection or idea generation.
(Blohm et al. 2011)	“Idea evaluation mechanisms for collective intelligence in open innovation communities: Do traders outperform raters?”	Integrates the prediction market and a rating scale as evaluation mechanisms for idea evaluation.	<ul style="list-style-type: none"> <li>- The study is in the context of collective intelligence.</li> <li>- The study is based on evaluating these mechanisms rather than human centred approaches.</li> </ul>
(Martinsuo & Poskela 2011)	“Use of evaluation criteria and innovation performance in the front end of innovation”	Using evaluation criteria promotes competitive advantage in an organisation.	<ul style="list-style-type: none"> <li>- In the context of closed innovation and product innovation in the private sector.</li> <li>- The study considered the market and technical criteria but not human criteria.</li> </ul>
(Schwarz & Bodendorf 2012)	“Attributive idea evaluation: A new idea evaluation method for corporate open innovation communities”	Introduced an evaluation method for open innovation communities	<ul style="list-style-type: none"> <li>- The study proposed only a set of attributes that should be considered when evaluating ideas, such as “allow short evaluation times and involve large</li> </ul>

			numbers of evaluators”. - The study was conducted in the private sector.
(Salminen & Harmaakorpi 2012)	“Collective intelligence and practice-based innovation: An idea evaluation method based on collective intelligence”	Proposed a tool for rating ideas.	- The evaluation is performed automatically by using an algorithm. - Human is not considered as primary stakeholder of the evaluation team.
(Schulze et al. 2012)	“Idea assessment in open innovation: A state of practice”	Organisations using information systems to assess ideas are more satisfied with the idea assessment process	- The study did not produce a model for assessing ideas. - It only investigates how information systems can assist in the ideas evaluation performance.

## 2.3 Open innovation

### 2.3.1 Application of open innovation

Studies have reported open innovation is more successful than closed innovation and can support organisations to create more value. To exemplify, Souitaris (2001) conducted qualitative research by interviewing 100 firms in Greece, and the findings showed that successful innovation could be increased when the firm opens its relationship with external sources. Another study in several European countries showed that external sources, applied in open innovation, could improve innovation and service performance Caloghirou, Kastelli & Tsakanikas (2004). A survey by Ili, Albers & Miller (2010) on 40 automotive firms showed that applying open innovation could create more value than using closed innovation. Moreover, Lee, Hwang & Choi (2012, p. 150) determined the benefits of including the public, an example of open innovation, in government: “improved quality of service, reduced investment of public resources, and increased ability to mobilise rare public resources”. Many countries have recognised the importance of the inclusion of citizen knowledge in their strategies, for example, the application of an online platform by the US federal government (Mergel 2018).

Open innovation was first applied in the private sector (Yuan & Gasco-Hernandez 2021). However, open innovation can also be applied in the public sector, with the same purpose of bringing external thoughts and ideas to the sector. Open innovation in the public sector (governments and all publicly controlled or funded agencies) is used to leverage resources and knowledge from peer government departments, citizens, and private sector organisations to solve public problems (Design Council 2019; King & Lakhani 2013; Mergel 2018). Open innovation in the private sector is used to achieve a competitive advantage through new products or services; external stakeholders in this process are suppliers, customers, partners, and research institutes. For example, LEGO is a toy brand that faced a decrease in revenue. The company launched a philosophy that “people don’t have to work for us to work with us” by establishing LEGO Ideas where customers can share and votes for ideas. This was a turning point for the company which became “a global leader in toy innovation” (Markowitz 2018). Therefore, the application of open innovation in the private sector leads to various benefits, such as high revenues and competitive advantage (Bommert 2010).

In the public sector, the goal is only to serve the local community (Lee, Hwang & Choi 2012). Table 2.3 lists other aspects of the difference between the private and public sectors in the context of open innovation.

**Table 2.3: Differences between open innovation in public and private sectors (Kankanhalli, Zuiderwijk & Tayi 2017)**

	Open innovation in the private sector	Open innovation in the public sector
Focus	Both on new product and service development	Usually not for a physical artifact
Aim	Initiated primarily to achieve competitive advantage	Driven by the objective of improving service performance
Value	Add value in terms of higher revenues	Add value in terms of public benefit
External stakeholders	Suppliers, customers, competitors, partners, research institutions, organizations in other industries	Citizens, online intermediaries, academia and higher education, other governmental organizations (e.g. legislators), non-governmental agencies (including the private sector) and non-profit organizations

### **2.3.2 Open innovation via web-based platforms**

Open innovation can be performed through a platform designed specifically for this purpose. Many organisations have used the world wide web to process open innovation. Web-based technologies have been the main driver of open innovation in organisations, as they facilitate the use of open innovation by external users (Milutinović, Stošić & Štavljanin 2018).

Milutinović, Stošić & Štavljanin (2018) classified open innovation platforms into several categories: (1) hackathons, an event where people are invited to join a competition to solve technical problems (Sigala & Ukpabi 2019); (2) innovation lab, where all stakeholders gather to discuss public problems and find and test solutions (Tõnurist, Kattel & Lember 2017); (3) innovation contest, where participants can enter a competition by posting their ideas about a problem, then the ideas are evaluated, and the winners are awarded (Haller, Bullinger & Möslein 2011; Yang, Chen & Pavlou 2009) ; (4) innovation market place, similar to the idea of the innovation contest, except participants are innovators from the same field of expertise (Hallerstede 2013); (5) innovation toolkit, which allows innovators to solve specific problems within a limited space (Milutinović, Stošić & Štavljanin 2018); and (6) innovation technologies, where by using this platform, participants can implement their specific designs, completing the last phase of the innovation (Milutinović, Stošić & Štavljanin 2018).

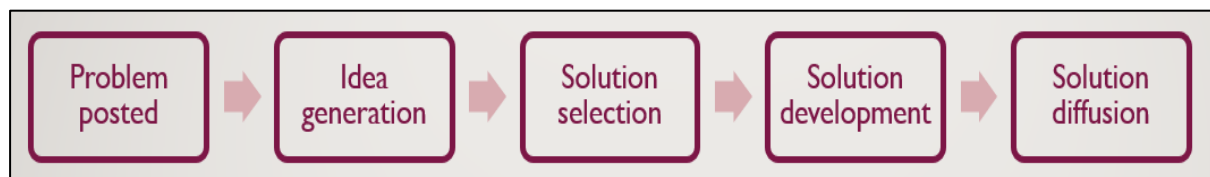
**Table 2.4: Open innovation platform types**

<b>Open innovation platform type</b>	<b>Definition</b>	<b>Reference</b>
Hackathons	It is a short competition event where participants join in solving most technical problems. Hackathons can be virtual or face-to-face.	(Franco, Presenza & Petruzzelli 2021; Yuan & Gasco-Hernandez 2021)
Innovation lab	“Improve public services and public policies by creating a safe space to co-create ideas, test prototypes and refine concepts with citizens, civil servants and stakeholders.”	(Whicher & Crick 2019)
Innovation contests	It is a web-based platform. It depends on posting a project or problem for some time; then, users can submit their solutions. Expert teams evaluate and select the best solution. Finally, the chosen winner is rewarded.	(Haller, Bullinger & Möslein 2011; Yang, Chen & Pavlou 2009)
Innovation marketplace	It is similar to innovation contests. However, it works as a mediator between the organiser of the challenge and the users or inventors. Therefore, the maker of this platform takes a percentage of the reward given to the winning innovator. Moreover, this platform can work to the contrary, meaning innovators can submit their solutions for any problem, and the organiser can benefit from it.	(Hallerstede 2013)
Innovation toolkits	This platform allows innovators to solve specific problems within a limited space. This means the problem organiser will restrict the users’ solutions within particular boundaries.	(Milutinović, Stošić & Štavljanin 2018)
Innovation Technologies	The implementation phase of the innovation process is the fundamental concept of this type of platform. The innovators can implement their design with a prototype, such as a 3D printer.	(Milutinović, Stošić & Štavljanin 2018)

Yang, Chen & Pavlou (2009) described the open innovation process using online contests as having the following steps: 1) posting, when the innovation seekers post a description of the project that they want people to give innovative ideas or solutions for; 2) bidding, when users submit their ideas; 3) feedback, when the innovation seekers give feedback to the platform users; 4) awarding, when they provide awards for the best selected posted ideas; 5) extending, an optional stage for if the seeker wants to extend the project post for additional time and 6) evaluating, another optional stage where the seekers can leave feedback on all of the users’ ideas. West & Bogers (2014) reported that the open innovation process includes searching for innovative ideas using technology (e.g., online communities) and generating explicit contracts and licensing, followed by commercialising

innovations. Similarly, Durst & Stähle (2013) divided the open innovation process into three phases: 1) seeking innovation opportunities; 2) selecting the more appropriate innovation choice; and 3) developing the selected opportunity.

In summary, open innovation that uses an online platform has a similar process as open innovation without using a platform, however it is performed as following (Figure 2.1): problem posted, idea generation, solution selection, solution development, and solution diffusion.



**Figure 2.1: Innovation process through online open innovation platform**

### **2.3.3 Open innovation in the public sector**

Open innovation in the public sector is limited and still needs more investigation (Ham et al. 2015; Kankanhalli, Zuiderwijk & Tayi 2017; Paskaleva & Cooper 2018; Yuan & Gasco-Hernandez 2021). Open innovation in the public sector is used for value creation in terms of public benefits. External stakeholders include citizens, research institutes, and non-governmental agencies (Lee, Hwang & Choi 2012; Venturini & Verbano 2017). In the public sector, citizens play an essential role as an external source of knowledge for innovation (Lee, Hwang & Choi 2012; Seltzer & Mahmoudi 2013). This involvement is usually implemented through online platforms (Mergel 2018). According to Curtain (2003), there are several points that are important such as including citizens in the decision making process in the context of government services like education or health. For example, citizens can play the teacher role in order to explain specific problems and their solutions in more detail. Another role that citizens might take is the discovery role. Therefore, citizens can define the hidden principles for specific problems (Curtain 2003). Many initiatives have been applied to get insight into citizens' values. As the Chief Executive of Accenture's Government and Health business in Australia and New Zealand states, "What do today's citizens and businesses want from their government? They want services that are easy to use, simple to access, and reliable. They want the flexibility to connect through the channel that suits their particular needs. And they want public agencies to be

smart and innovative about using technologies to close the gap between what government does and what the private sector does” (Garner 2019). Füller et al. (2014) used cluster and social network analysis to analyse the community role in web-based innovation contests. They found that there are six types of users such as idea generators who are concerned about creating creative ideas, while socialisers focus more on discussion about the ideas. An efficient contributor is effective in generating ideas and active in voting and posting feedback.

Globally, innovation has been an important practice. For example, the Global Innovation Index (GII) is issued by Cornell University, The Business School (INSEAD), and the World Intellectual Property Organization (WIPO). The index aims to measure the innovation system in 129 countries according to specific indicators. The main purpose of the index is assessing a country’s ability to innovate. The GII framework consists of two main criteria: innovation input sub-criteria and innovation output sub-criteria and different sub criteria, such as infrastructure and market sophistication, to encourage countries to reach for higher levels on the index (Global Innovation Index 2018). For example, according to Global Economy (2019) from 2011 to 2014, the innovation level in Saudi Arabia gradually increased. However, Global Innovation Index did not mention or include any criteria of how countries may be innovative through communities. The focus is only on the outcome of closed innovation in general.

Füller et al. (2014) defined open innovation in the public sector as “the act of governments leveraging resources and knowledge contributed by peer government departments, citizens, and private sector organizations to solve public problems”. There are a number of countries that have started applying open innovation strategies. One of the leading countries in open innovation in the public sector is the United States. The US government launched a website that included an open government dataset, in addition to another website to obtain public ideas about government policies (Lee, Hwang & Choi 2012). Further, the US government launched “Challenge.gov”, a platform available to all federal agencies to help them list their challenge and prize competitions and learn how to engage the public through this innovative approach (Lee, Hwang & Choi 2012).

The United Kingdom also adopted open innovation in the public sector (Lee, Hwang & Choi 2012). For example, the National Endowment for Science, Technology and the Arts (NESTA) launched a website ([www.nesta.org.uk](http://www.nesta.org.uk)) to improve public services by generating innovative ideas. Moreover, to improve public services, the Cabinet Office formulates an open innovation team to enhance collaboration between academics and policymakers (Open Innovation Team n.d.). There is a blog in the United Kingdom for the open innovation team (<https://openinnovation.blog.gov.uk/>).

Another country that adopts open innovation is Canada. The main aim of such an initiative is to improve services efficiently (Lee, Hwang & Choi 2012). The Toronto Transit Commission launched a one-day event for solving problems called the Toronto Transit Camp. Many online ideas appeared through online and in-person discussions by transport users. Australia is also one of the countries keen to adopt the option. The Australia 2020 Summit invited the public to share their ideas in many sectors such as education and health. Another example from Australia is the Future Melbourne program, which allows citizens to add ideas for city improvements by using an online blog (Hilgers & Ihl 2010). The Netherlands launched an online platform to enable citizens to share their thoughts about all agencies that can inspire citizens' ideas (Kankanhalli, Zuiderwijk & Tayi 2017).

Recent literature from 2020 about applying open innovation in the public sector has gained more attention. For example, a virtual hackathon in Sweden is an online open innovation competition where community members are invited to share their ideas to solve a pre-determined problem (Wang et al. 2021). Sweden's experience during the COVID-19 pandemic has valuable lessons (Temiz 2021). The study conducted a case study to investigate the issues of applying such knowledge during the pandemic. The case study revealed many issues. For example, some participants stated that there was a problem of not receiving comments from the government institutes (who ran the hackathon) about their solutions. Further, there was an ambiguity in implementing the solutions after announcing the winners from the hackathons. This means that the organisation who needed the solution did not communicate with the winners to start testing and diffusing the solution to the community. One of the participants stated that some organisations have a similar solution. Thus, the problem specification was not specified well. Moreover, the study indicated that teams who organise



hackathons prefer to work with people who already know and have knowledge on how to implement and organise an open innovation platform. In general, the public sector is slower than the private sector in applying this process due to their very accurate policies (Temiz 2021).

Another recent case study in Spain analysed two online open innovation platforms during the COVID-19 pandemic (Criado & Guevara-Gómez 2021). The findings indicated that the community played an essential role in developing innovative solutions during the pandemic. However, especially during the pandemic some solutions are expected to be implemented in public sector organisations, however this is not a guarantee (Criado & Guevara-Gómez 2021). Another challenge launched during the pandemic is managed by the European Innovation Council (Bertello, Bogers & De Bernardi 2022). The study pointed out that diversity of community backgrounds leads to a lack of coordination between them, in addition to the lack of a human centred approach by some participants (Bertello, Bogers & De Bernardi 2022). Similarly, coordination and collaboration between organisations working together to apply open innovation is also a concern, thus, an approach is needed to facilitate the communication (Hameduddin, Fernandez & Demircioglu 2020; Mergel 2018).

However, studies stated that the implementation of open innovation in the public sector suffers from some challenges compared to closed innovation, which has been well established and has clear rules about the process (Mergel 2018). Mergel (2018) stated some barriers to applying open innovation in the public sector, such as “legal barriers”, “uncertainty about the process and its outcomes”, “technological barriers to design crowdsourcing processes”, and “cultural factors that prevent or delay adoption decisions. As Table 2.2 shows, studies that provided information about idea selection and evaluations mostly focused on closed innovation.

## **2.4 Design thinking**

### **2.4.1 Design thinking definition**

Design thinking is “a specific method to solve complex (wicked) problems and to generate innovative solutions, based on a user-centred approach with multi-disciplinary teams” (Thoring &

Müller 2011). The design thinking approach supports involvement of different people from different backgrounds, departments, perspectives, and experts to integrate their views and reach the right solution (Carlgren, Rauth & Elmquist 2016; Glen, Suciú & Baughn 2014).

Design thinking is a human centred process that has been increasingly used in many organisations (Brown & Katz 2011). It has helped organisations solve complex and ambiguous problems (Gasparini 2015). According to Tschimmel (2012), design thinking is “a way of thinking which leads to transformation, evolution and innovation, to new forms of living and new ways of managing the business”. Another definition is “methodology originating from design disciplines, oriented towards problem-solving through a human-centred approach, rapid prototyping and reasoning” (Culén & Følstad 2014). Therefore, design thinking is a way of thinking that is based on humans. It is for solving complicated problems by innovative methods to get innovative solutions, which can be applied in any field. Thus, humans, the problem, and innovation are the main factors for design thinking.

Design thinking has been practised in informal ways for years (Hawryszkiewicz & Alqahtani 2022). Three terminologies appeared before design thinking emerged: creative, visual, and ambidextrous thinking (Thienen et al. 2018). They were used to teach students how they think in innovative ways. Creative thinking was introduced in a seminar in the 1950s at Stanford University (Thienen et al. 2018). However, design thinking as a term was first used by Simon (1969) to refer to the ways of solving problems (Cankurtaran & Beverland 2020).

Application of design thinking improved organisational performance (Elsbach & Stigliani 2018; Knight, Daymond & Paroutis 2020). Organisations apply design thinking to achieve competitive advantages (Elsbach & Stigliani 2018; Martin & Martin 2009).

It is important to know that design thinking is for any organisation that wants to use creative ways to solve problems in any field (Brown & Katz 2011). Design thinking represents the designer’s skills, however, as (Brown & Katz 2011) stated, “Design thinking takes the next step, which is to put these tools into the hands of people who may have never thought of themselves as designers and apply

them to a vastly greater range of problems”. The main reason that encourages organisations to include design thinking is the effectiveness of design thinking as an approach to bring innovation to an organisation (Pavie & Carthy 2015).

Including design thinking assists businesses in which their products or services change rapidly based on customers’ needs, as design thinking is a human centred approach that will help to understand people’s needs (Luchs 2015). A study by Pereira et al. (2021) indicated that design thinking adoption in software development companies “helped the professionals improve the requirements gathering and specification, reflecting on better users’ real needs understanding and building solutions to support them”, which reflects the significance of applying design thinking as an approach to understand people’s needs rather than requirements (Vetterli et al. 2013).

Design thinking includes two ways of thinking: divergent and convergent thinking (Hawryszkiewicz 2014). Divergent thinking means thoughts of solving problems begin with understanding the big picture of the problem by observing and extracting the stakeholders’ points of view (Hawryszkiewicz 2014). Then, convergent thinking emerges when thoughts narrow down the picture to selecting innovative solutions. Design thinking is an iterative process that makes it different from the linear traditional approach to solve complex problems, which start by gathering data about problems, analysing data, finding the solution and implementing the solution (Conklin 2006).

According to studies by Micheli et al. (2019) and (Luchs 2015), design thinking has been linked to several attributes in the literature. The following are explanations of each point:

**(1) Innovation and creativity:** In the literature innovation and creativity are the attributes that are mostly linked with design thinking studies (Micheli et al. 2019). Innovation and creativity are described as the outcome of practising design thinking.

**(2) A human centred approach** is always a description of design thinking in the literature (Brown & Katz 2011; Liedtka 2015; Martin 2011). This means humans/users are involved during the design

thinking process, which is the empathy phase. Empathy includes speaking with users/customers and understanding their needs (Connell & Tenkasi 2015),

**(3) Problem solving:** Design thinking approaches are used to solve complex problems (Micheli et al. 2019).

**(4) Iteration and experimentation:** One feature that distinguishes design thinking from other approaches is iteration which means solutions are generated, and tested until the right solution is acquired (Beverland, Wilner & Micheli 2015).

**(5) Interdisciplinary collaboration** is a crucial characteristic of design thinking (Panke 2019).

**(6) Ability to visualise:** This means that the design thinking approach supports participants to visualise ideas, solutions and outcomes (Kimbell 2011; Razzouk & Shute 2012). For example, storytelling techniques can support visualising (Carlgren, Rauth & Elmquist 2016).

**(7) Fast process:** Herrmann & Goldschmidt (2013) and Liedtka, King & Bennett (2013) confirm that design thinking is a fast learning process.

## **2.4.2 Design thinking models**

Many design thinking models have been introduced based on design thinking principles. The unified goal of these models is solving problems.

### **2.4.2.1 IDEO's 3 I Model**

IDEO's model was created by Innovation Design Engineering Organization (Tschimmel 2012). As shown in Figure 2.1 this model started with divergence thinking and convergence thinking, and then it repeats. The first section is high, which means that thinking starts as broad, and then the second section becomes low when thinking is narrowed. The first phase is an inspiration when the problem is identified through collaboration with the team. Data is collected from the target group by observing their behaviours or interviews. The second phase is imagination. When possible, ideas are generated. During this phase, the team determines the possible solutions, extracts others' ideas, and goes deeper into concepts. Some tools can be practical during this phase, such as "brainstorming and

filling the insight statements, creating frameworks for strategy development, selecting most promising ideas, rapid prototyping, business model canvas, collecting feedback and iteration according to it” (Ganova 2015). The final phase is implementation, when the selected idea is developed. Whether the last object is a product or service, it should be tested and introduced to the target group or customers. Thus, the team translated all preparations into an effective solution.

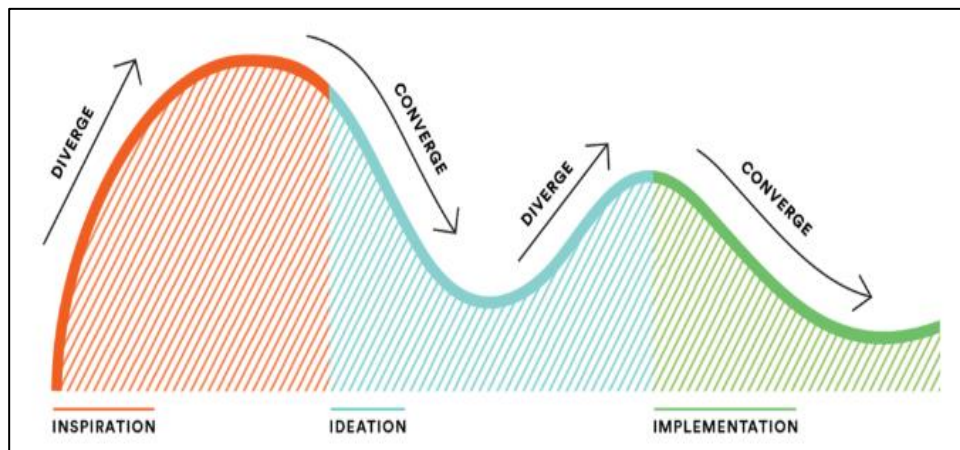


Figure 2.2: IDEO’s model (IDEO n.d.)

#### 2.4.2.2 Double Diamond model

The second model derived from the design thinking principle is the Double Diamond. The model was introduced in 2004 by the British Design Council (Design Council 2019). Figure 2.3 illustrates the Double Diamond phases: discover, define, develop, and deliver. This is the reason the model is sometimes called 4D. The first half of the diamond refers to the discovery of the problem. This is where the team get insights about the problem, and questions are asked to the people involved in the situation (divergent). When a broad sense has been developed, insight is narrowed down at the define phase to get more details and define themes of problems (concurrent). Then in the build phase, idea generation takes place. The final step is delivering the selected solution. At this stage, the team may reject ideas and accept others. Therefore, the first diamond represents problems, and the double diamond represents solutions. According to Nassler (2016), the following are the deliverables that the team should acquire at the end of each stage:

- Discover: "a huge pile of unstructured research findings."

- Define: "a revamped brief (final brief, How Might We-question) that either clarifies or details the brief initial challenge or contradicts it.". The HMW refers to the How Might We question the team should ask themselves at this stage.
- Develop: "one or a small number of ideas you want to later prototype and test to find the best answer or solution to your initial question or problem."
- Deliver final solution.

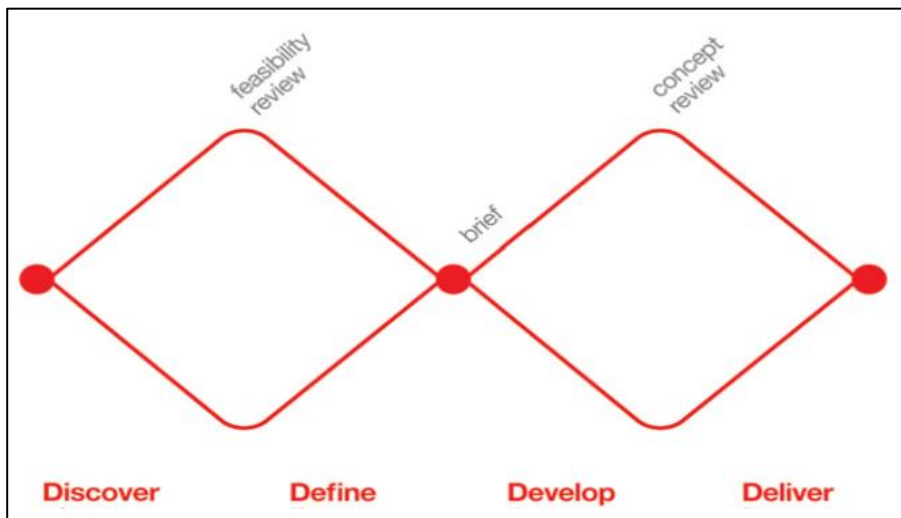


Figure 2.3: Double Diamond model (Schweitzer & Groeger 2016)

#### 2.4.2.3 Stanford d. School Model

The Stanford University Design Department developed another standard design thinking model (Figure 2.4). The model has five steps. The developer called them modes instead of steps. The first mode is empathising with target individuals. At this stage, observation of what people feel and need is essential. As (Plattner 2010) stated, "to create meaningful innovations, you need to know your users and care about their lives". Therefore, understanding people and getting inside people's environments are the main aims of the first mode. (Plattner 2010) listed some ways of using the empathise mode, such as watching and listening to people by having conversations with them. The second mode is defining the problem that the target people face. As Plattner (2010) stated, "framing the right problem is the only way to create the right solution". After understanding the nature of the problem, generating all possible innovative solutions comprises the ideate mode. This mode can be implemented by brainstorming, sketching, or mind mapping. Then, prototyping of the most

appropriate solutions occurs. This is an iterative step. Finally, letting people experience and interact with the defined prototype in test mode happens.

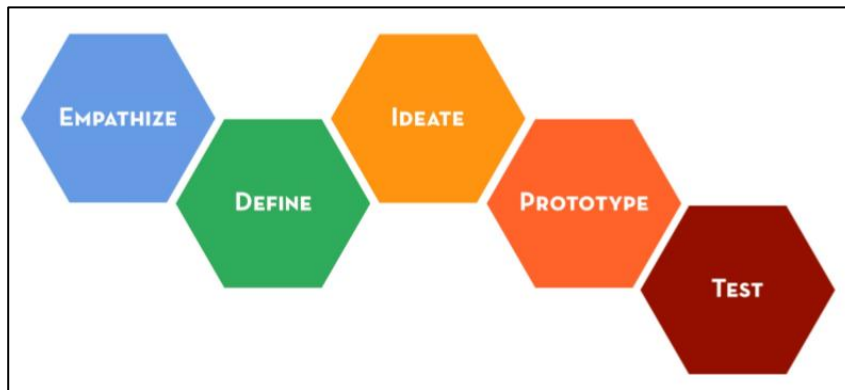


Figure 2.4: Stanford d. School design thinking model (Plattner 2010)

#### 2.4.2.4 Hasso-Plattner Institute Model (HPI)

Stanford University developed this model for educational purposes (Grönman & Lindfors 2021). The model has six phases (Figure 2.5). The first phase, understand, means understanding the topic by collecting information through research (Tschimmel 2012). The second phase is to observe the target people and gather information about them by interviewing them. Then, the team synthesises the users' needs and insight in a visual framework called the point of view phase (third phase) (Grönman & Lindfors 2021). The fourth phase starts the imagination by generating ideas to solve the problem in addition to comparing and discussing the proposed ideas to decide on the best solution. Then a prototype is made for that idea. The final phase is to test the final solution by including the end users. The lines between the phases are noted, which means the possibility for iteration and experimentation, one of the attributes of design thinking.

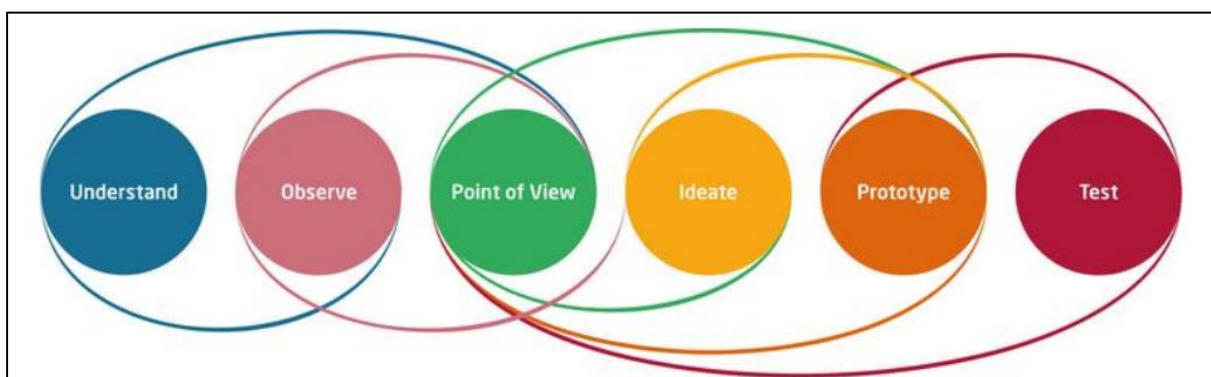


Figure 2.5: Hasso-Plattner Institute Model (Grönman & Lindfors 2021)

According to (Hawryszkiewicz & Alqahtani 2022), design thinking also brings in the tools and techniques to encourage innovation. This includes both the way teams work and the tools they use. Team methods focus on supporting collaboration in ways that generate relevant ideas through brainstorming. This includes creating environments that bring together people with expertise in the area and support with tools that enable people to express their views in ways relevant to the context. Typical ways to do this are through brainstorming and working in front of boards that focus on sketches that support open discussion. Here, designers raise the questions to be answered during the design process. The facilitator often leads by collecting post-it notes or drawing sketches or models of what is happening now or proposed solutions.

It is important to know that design thinking is for any organisation that wants to use creative ways to solve problems in any field (Brown & Katz 2011).

Collaboration is key to design thinking. Collaboration brings together people with tacit knowledge to work (Liedtka 2014). Many early examples of design thinking were in startups or development labs where designers and practitioners got together to find ways to develop an idea into a functional product. Often this tool is placed in a team room where ideas and models are discussed, bringing together experts when needed to address issues. Most participants were local, a central coordinating group that facilitated the process. A facilitator is often used to facilitate progress and ensure that brainstorming results in an outcome rather than an endless discussion. Liedtka, King & Bennett (2013) and Micheli et al. (2019) indicated a set of standard tools used in design thinking: ethnographic methods such as interviews and observation, personas, journey maps, brainstorming, mind maps, visualisation, prototyping, and experiments. Chapter 3 explains more tools and techniques used in design thinking and how each can be used in each phase of the design thinking model.

Lim, Kim & Sawng (2022) indicated that “despite such efforts in the public sector, academic research on the achievements of Design Thinking is still focused on the private sector”. However, design thinking is an important aspect that should be considered in the public sector, precisely because of the gap between the community needs and the public services provided (Mintrom &



Luetjens 2016). Policymaking was traditionally a linear process that started with problem identification and then analysing choices until the policy was developed. However, design thinking introduced a new era of policymaking in the public sector despite the complexity of the government context (Liedtka et al. 2020; Mintrom & Luetjens 2016). It can be noticed that there has been minimal effort to study practising design thinking as an approach in the public sector.

## 2.5 Theoretical underpinnings of design thinking: wicked problems

In relation to theories of design thinking, it is important to note that design thinking is a paradigm which originally derived from design theory. In the 1970s, Rittel & Webber (1973) argued that design problems are not fixed, thus, they introduced the term “wicked problems” (Rittel & Webber 1973). Figure 2.6 shows the wicked problems attributes based on them.

- 
1. There is no definite formulation of the problem. The problem includes a permanent feedback with its environment. The process of formulating the problem is interconnected with the process of its solution. To ask all the relevant questions to gain information on the problem, you must know all the conceivable alternative solutions.
  2. There are no stopping rules. The logic inherent in the problem does not tell you when to stop the inquiry.
  3. There are no criteria for correctness. There is nothing in the problem to say how the solution should be judged.
  4. There is no immediate test of the quality of the solution.
  5. There is no ultimate test of a solution.
  6. Once committed to a plan of action, change is consequential. You can't make consequences not happen.
  7. There is no list of permissible operations. (If you have a habitual set of actions or prescriptions, try to break out.)
  8. There are no well defined solutions. You either have many solutions or none. The probability that a wicked problem has one solution is null.
  9. Every wicked problem is unique.
  10. The problem solver has no right to be wrong. Designers are responsible for their work. Unlike scientists, they do not put up work for rejection at a later time.
- 

**Figure 2.6: Wicked problems attributes by Skaburskis (2008) based on (Rittel & Webber 1973)**

In 1992, Buchanan linked wicked problems to design thinking (Buchanan 1992). Buchanan introduced the “the wicked problem theory of design” for design thinking in a widely influential article on “wicked problems in design thinking”. Following the previous definition of wicked problems, Buchanan (1992) asked “why are design problems indeterminate and, therefore, wicked?”. Then, he answered because “because design has no special subject matter of its own apart from what a designer conceives it to be”, therefore, “the subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience”. Moreover,

Buchanan (1992) linked design thinking with innovation, explaining that the creation of innovation is when “the initial selection is repositioned at another point in the framework, raising new questions and ideas”. Buchanan believes that design thinking is “mastered by a few people who practise the discipline with distinctive insight and sometimes advance it to new areas of innovative application”. In addition, Buchanan confirmed the iteration process of design thinking of problem identification and solution development.

According to Buchanan (1992) design has four main ways as Figure 2.7 shows. The four levels increase in difficulty. For example, the first level of design is to design signs and symbols which are considered relatively straightforward, although skill is needed to do so. Then, design systems and services, which is more complex. The last level involves many stakeholders who have different needs. At this point, design thinking is needed to work with complexity and interactions (Buchanan 1992; Design Council 2018). Therefore, Buchanan (1992) described design thinking as a multidisciplinary practice to solve wicked problems by producing innovative solutions.

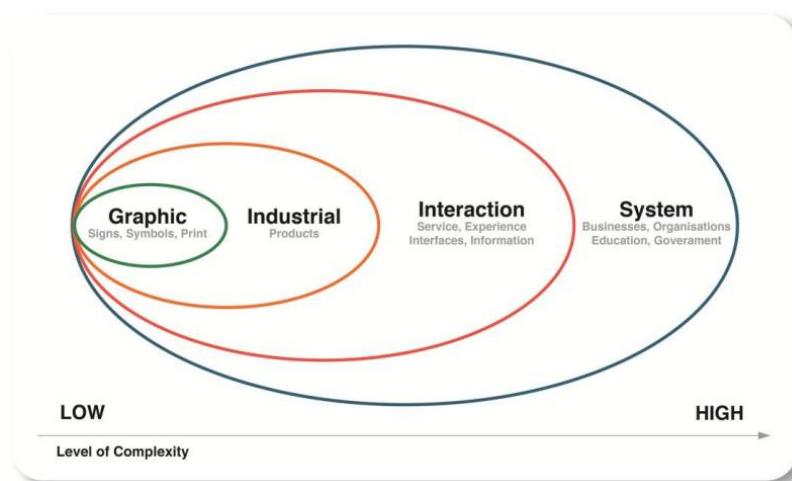


Figure 2.7: Four orders of design by Gaynor (2017) based on Buchanan (1992)

## 2.6 Design thinking and innovation in literature

Design thinking is a way of thinking that leads to innovation. Therefore, design thinking and innovation are linked to each other. As Owen (2006) indicated, innovation is “more than principles, rules and procedures, it is a process most effective when imbued with attitudes and ways of

thinking”, and he added that “these are ways of thinking from the design fields appropriately referred to as design thinking”. Moreover, Prud'homme van Reine (2017) pointed out that design thinking is a solution that brings innovation to an organisation. Seidel & Fixson (2013) confirmed by applying a case study on how the multidisciplinary teams produced innovative concepts by using design thinking techniques. Micheli et al. (2019) approved that innovation is the attribute most linked to design thinking in the literature. Most studies described innovation as an outcome of design thinking. Moreover, Pavie & Carthy (2015) stated that “design thinking is incorporated into the innovation process in order to develop specific solutions to address complex issues”.

Open innovation and design thinking can also link to each other. Although there is little attention in the research to linking them to each other, Kim (n.d.) stated that design thinking can be considered as a form of open innovation. Both concepts involve thinking outside of the box. Another common feature is that design thinking includes people’s insights from outside an organisation’s boundaries in order to be involved through the design thinking process, which is similar to open innovation that is based on outside thinking. The Executive Director of Food Design Research at Stanford University indicated that “open innovation is the basis for design thinking” (Kim n.d.).

The goal of design thinking is the same as open innovation but practised in different ways. In open innovation it is by opening to external stakeholders, whereas in design thinking, the focus is on empathising with selected, often internal, stakeholders. The captured information in both has to be analysed to identify issues and problems and then to resolve them. It is here that design thinking provides the tools needed to identify issues and provide solutions (Hawryszkiewicz & Alqahtani 2022).

## **2.7 Literature review summary and research gap**

The narrative literature review on innovation, innovation process, types of innovation, open innovation online platforms, open innovation in the public sector, and design thinking has led to the following results.

Innovation refers to implementing creative ideas for the purpose of generating value, enhancing value or achieving competitive advantage, which is called closed innovation. Innovation can be radical or incremental, in products or in services.

In 2003, Chesbrough introduced the era of open innovation which includes external people such as customers, researchers and external experts who can generate innovative solutions for organisations. Since then, open innovation has become an important aspect for business and private organisations.

The innovation process includes the following: idea generation, idea selection, solution development, and solution diffusion. Open innovation follows the same process, except the source of knowledge can be from outside the organisation's boundaries.

Recently, web-based platforms have begun to be used by the public sector to facilitate the open innovation process and have many forms. However, in general an open innovation platform in the public sector allows the community to share innovative ideas of solutions for problems. Then, the suggested ideas are evaluated and the best solution is selected, and winners are awarded.

The literature review revealed a number of issues regarding open innovation in the public sector applied via web-based platforms.

Open innovation has been discussed widely in the private sector but is limited in the public sector and, due to the differences between the two sectors, more investigation is needed (Ham et al. 2015; Kankanhalli, Zuiderwijk & Tayi 2017; Paskaleva & Cooper 2018; Yuan & Gasco-Hernandez 2021).

People who adopted open innovation in the public sector tried to avoid failure, therefore this will impact practising experimentations of the right solutions (Mergel 2018).

The diversity of a community's background can lead to a lack of coordination among members of the community (Bertello, Bogers & De Bernardi 2022). Similarly, there may be a lack of coordination and collaboration between organisations who are working together to achieve a solution by applying open innovation (Hameduddin, Fernandez & Demircioglu 2020; Mergel 2018).

There are a number of issues specifically regarding the process of applying open innovation platforms in the public sector.

First, open innovation in the public sector has a slower process than in the private sector (Temiz 2021). Second, a lack of awareness of the open innovation process in the public sector is a barrier for the adoption of such platforms (Mergel 2018). Third, the extensive review of the open innovation process via a platform in the public sector missed details about an important process before asking the community for solutions, which is the process of specifying the problem (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021). In addition, there is a challenge of the ways of identifying the problem statement in plain language to post for the community (Mergel 2018). Another study concluded there is an issue regarding the final solution which is the organisation already has a similar solution (Temiz 2021). This may refer to a lack of identifying the right problem. Fourth, there is a lack of understanding in the literature regarding the process, tools and techniques used to evaluate and select the best solutions during the open innovation process (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021). Fifth, accumulated evidence from the literature showed that little is known about the existence of the problem identification phase, and it was overlooked in previous studies. In addition, there is a lack of understanding and clarification about the solution diffusion phase of the open innovation process in the public sector.

The last phase of the open innovation process in the public sector, which is implementing the final solution, and then diffusing it to the community, is not well defined. The literature indicated that the final solution is not implemented, so the winners are awarded but in most cases the solutions are not tested and not diffused to the community (Criado & Guevara-Gómez 2021; Mergel 2018; Mergel & Desouza 2013; Temiz 2021).

On the other side, design thinking is “a specific method to solve complex (wicked) problems and to generate innovative solutions, based on a user-centred approach with multi-disciplinary teams” (Thoring & Müller 2011). The design thinking approach supports involvement of different people

from different backgrounds, departments, perspectives and experts to integrate their views and reach the right solution. The use of design thinking includes involving multidisciplinary teams, empathy with the community, experimentation, and failure tolerance, and using design thinking tools. Design thinking is an approach that can lead to innovation. Recent studies have suggested that open innovation needs to be further investigated in the public sector context. Little research attention has been paid to the application of open innovation in the public sector with a number of challenges related to the process of practising open innovation in the public sector. The thesis study mainly explores the use of design thinking as an approach to overcome previous challenges regarding the open innovation process in the public sector.

Providing knowledge and evidence of the application of open innovation in the public sector would be a great advance. Conducting studies that provide knowledge on addressing these challenges would be a significant contribution.

## **Chapter 3: Conceptual Framework and Propositions**

After the intensive literature review and gap discovered in Chapter 2, this chapter presents the basics that underpin the development of the conceptual framework. Then, a conceptual framework is developed in addition to the propositions that are derived from the conceptual framework. The study mainly explores the relationship between the open innovation process applied in public open innovation platforms and the Double Diamond design thinking model. Therefore, the two concepts are discussed in this chapter.

### **3.1 Conceptual framework**

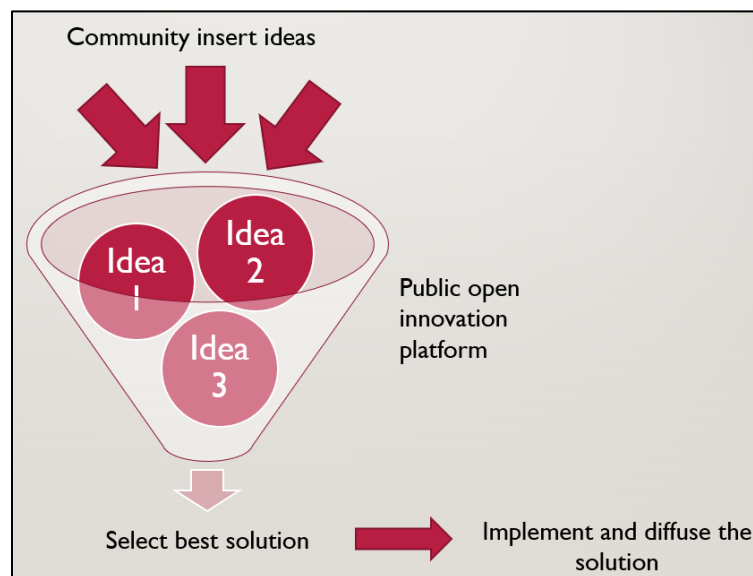
A conceptual framework can be represented graphically or in text form (Miles & Huberman 1994). It includes all the factors, constructs or variables in a study, in addition to the relationship between them. Miles & Huberman (1994) mentioned in their qualitative data analysis book that developing a framework in qualitative research can be based on theory, experiences, or logic. Moreover, Yin (2014) described the multiple case studies designed to begin with preliminary theory. The graphic conceptual framework evolved as the research progressed and is a guide to answering the research questions.

This section explains all the points that constructed the conceptual framework and then how they can be combined with each other according to the previous studies. First, the stages of the open innovation process are explained through an online open innovation platform. Second, the stages of the Double Diamond model are described in detail.

### **3.2 Open innovation process through public open innovation platforms**

After reviewing the studies that defined the open innovation process, shown in Chapter 2, Figure 3.1 describes how a public open innovation platform works. It follows the basic function of open innovation and online platforms. As Figure 3.1 shows, in general, public online open innovation platforms allow the community to post their innovative ideas, and then, the best solution is selected

to be implemented. The following points explain each phase of the open innovation process through public online open innovation platforms in detail.



**Figure 3.1: How public open innovation platforms work**

### **3.2.1 Phase one: problem posted on the platform**

First, the problem or challenge is posted on the platform. A set of instructions and guidelines can be included with the problem statement, such as the criteria of the selection process, what should be in the solution and what should not be, and the deadline for receiving the answers.

### **3.2.2 Phase two: idea generation**

As shown in Figure 3.1, the community starts to generate potential solutions (ideas) through the platform based on instructions posted along with the problem.

### **3.2.3 Phase three: solution selection**

Selecting ideas in the context of innovation has been discussed in the literature. For example, Stevanovic, Marjanovic & Storga (2015) stated that the evaluation of ideas is an essential part of the innovation process. However, as they indicated, there is a lack of identifying specific methods of selection ideas (Stevanovic, Marjanovic & Storga 2015). The Stevanovic, Marjanovic & Storga (2015) study was conducted for product innovation. Consequently, the model is designed to evaluate statements for product development. The evaluation model is divided into five criteria: technical, customer values, market, financial, and social factors (Stevanovic, Marjanovic & Storga 2015).



Another study identified the idea evaluation criteria as: “marketing, business, and human factor criteria” (Montoya-Weiss & O'Driscoll 2000). Feyzioglu & Büyüközkan (2006) produced a model by using "neural networks" and "fuzzy logic" to assist the decision maker in evaluating ideas for new product development. The model contains eight criteria. It is noted that all the previous studies that were conducted either considered closed innovation or product innovation and did not include customers as a significant contributor of data. On the other hand, as Stevanović, Marjanović & Štorga (2016) stated, only the generation of many ideas can guarantee that the good idea exists between them and “quantity leads to quality”, which leads to the concept of open innovation. Although some attempts have been made to address the selection process, as shown in Chapter 2, it is still necessary to explore the process of evaluating the ideas specifically in the context of open innovation.

#### **3.2.4 Phase four: solution development**

It is not clear in the literature who is responsible for implementing the selected solution in the context of public online open innovation platforms. However, Yuan & Gasco-Hernandez (2021) defined solution development in the context of applying open innovation in the public sector as “involves actions to develop initial designs into fully functional services, practices, and programmes as well as to manage changes introduced by innovations in individual behaviours and organizational structures”. There are very limited studies on the procedure and responsibility of developing the solution.

#### **3.2.5 Phase five: solution diffusion**

At this stage the implemented solution should be diffused to the community. Previous research typically only investigated innovation diffusion in closed innovation. This phase should be examined more in the context of the public open innovation process.

The available studies on the details of the process of applying open innovation platforms are limited. No previous study has focused on the tools, methods, techniques and team included during the process. Therefore, this research explores the details of the process applied by using open innovation platforms. Then the relationship between the studied process and the Double Diamond Model is

investigated. The possibility of practising design thinking attributes during the open innovation process is also examined.

### **3.3 Double Diamond model**

Another concept is design thinking which, as presented in Chapter 2, has a general definition of “a human-centred approach to solving problems, large and small” (Batat 2021). Design thinking has been embodied in many models discussed earlier in Chapter 2. However, in this study, the Double Diamond model is the most appropriate choice to combine with the open innovation process. The previous design thinking models discussed in Chapter 2 have a common goal: solving complex problems in an innovative way to get innovative solutions. However, there are some differences between them according to some aspects, such as the number of stages and the flows of each model. The Double Diamond model has been applied broadly in the public sector, while the IDEO model has been used in product and service development (Ganova 2015). The Double Diamond model has been used by major companies such as BSKyB, Virgin Atlantic Airways, and Yahoo (Design Council 2007). Therefore, it has been practised. Nevertheless, there is no ideal design thinking model for a specific project. All the previous models have been used in academia, private organisations, and public environments (Ganova 2015). The Double Diamond model has four main stages. The first two stages are represented in one diamond which is related to the problem part.

#### **3.3.1 First diamond: The problem**

##### **3.3.1.1 Phase one: Discovery**

In the first phase of the Double Diamond model, people act in an unofficial way to discover the problem. All procedures done in this phase are crucial to ensure valuable innovation and confirm the quality of the rest of the stages (Gustafsson 2019). This is a diverging phase where people try to extend the problem area and collect as much as possible about the problem side. Interviews, observations and data analysis are applied to discover more about the problem (Caulliraux et al. 2020). According to (Design Council 2015b) in addition to discovering users’ problems, users’ needs can also be discovered during this phase. Moreover, “a space of solution” can be defined. The discovering phase can include qualitative or quantitative data, in addition to contacting users directly

or indirectly, and analysis of economics and social trends. All of these will produce the richness of insights and knowledge which is the main objective of this stage.

In addition to the previous tools mentioned earlier, Design Council (2015b) said more methods could be used during this phase, such as User Journey Mapping, User Diaries, Service Safari, and User Shadowing. **Journey map** is a graphic representation of the user journey while using a product or service. It displays all the user activities, actions and emotions. It reflects the user's perspective of the service or product. Therefore, instead of drawing how a specific service works, a journey map is an accurate presentation of the user experience with the service, either positively or negatively. Chasanidou, Gasparini & Lee (2015) described it as a customer touchpoint while using a specific service. A touchpoint is "an instance or a potential point of communication or interaction between a customer and a service provider" (Halvorsrud et al. 2014). The user map aims to define the problem that customers might face during interacting with a service. **User Diary** is another tool that can be used. It includes three main components: first, the user background, such as name and age, and interests give insight about the user's life; second, a space for users to write about themselves, which can be structured by adding questions to be answered by users, and users can add their own photos; and third, more tasks related to specific interests can be answered by users. The output of user diaries is related to discovering needs rather than problems. **Service Safari** is an observation tool where the design team go to the service place and find out what happens. It is an unstructured process; thus, every team member can find out what they might see through either documents or photos. **User Shadowing** is similar to Service Safari, but it is an observation of users, not service. It is a search about user interaction with the service. The output of this tool is users' needs, either from documents, photos or videos. Disadvantages of the service can also be discovered (Design Council 2015b). Learning users' problems and needs can be gained by many other tools and techniques such as Fast visualisation, Hopes and fears, and secondary research. All of them have the one aim of discovering users' needs and problems, however in different ways.

### 3.3.1.2 Phase two: Defining

This is a convergent stage. The output from the previous phase is narrowed down by making sense of discovering phase data (Kochanowska & Gagliardi 2022). The define stage aims to extract a problem statement. This can be done by filtering the previous data to be more structured. The defined problem should be checked with the organisation's needs and objectives (Design Council 2015b). Therefore, tools and techniques are used to organise data and find patterns (Kochanowska & Gagliardi 2022).

This is an important phase to structure the organisation's problem based on user needs, not designer assumptions. One of the tools used during this phase is a **Focus Group**, which is a group discussion to review the output of the discovery phase in an unofficial way. According to (Design Council 2015a), it should have a leader who manages the meeting and provides some exercises to extract problems or needs of specific topics. A sample of users can also join the conversation. The focus group session can be recorded. It can last for two to three hours. Another tool used during the define phase is **Comparing Notes**, which sorts and organises large amounts of data collected from the discover phase. It is based on a sticky notes' comparison. The team takes notes about the problem, and then sorts them from low to high priority. High-priority notes are placed at the top of a whiteboard. The focus is not only the criteria of comparing notes, as quality and importance can also be considered. Users can be involved during this stage; for example, they can be asked about the most crucial feature they need in a specific service (Design Council 2015a). Design Council (2015a) mentioned a technique called **Drivers and Hurdles** based on brainstorming the motivators and restrictions of doing a service. Then, as Design Council (2015a) explained, the leader can "Collect the ideas on two separate sheets of paper. Establish what the project can and can't address, and agree which drivers it would be best to focus on in order to overcome the hurdles". However, Drivers and Hurdles were included in the define phase; the technique works better in the discovery phase, as there is a divergence which is not the objective of the define phase. On the other hand, **Assessment Criteria** can achieve the convergent concept. It is also a brainstorming technique where a list of

criteria is set, such as cost and feasibility. Then, participants score each idea according to a standard for each criteria (Design Council 2015a).

### **3.3.2 Second diamond: The solution**

#### **3.3.2.1 Phase three: Development**

After defining the actual problem in the previous phase, the development phase is the process of designing the solution. It is the phase of formulating, prototyping and testing the potential solution (Dekker 2020). It is an iterative process to acquire the best product or service solution design. Here the divergent concept is applied again but with the solutions, not the problem. At this stage, more ideas for solutions are generated. Dekker (2020) stated that the generation of solutions at this stage should have the concept of fluency and flexibility, which means “you want a large number of solutions quickly (fluency). On the other hand, you want solutions that are truly different and distinct (flexibility)”.

It is noted from the study conducted by Design Council (2007) that many companies that applied the Double Diamond model employ a multidisciplinary team. They are essential to work in the development phase to ensure the existence of people of different backgrounds who can give their opinions from different angles, thus improving the development of the product or service design. Therefore, internal teams “such as engineers, developers, programmers, and marketing teams” and external teams can work together at the development phase (Design Council 2007). Managing the development of the solution at this stage is crucial to tracking the product or service improvement. For example, Yahoo uses AGILE principles to manage the solution development phase.

The development phase is based on ideation techniques of which **brainstorming** is an example. Brainstorming includes many techniques and tools based on the concept but applied differently. **Brainstorming** is an ideation technique used to generate ideas for a specific problem. It is a flexible technique to solve a particular problem in a specific time. Design Council (2015b) suggested that the number of people in the discussion not be more than 12 to ensure the quality of the ideas generated. Brainstorming assists to see the problem from different perspectives, thus producing the best

solutions for the problem. Moreover, to ensure a successful brainstorming session, it is recommended to include people who have different skills, as this will assist in developing more ideas (Design Council 2015b). A set of How Might We questions can be asked during the brainstorming session (Dekker 2020), such as how might we compare solutions, and how might we focus on the positive part of the solution. There are different types of brainstorming such as **reverse brainstorming** when the discussion focuses on the negative effect of the solution (Müller-Roterberg 2020). **Brainstation** is another type of brainstorming technique, where every group of people discusses the solution in different places, then the members are exchanged between stations (Müller-Roterberg 2020).

Prototyping is another feature that should be applied during the development phase. It is important to convert the previous discussions into solutions in the real world. It is recommended to include end users to learn and solve unexpected problems (Kernbach & Nabergoj 2018). The prototype can be divided into “high resolution” and “low resolution”. For example, “objects and role play” are “high resolution prototype”, while “**mock-ups, customer journeys, Sankey diagram, confluence diagram**” are “low resolution prototype” (Kernbach & Nabergoj 2018). All of the previous methods aim to explore if the potential solution satisfies the users’ needs, in addition to collecting users’ feedback. Generally, as Design Council (2015b, p. 20) pointed out, prototyping is a way of testing new service ideas or designs for specific touchpoints.

### **3.3.2.2 Phase four: Delivery**

The delivery phase is the last phase of the Double Diamond model. It is when the final testing of the product or service is done, in addition to launching the final product or service to the market (Design Council 2015b). **Phasing** is when the final product or service is tested on a small number of users, then they record the problems they face to be solved, then increase the number of users every cycle of testing (iteration process) (Design Council 2015b). During the testing process, designers can learn more about the problem, which will lead to refining the problem statement in the early stages of the Double Diamond model (Kernbach & Nabergoj 2018). After launching the final product or service to the target users, Design Council (2015a) suggested conducting an evaluation to measure user

satisfaction. This can assist designers in their future projects. Dekker (2020) pointed out that three features should be considered in parallel with final testing: feasibility, viability, and desirability. Feasibility is about the organisation's technical, functional and financial capability to launch the product or service. Viability is about money sustainability and a good business case. Desirability is related to the users' need for the solution.

### **3.4 Design thinking attributes**

After reviewing studies in Chapter 2 that explained the attributes or characteristics that differentiate design thinking as an approach from other approaches, the following is a summary of the most essential attributes discussed previously. They are used to examine the application of design thinking through an open innovation process:

- **Problem solving:** The main objective of design thinking is to solve complex problems.
- **Human centred approach:** Design thinking is based on involving humans during the design process. Designers should speak and listen to the users to understand their needs and problems, which is called 'empathy'.
- **Iteration and experimentation:** Design thinking is an iterative process and requires practising experimentation to reach the right solution.
- **Multidisciplinary teams:** Design thinking requires collaboration between people from different backgrounds.
- **Multimodal communication skills:** Different communication skills are recommended when practising design thinking to ensure a high level of collaboration between stakeholders.
- **Ability to visualise:** This means using techniques or tools to facilitate the ability to visualise the ideas.
- **Tolerance of ambiguity and failure:** Experimentation and iteration can lead to mistakes and the nature of complex problems can lead to ambiguity, thus designers should be tolerant of failure and ambiguity.

- **Using design thinking tools:** Practising design thinking tools, as well as the previous attributes, can lead to the sufficient application of design thinking.

### **3.5 A framework of combining open innovation and the Double Diamond model**

In this research, the design thinking model chosen is the Double Diamond model because according to Tschimmel (2012) it is “the complete one”, compared to the other design thinking models. All three models, including IDEO’s model, the Stanford model, and the Double Diamond model, start with communication with people who are facing problems. After this, only the Double Diamond model has deep and detailed thinking steps. The Double Diamond model provides a space for creativity; however, it narrows down the stretch for solution designers to implement the best solution. In addition to that, design thinking is not a linear process; for example, designer can move between the defining and discovery phases (Linton & Klinton 2019). The Double Diamond is a well-organised model in that every member of the team has a clear role. User inputs play an essential role in the Double Diamond model. Thus, a user’s problem is well-defined. Another advantage is that the Double Diamond model allows asking a question directly to the users rather than having set assumptions. Therefore, it applies effective communication with users. These advantages, specifically communication with users, support the selection of the Double Diamond model to be combined with an open innovation process in this research. The focus on community engagement with solving community problems is also important.

Drawing from the literature review of open innovation and design thinking, the following conceptual framework is proposed where design thinking concepts enhance open innovation as Figure 3.2 shows.



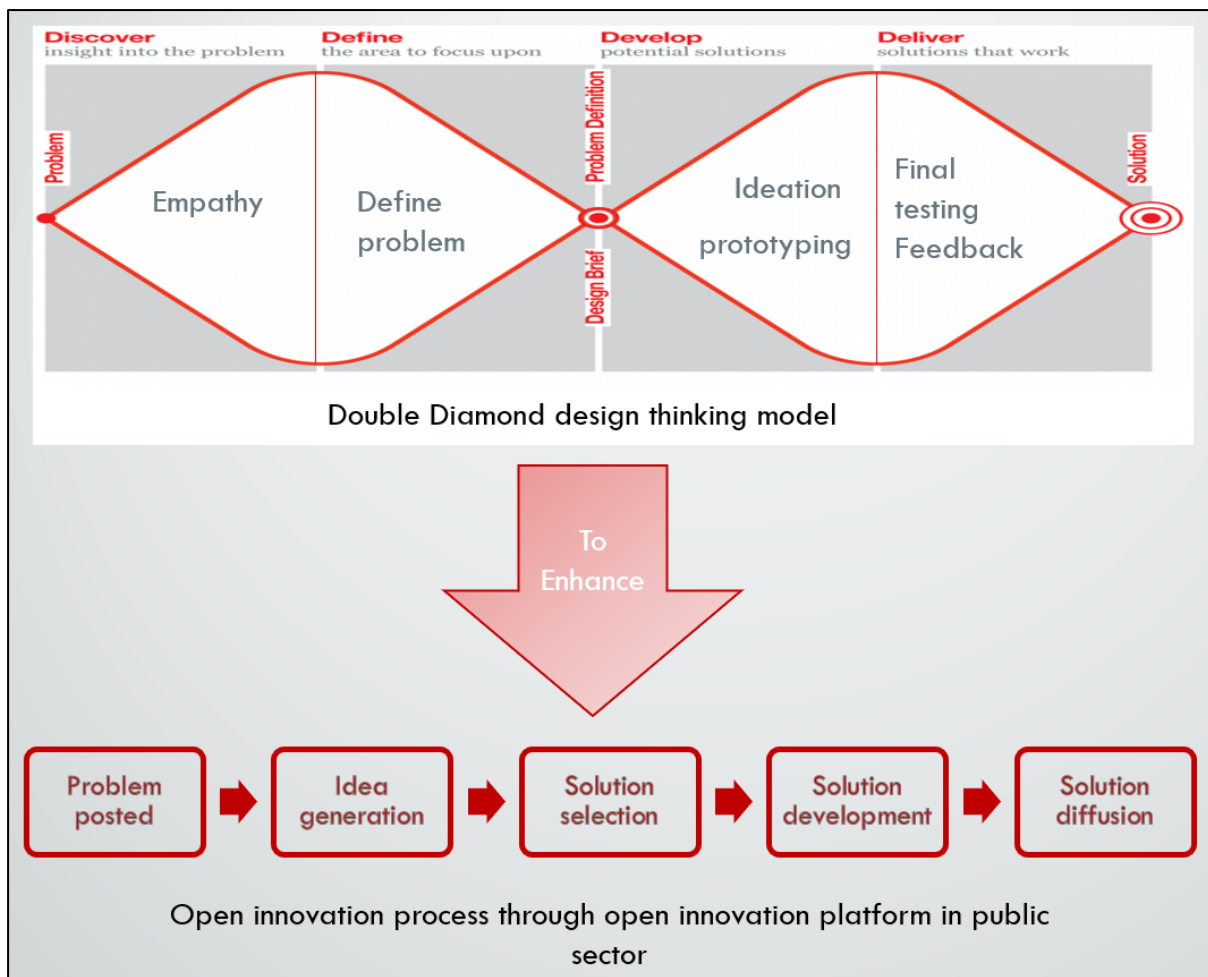


Figure 3.2: Proposed conceptual framework of using design thinking through open innovation process in the public sector

### 3.6 Development of propositions

Yin (2014) suggested that case studies should begin with theoretical propositions. Propositions are different from hypotheses which are developed to test the relationship between variables, and thus should be measurable. On the other hand, a proposition is a statement linking two concepts that cannot be measured. However, as (Baxter & Jack 2008) noted both hypotheses and propositions “make an educated guess to the possible outcomes of the experiment/research study”. Propositions mean “statements derived from theories or from generalizations based on empirical data” (Nieswiadomy 2002). Defining propositions assists in setting limits for the study. Propositions can be built based on many sources such as previous studies, theories or personal experience (Baxter & Jack 2008). From the last initial conceptual frameworks that were developed based on previous studies, the following propositions are developed:

- ▶ Current phases of the open innovation process that are reported in the literature can be extended and the problem identification phase can be added to the current open innovation process.
- ▶ The concepts of the design thinking approach are embedded in driving open innovation in the public sector.
- ▶ Tools and techniques used in different phases of design thinking are applied in the open innovation process.

### **3.7 Chapter summary**

According to the previous studies reviewed in Chapter 2, there are many challenges regarding the open innovation process in the public sector. This chapter proposed a conceptual framework combining two concepts: open innovation applied through public online open innovation platforms, and design thinking to enhance previous challenges by empowering the design thinking approach to be used during the open innovation process in the public sector. Based on that, a set of propositions were developed. The following chapter presents the research methodology.

# Chapter 4: Research Methodology

This chapter introduces the methodology chosen for the study. First, the research paradigm is explained using the research onion diagram in Figure 4.1. Then, the research philosophy, approach to develop theory, and research strategy are specified. Then, the use of a qualitative methodology is justified. More specifically, the multi-case study design is explained in detail by conducting five phases. Trustworthiness criteria for qualitative research are discussed. Finally, human research ethics approval is presented.

## 4.1 Research paradigm

The research paradigm is based on a set of concepts and philosophical basics. Many considerations should be determined to choose the most appropriate methodology that answers the research questions and in accordance with the research objectives. The research onion diagram developed by Saunders, Lewis & Thornhill (2015) is used to understand the nature of the research, and therefore to choose the correct methodology. Figure 4.1 shows the diagram comprising six layers: philosophy, approaches, methodology, strategy, time horizon, and techniques and procedures.

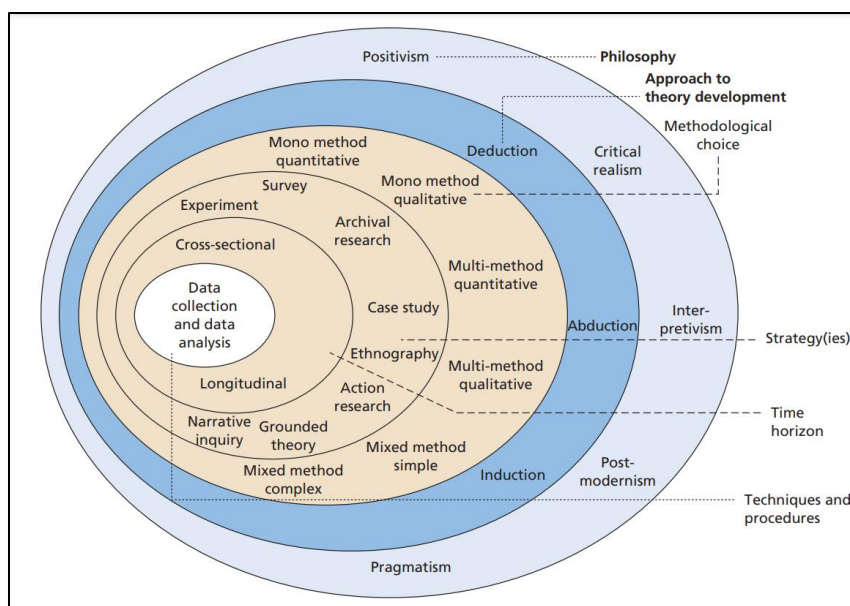


Figure 4.1: The research onion diagram (Saunders, Lewis & Thornhill 2015)

### 4.1.1 Research philosophy

According to Saunders, Lewis & Thornhill (2015), research philosophy is “a system of beliefs and assumptions about the development of knowledge”. It is the first step the researcher should consider when conducting a research study. Moreover, research philosophy is the foundation stone of the research process and it influences decisions about research methods (Bryman & Bell 2015; Hesse-Biber & Leavy 2011). To determine the research philosophy two major areas should be examined: ontology and epistemology (Saunders, Lewis & Thornhill 2015). Ontology is “what out there to know” (Brown & Dueñas 2020). Chilisa & Kawulich (2012) described ontology as “what do we believe about the nature of reality?”, while epistemology is “what and how can we know about it” (Grix 2002). Moreover, as Crossan (2003) pointed, epistemology is “what can be known?”. According to Figure 4.1, the research philosophy choice can be positivism, critical realism, interpretivism, post-modernism, or pragmatism, depending on what fits the research.

The ontology of the pragmatism philosophy is that “reality is the practical consequences of ideas” (Saunders, Lewis & Thornhill 2015), which is not appropriate for this research, while the ontology of critical realism is that the reality is external and independent. In the post-modernism philosophy “some meanings, interpretations, realities are dominated and silenced by others” (Saunders, Lewis & Thornhill 2015). The ontology of positivism philosophy indicates that the truth is singular (Chilisa & Kawulich 2012). In addition, “objective reality can be observed through science” (Brown & Dueñas 2020). The epistemology side of positivism philosophy is that the facts are observable and measurable (Muhaise et al. 2020). Positivism focuses on scientific methods to produce data that is not influenced by people (Ketokivi & Mantere 2010). The ontology of interpretivism is that there is no single reality and it is different depending on human understanding (Morgan 2007; Scotland 2012). Moreover, the epistemology of interpretivism is that the truth is subjective and can be accessed by exploring human perspectives (Patterson & Williams 1998). Both positivism and interpretivism seem to be the most appropriate choices for this research.

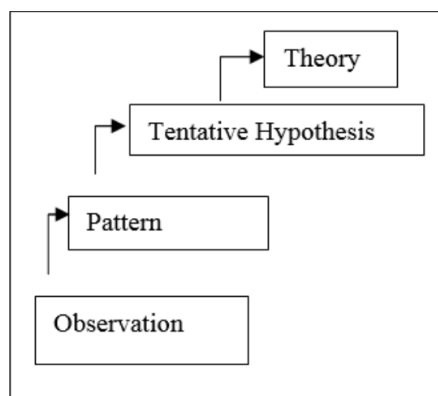
As this research is exploring the activities and actions of different people who are from different cultures, interpretivism is the most appropriate philosophy for this research. As mentioned in

Chapter 1, the research aims and objectives focus on exploring the open innovation activities by people using public online open innovation platforms. Therefore, this is an indication to use interpretivism philosophy. Moreover, as five different cases are studied in this research, the knowledge is different from person to person, which corresponds to what Terre Blanche & Kelly (1999) indicated about interpretivism as “techniques that endeavour to portray and decipher individuals’ emotions and encounters in human terms as opposed to evaluation and estimation, or through measuring and quantifying”. Saunders, Lewis & Thornhill (2015) added about interpretivism philosophy that “different people of different cultural backgrounds, under different circumstances and at different times make different meanings, and so create and experience different social realities”. According to Denzin & Lincoln (2008) and Saunders, Lewis & Thornhill (2015) interpretivism philosophy mostly corresponds to qualitative research. Therefore, as discussed, the ontology and epistemology of the interpretivism philosophy correspond to the aims and objectives of this research.

#### **4.1.2 Approach to theory development**

The second layer of the Saunders, Lewis & Thornhill (2015) research onion is to select the theory development approach which, according to Figure 4.1, can be deduction, abduction, or induction. Deductive reasoning is testing a hypothesis based on existing theory (Wilson 2014). Therefore, the researcher should develop hypotheses, then select a methodology to test them. The hypothesis can be accepted or rejected. Zalaghi & Khazaei (2016) described deductive reasoning as “a general to specific (top-down) reasoning process”. On the other hand, inductive reasoning is when the researcher needs to explore a phenomenon, and build a conclusion (Saunders, Lewis & Thornhill 2015). Thus, theory development occurs after analysing data. Abduction reasoning is described by Saunders, Lewis & Thornhill (2015) as “where you are collecting data to explore a phenomenon, identify themes and explain patterns, to generate a new or modify an existing theory which you subsequently test through additional data collection”. The difference between induction and abduction reasoning is that abduction generates a testable conclusion, while induction generates an untested conclusion. (Saunders, Lewis & Thornhill 2015). According to the previous definitions, this

research follows induction reasoning because, as discussed in Chapter 3, design thinking is an approach that leads to general innovation. However, a limited number of studies have mentioned that there is a link between open innovation and design thinking, thus the research gap is the linking of applying design thinking through use of public online open innovation platforms. In addition, there are a few issues observed in recent studies on practising open innovation in the public sector, such as a lack of addressing the details of the approaches followed when practising open innovation. For instance, Temiz (2021) indicated there is ambiguity in the implementation phase of the solution, and there is a lack of coordination among members of the community. In general, the two concepts are under investigation and need more exploration. This observation leads the research to use induction reasoning rather than deduction reasoning. The research begins with perception which is the relationship between design thinking and open innovation. Therefore, this research is not testing a hypothesis to be accepted or rejected, rather it is exploring a phenomenon, therefore induction reasoning is applied as described in Figure 4.2.



**Figure 4.2: Induction reasoning created by Aliyu et al. (2015) based on Trochim & Donnelly (2006)**

### **4.1.3 Methodological choice**

The third layer of the research onion diagram is choosing the methodology. Two methodologies that researchers can follow are quantitative and qualitative, or a mix of the two. Quantitative data is numeric, while qualitative data is non-numeric such as text, images or audio (Saunders, Lewis & Thornhill 2015). As referred to by Slevitch (2011), a “quantitative approach stems from positivism”.

Rashid et al. (2019) added that “interpretive research is commonly linked to qualitative research methods”. Thus, selection of the methodology is based on choosing the research philosophy in advance. As explained earlier in this chapter and according to the research assumptions, this research follows the interpretivism philosophy. Therefore, this philosophy is usually associated with qualitative methodology to address the research questions (Denzin & Lincoln 2008). Qualitative methodology can also be used with other philosophies such as pragmatic. However, interpretivism is the most appropriate one as in this research there is a need for a deep interpretation to understand meaning around the phenomena. To acquire a richness of data, a multi method qualitative approach is used, which means using more than one data collection method. Semi-structured interviews, and web-platform and document content are used to collect accurate data.

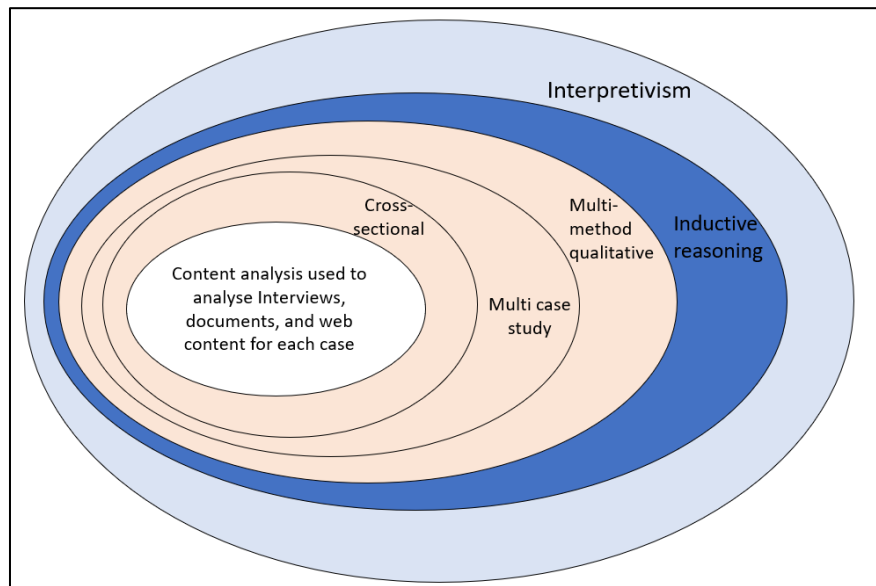
#### **4.1.4 Research strategy**

The fourth layer of the research onion diagram is to choose the research strategy. There are many strategies as shown in Figure 4.1, and each of them has its own procedure. Some of them can be used in both quantitative and qualitative methodology such as case study research. According to Saunders, Lewis & Thornhill (2019), choosing a research strategy should be based on many considerations such as the research questions, objectives, research philosophy, and the possibility of accessing data. Case study is selected for the strategy as the main research aim is to explore the design thinking practised during the open innovation process applying through open innovation platforms in the public sector. Therefore, applying case study strategy allows exploring and discovering what and how is happening. Taking a case, or multi cases, operating a public online open innovation platform and exploring them can definitely answer the research question and meet the research objectives, rather than using other strategies.

The time horizon is when the researcher asks the question “Do I want my research to be a ‘snapshot’ taken at a particular time or do I want it to be more akin to a diary or a series of snapshots and be a representation of events over a given period?” (Saunders, Lewis & Thornhill 2019). When the researcher decides to conduct the research on a particular time, it is called cross-sectional. On the

other hand, longitudinal study is when the study is conducted over a long time period. As this research is studying the phenomenon at a particular time, it is a cross-sectional study.

The last layer is about the techniques used to collect and analyse data. In this research, content analysis is used to analyse interviews, documents and web content for each case. Figure 4.3 depicts the six layers chosen for this research.



**Figure 4.3: The selected research philosophy based on the research onion diagram by Saunders, Lewis & Thornhill (2015)**

## **4.2 Qualitative methodology: multi-case study**

To draw conclusions from the analysed data, a link between the research aim, objectives, questions and collected data should be logically determined which refers to the research design (Bloomberg & Volpe 2018; Rowley 2002). The research design is the framework that explains how the research question will be answered (Cooper, Schindler & Sun 2006). Moreover, drawing a research design will assist the researcher in acquiring sufficient data required for the research question (Vogt 2007). Figure 4.4 shows the research design.

As discussed in the previous section, the qualitative method was chosen after selecting the appropriate research philosophy of interpretivism based on the research assumptions. Using



“qualitative research involves the use of qualitative data, such as interviews, documents and participant observation to understand and explain social phenomena” (Myers 1997). Moreover, as Hunter (2004) indicated “qualitative researchers attempt to make sense of, or interpret, phenomena in terms of their meanings attributed by individuals”. In terms of applying a qualitative methodology in the information systems field, Hirschheim (1985) noted that information systems should be considered social before being considered technical systems. Thus, qualitative research should be considered in information systems field. Since the 1990s, conferences and workshops have encouraged researchers to apply qualitative research in the information systems field (Hunter 2004). However, qualitative research in information systems started earlier (Klein & Myers 1999). Many studies have applied qualitative methodology in the information systems field. For example, Curtis, Krasner & Iscoe (1988) interviewed people to discover problems associated with large software systems. Another example is the case study by Corbett (2013) to explore “using carbon management systems to promote ecologically responsible behaviours”, in which interviews and archival data were the main data sources. In addition, Schlagwein & Bjorn-Andersen (2014) answered the research question “How can organizations use crowdsourcing for their learning?” by conducting a qualitative methodology and analysing interviews, blogs and reports. Many books and articles, such as Lee & Liebenau (1997) and Trauth (2001), have explained how to conduct qualitative research in information systems fields. Some journals have also produced a special issue on action qualitative research in information systems such as Baskerville & Myers (2004) and Kock & Lau (2001).

A multi-case study method is selected to address the research questions. As discussed previously, case study is a qualitative method. Qualitative research produces a deep understanding of the research phenomena by collecting non-numeric data (Mason 2017). In this research a deep understanding is required to understand how public online open innovation is implemented in the public sector and if design thinking attributes are informed and applied in the stages of open innovation. As indicated by Myers (2019), case study mainly answers “how” and “why” questions, which apply to this research. Using case study answers the main two research question: How is open innovation conducted in the public sector? and How can concepts of the design thinking approach be

embedded to enhance the open innovation process? Case study is an effective method to describe people's behaviours, procedures for doing things, or even a series of actions that happened through a certain behaviour (Denzin & Lincoln 2008). Moreover, as noted by Chetty (1996), case study is an appropriate method when the existing conceptual framework in the literature is not enough to explore the phenomena. Similarly, Yin (2014) pointed that the reason for conducting a case study is when there is a need to explore the ambiguous relationship between an environment and phenomena. All the previous points make case study the most appropriate method to answer the research question and achieve the research objectives. Case study can help explore the procedures used to apply online open innovation platforms in the public sector, and therefore its relationship with design thinking.

More specifically, this research is applying a multiple case study method. Every case represents one open innovation platform in a specific environment. Applying a multiple case study provides more perspectives about the research concern (Denzin & Lincoln 2008). Moreover, as referred by Yin (2014), multiple case study research is stronger than single case study. To acquire deep knowledge and explore more than one national context using the same platform, the research applied a multi-case study design. Referring to the research questions, applying a multiple case study design will add richness of knowledge (Battistella et al. 2017)

### **4.3 Research design**

Before proceeding with the case study stages, it is essential to know that there are many types of case study research. A number of researchers have classified the case study research types. One of the most cited researchers in case study research is Yin (2014). Yin has many publications in that field. According to Yin (2014), case study research can be descriptive, exploratory, and explanatory. A descriptive case study is a description of phenomena; thus, it provides narrative context (Yin 2014). Explanatory case study is an explanation of the phenomena that happened in that case to answer why it is happening (Kahkonen 2011). According to Ogawa & Malen (1991), exploratory case study research aims to "extend our understanding of complex social phenomena". Furthermore, exploratory case study is selected to describe a process (Varajão & Trigo 2016). Therefore,

according to the research questions and objectives, exploratory case study is the most appropriate type of case study research.

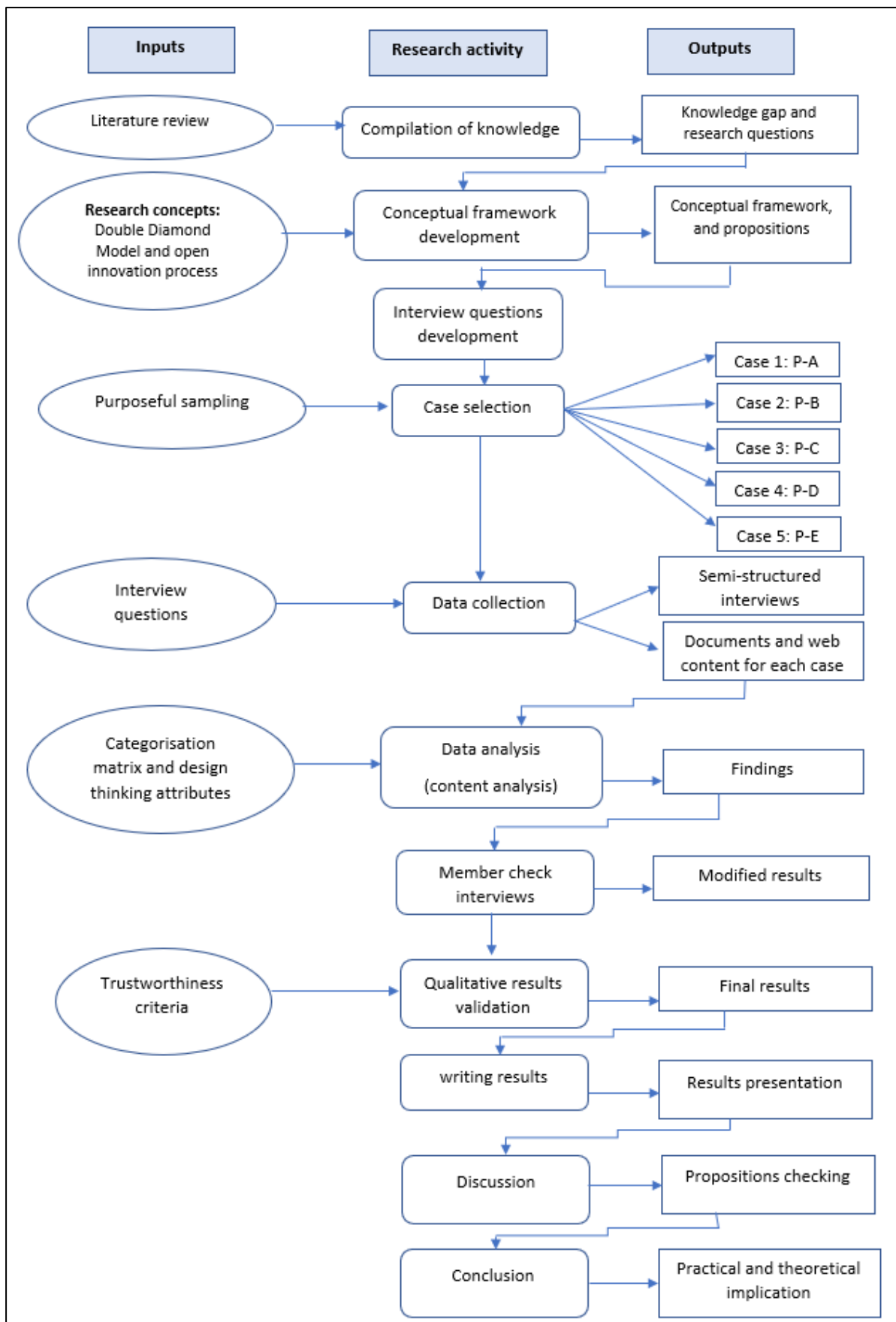


Figure 4.4: Research design

Figure 4.5 describes the process of conducting a case study design. First, a literature review of the existing relevant studies should be considered. Stuart et al. (2002) indicated that a literature review is the starting point for all research. This was presented in Chapter 2, which identified a research gap, and, following that, the research questions were developed. Chapter 3 then presented a conceptual framework based on the literature review. A qualitative research methodology was selected. The data collection method, data analysis, and conclusion are described later. Figure 4.4 describes the study research design.

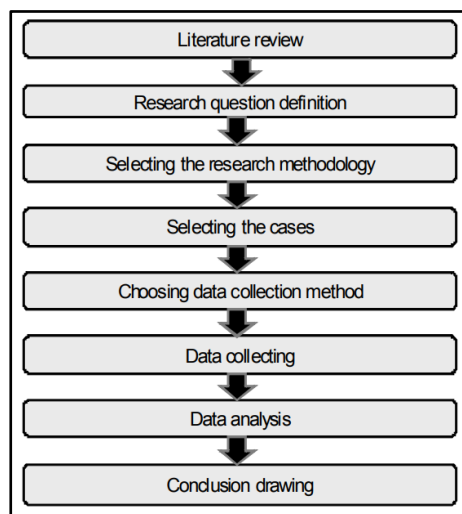


Figure 4.5: Case study process (Kahkonen 2011)

### 4.3.1 Stage one: case selection

Eisenhardt (1989) pointed out that selecting the case should not be a random process. Instead, purposeful sampling in qualitative research can be applied and used to acquire specific knowledge about the phenomena based on the research purpose (Patton 2002). Therefore, the selected case should be relevant to the research question, and provide richness of information related to the research issue (Carson et al. 2001; Patton 2002). Two features should be considered when selecting cases: adequacy and appropriateness. Adequacy refers to the number of instances and appropriateness refers to ensuring the issues are related to the research purpose (Crabtree 1999; Miles & Huberman 1994; Patton 1990). To select appropriate cases, first, a general search was conducted over the web on web-based platforms which run open innovation with the condition of being a public platform and the forum being run by the public sector or government and not a

completely private organisation. Emails and telephone contacts were sent to the platforms with an information sheet about the study until five cases agreed to participate in the study. The preferred number of cases is three to five instances (Creswell 2002). Schoch (2020) suggested three to four distinct cases.

To obtain in-depth knowledge about the research questions, the research explored five platforms from three different countries. They all run open innovation platforms to allow their communities to solve problems by sharing innovative solutions. The five cases are limited to web-based open innovation platforms established for the community and are run entirely or partially by governments, not completely private organisations. Two platforms are located in Saudi Arabia, two are in Australia, and one is in the United Arab Emirates.

### **4.3.2 Stage two: data collection**

#### **4.3.2.1 Semi-structured interviews**

Two data sources are selected to collect data: interviews, and content from documents and websites. It is preferred to use more than one source of data to triangulate data (Yin 2009). As noted by Myers & Newman (2007), interview is the primary data source in qualitative research. On the other hand, other sources such as reports, records and newspapers are secondary sources (Pervan & Maimbo 2005). In this research semi-structured interviews are used. First, a list of open-ended questions is defined based on the conceptual framework and propositions defined in Chapter 3. Some questions are based on the interviewee answers during the interview. As McIntosh & Morse (2015) defined, a semi-structured interview “is designed to ascertain subjective responses from persons regarding a particular situation or phenomenon they have experienced. It employs a relatively detailed interview guide or schedule, and may be used when there is sufficient objective knowledge about an experience or phenomenon, but the subjective knowledge is lacking”. As presented in Appendix A, the questions cover four areas:

- **Closed and open innovation:** an introduction and background about the platform

- **Discovering and identifying community needs and problems:** process, people, and tools used throughout this phase
- **Evaluation team:** questions about formation of teams, and all stakeholders involved
- **Process of ideas analysis and selection:** questions about implementing the solution phase, in addition to tools and techniques used.

Each section includes a set of open-ended questions. Due to COVID-19 restrictions, and the existence of participants in different countries, the interviews were conducted online either by Zoom or Microsoft Teams. The expected time was one hour. However, some interviews took more than one hour. The interviews were recorded. As some of the participants spoke Arabic, the interview questions and transcripts were translated into Arabic and then to English by an official translation centre. The recorded English interview was transcribed. After obtaining Human Resource Ethics Approval from the University of Technology Sydney (Appendix C), the data collection was conducted from late 2020 until 2021. The information sheet with information about the research topic was sent to the participants prior to the interview, in addition to a consent form (see Appendix D,E,F, and G).

#### **4.3.2.2 Web-based platform content and documents**

To gain more knowledge about the topic and to confirm the interview results (Yin 2009), both documents and web-based platform content were analysed from late 2020 to 2021. Some interviewees sent documents containing information about the topic, in addition to the content of the web-based platform which included useful information to complement the interview findings. It is preferred to use more than one source of data to triangulate data. The aim of analysing such data is to explore the use of design thinking through applying the open innovation process. Therefore, the researcher is looking for the indicators for each platform of using design thinking during practising open innovation according to the design thinking attributes defined in Chapter 3 of problem solving, a human centred approach, iteration and experimentation, multidisciplinary collaboration, multimodal communication skills, ability to visualise, tolerance of ambiguity and failure, and using design thinking tools.

Data saturation refers to collecting more data about the phenomena until reaching the point where no new data is added (Marshall et al. 2013). In this research, we interviewed the platform team responsible for each platform, in addition to analysing documents and web content for each case. Therefore, for each case conducting interviews along with documents and web content led to the same data, thus data saturation was reached for each case. Overall, by collecting data from the fifth case, it was found that data saturation had been achieved.

### **4.3.3 Stage three: data analysis**

After collecting all the acquired data, the data analysis stage starts. Each interview transcript ranged from 10 to 16 pages. NVivo 12 software was used to analyse transcripts. According to Yin (2014), there are four general strategies to analyse case study research: “relying on theoretical propositions, working your data from the ‘ground up’, developing a case description, and examining plausible rival explanations”. In this research the first strategy is used, as the propositions were defined in Chapter 3 and thus it relies on theoretical propositions. A content analysis technique is used to analyse the research data. As explained by Coners & Matthies (2014) about content analysis in the information systems field, “content analysis is used to investigate information systems themes in an extensive range of ways, and the studies investigated here generally state that content analysis could provide valuable contributions to explore complex social phenomena based on natural language”. The reason for using content analysis as an analysis method is to make “replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use” (Krippendorff 2019). Many studies suggested similar procedures for conducting the content analysis method. However, Elo & Kyngäs (2008) provided a precise mechanism for applying content analysis. After completing the content analysis for interviews, documents and web content, pattern matching is used. As Yin (2009) stated, “for case study analysis, one of the most desirable techniques is to use a pattern matching logic”. Pattern matching occurs between findings of the analysed data and propositions developed from the literature before collecting data (Almutairi, Gardner & McCarthy 2014; Attard Cortis & Muir 2021; Yin 2014).



#### **4.3.3.1 Content analysis**

Elo & Kyngäs (2008), in a study cited around 22,000 times, divided the content analysis process to be used in a deductive or inductive way as shown in Figure 4.6. Both ways have three stages: preparation, organising, and reporting phases. The deductive way is when the researcher needs to examine existing categories by developing a categorisation matrix (Elo & Kyngäs 2008; Marshall & Rossman 2014). According to that and because the research aims to explore the combination between design thinking and open innovation, the interviewees were asked about the process of open innovation, from which to derive their use of design thinking. Therefore, a categorisation matrix was developed based on the developed conceptual framework. The interviews were followed by the deductive content analysis. On the other hand, in inductive content analysis the categorisation is freely generated while analysing data (Elo & Kyngäs 2008). Inductive content analysis was used to analyse web content and documents because the research is looking for indicators of using design thinking based on design thinking attributes.

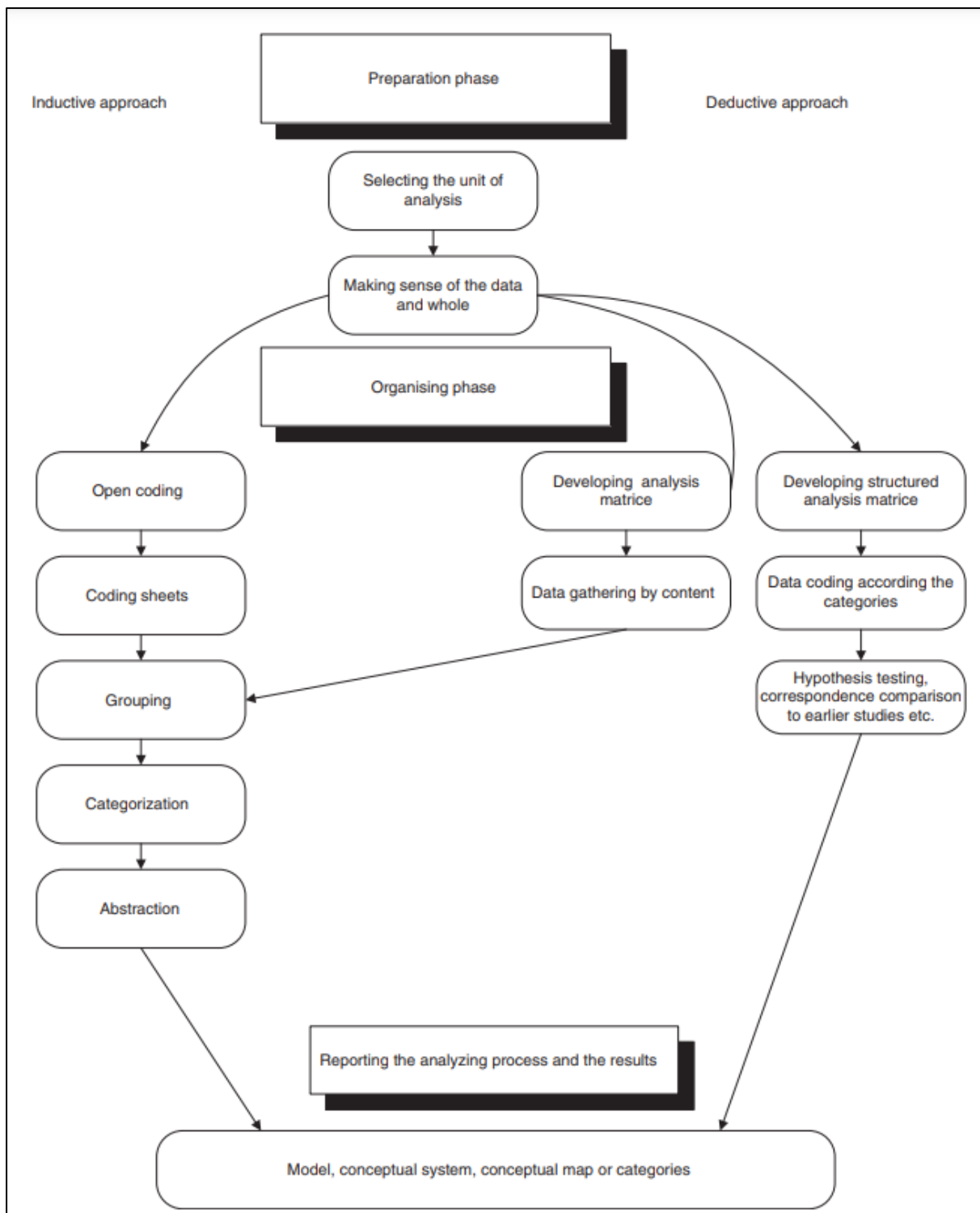


Figure 4.6: Content analysis phases based on (Elo & Kyngäs 2008)

#### 4.3.3.1.1 Preparation phase

The preparation phase includes two processes. The first process is to specify the unit of analysis which could be a word, one or more sentences or even a page (Elo & Kyngäs 2008; Polit & Beck

2004). Based on the research questions and what was needed from the data, in this study, the unit of analysis, which is one or more sentences, was examined to explain processes and approaches to show the relationship between design thinking and open innovation in communities. The second process is making sense of the data, which meant reading the data, becoming familiar with it (Burnard 1991) and generally making sense of it. Thus, the transcripts were read many times to enable the researcher to understand the transcripts thoroughly.

#### **4.3.3.1.2 Organising phase**

This phase has three processes. The first process is developing a categorisation matrix which can be structured or unconstrained (Kyngäs, Mikkonen & Kääriäinen 2019). In this study, the structured matrix was chosen, which means the matrix was developed based on the conceptual framework presented in Chapter 3. The chosen decision is based on research (Elo & Kyngäs 2008). In this research, the primary research aim is to determine the relationship between open innovation and design thinking; thus, the categories are predefined through the conceptual framework.

Tables 4.1 and 4.2 describe the categorisation matrix based on the conceptual frameworks. The columns represent the open innovation process: problem posted on the platform, idea generation, solution selection, implementation and diffusion. The rows represent the Double Diamond model. Table 4.1 presents the solution to discovering and defining problems, while Table 4.2 relates to developing and delivering a solution. Column 3 presents sub-categories derived from Double Diamond phases. The last column indicates how each stage links to each research question.

**Table 4.1: Categorisation matrix 1**

		Open innovation process						
Category (Based on Double Diamond Model)	Sub-categories	Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	Solution diffusion	Research question
Problem	Discover	Process of discovering community problems and needs						Sub- question 1
		Responsible of discovering community needs						
		Process of conducting team meeting						
		Meeting duration						
		Tools and techniques used during this phase						
	Define	Process of defining a specific community problem						Sub- question 2
		Responsible of defining specific community problem						
		Process of conducting team meeting						
		Meeting duration						
		Tools and techniques used during this phase						

The second process of the organising phase for deductive content analysis is the coding process which was carried out using NVivo 12 software. The analysis matrix and interview transcripts were entered into the software for analysis of the five cases. Then, the coding process started. The background and stakeholders for every case (platform) were analysed. The final organising phase compares the analysis results with earlier developed propositions.

**Table 4.2: Categorisation matrix 2**

		Open innovation process					
	Category (Based on Double Diamond Model)	Sub-categories	Idea generation	Solution selection	Solution development	Solution diffusion	Research question
Solution	Develop	Process of develop solutions for the selected problem					Sub-question 3 and 4
		Responsible of develop a solution for specific community problem					
		Process of forming evaluation team meeting					
		Disagreement among team members					
		Number of ideas discussed					
		Number of final selected ideas					
		Tools used during this phase					
	Deliver	Process of delivering the selected solution					Sub-question 5
		Tools used during this phase					

The documents and web contents were also analysed based on inductive content analysis. Inductive content analysis means the coding is conducted while reading data. Three steps of coding are open coding, grouping and categorisation (Elo & Kyngäs 2008), which lead to sub-categories, generic categories, and main categories. When analysing the documents and web content, the main category indicates design thinking as the main aim of analysing documents and web content is to find the use of design thinking attributes.

#### **4.3.4 Stage four: member check interviews**

After analysing the collected data, it is essential to avoid researchers' bias that may occur during the analysis stage (Miles & Huberman 1994). This can be effectively reduced by enabling the participant to confirm the results from analysed data (Birt et al. 2016). Member checking, also known as respondent validation or participant validation, can be used to confirm the research results (Birt et al. 2016). Member checking has been applied differently. For example, interview transcripts can be returned to the participant for checking and confirmation (Carlson 2010). Another approach is to send the primary interview transcript to participants before re-interviewing them (Doyle 2007). A member check focus group is another way to validate the analysed results by sharing the results with

a group of participants to discuss them, and they may amend them (Thomas 2017). Finally, findings can be sent to participants prior to re-interviewing them (Birt et al. 2016). This approach was used in this research. The findings were sent to participants by email and they were asked for a follow-up interview. However, as the analysis phase took time to complete, only three of the five cases agreed to do the member checking interviews.

#### **4.3.5 Stage five: reporting the analysing process and results**

The final phase of content analysis is to report the results. The linear analytic structure is followed which presents the problem, literature review, methods, findings, conclusion, and implications (Yin 2014). Yin (2014) recommended in multiple cases to present each result of each case separately and then compare all the cases' results in cross-case analysis. Chapters 5 and 6 present each case separately then a discussion of the cases' results is presented in Chapter 7. The analysis report of each case (platform) includes background, stakeholders, how needs and problems are discovered, how one specific problem is defined, how solutions are developed, and how solutions are delivered. Documents and web content are analysed in Chapter 6. Then, the use of design thinking attributes is derived from both interviews and documents and web content results. Finally, the developed propositions are checked.

#### **4.4 Trustworthiness in qualitative research**

There are many criteria used to judge the quality of research. The internal and external validity are usually used in quantitative research. On the other hand, in 1985 a set of criteria were introduced to ensure the quality of qualitative research (Connelly 2016). Trustworthiness means “the degree of confidence in data, interpretation, and methods used to ensure the quality of a study” (Connelly 2016). It involves credibility, dependability, confirmability and transferability. Credibility is “how congruent are the findings with reality?” (Merriam 1998), which means the researcher should ensure that the results answer the research questions correctly (Shenton 2004). According to Yonge & Stewin (1988), asking participants about the truthfulness of the findings is one of the best approaches to achieve credibility. In this research member check interviews were applied with most of the participants. After finishing the analysis stage, all the participants were asked by email to do

member check interviews. The draft analysis text was sent to them. After they responded, small changes were made which are explained in Chapter 5. However, not all cases agreed to do a member check. Chapter 5 explains more about each case. Another strategy to achieve credibility is to use triangulation, which means there is more than one source of data in the research (Decrop 1999). As discussed previously, in this study data is collected from three different sources: interviews, documents, and web content.

The second criteria of trustworthiness is *dependability* which means how dependable and stable the study is if it is applied again in a similar context (Polit & Beck 2004). According to Streubert & Carpenter (2011) dependability is measured by the process of conducting the study to allow readers to review it easily. As presented earlier in this chapter, the study was designed carefully on a scientific base with sufficient justification.

*Confirmability* is related to the findings and the collected data (Kyngäs, Mikkonen & Kääriäinen 2019). It measures the connection between them and if the results are supported by data. This means a permitted reader can access the data and confirm the relationship to the findings (Kyngäs, Mikkonen & Kääriäinen 2019). To ensure confirmability, an “audit trail” can be applied, which refers to keeping all the data saved and making it available upon request (Shenton 2004). Data includes written and audio data, notes and codes. In this research all the data is managed by the Stash system which was used to create the research data management plan in the University of Technology Sydney, including disclosure about data sources, data format and data storage.

Another criteria to ensure trustworthiness is transferability which is “the degree to which research findings will be applicable to other fields and contexts” (Kyngäs, Mikkonen & Kääriäinen 2019). According to Kyngäs, Mikkonen & Kääriäinen (2019) transferability is not a synonym for generalisation. While generalisation is the ability to extend the results to the whole population, transferability is “how readers will extend the results to their own situations”. To achieve transferability a “thick description” strategy should be applied which means a full description of the participants’ characteristics, research context, and sampling techniques (Kyngäs, Mikkonen & Kääriäinen 2019; Lincoln & Guba 1985; Tracy 2010). Although, some information about

participants is hidden for ethics purposes, such as positions and job description, the reader can still use the research results as the hidden information is not affected. Therefore, the interested reader can examine whether the result can be applicable to their own situation. Table 4.3 explains how the criteria are applied in this research.

**Table 4.3: Trustworthiness of study**

Trustworthiness criteria	Strategies applied to achieve them in the study
Credibility	<ul style="list-style-type: none"> <li>• A member check interviews are applied to check the main findings.</li> <li>• Data triangulation is applied. (more than one sources of data).</li> </ul>
Dependability	By presenting a full explanation and justification of the study procedures.
Confirmability	"Audit trail" is applied to provides a full description of how the findings are build based on the collected data. All the collected data are safe and retrievable.
Transferability	" Thick description" strategy which include a full description of the participants characterises, research context, and sampling techniques.

## 4.5 Ethics consideration

As this research involves human participation, approval from the Human Research Ethics Committee of the University of Technology Sydney was sought and received (ETH19-4450) to ensure ethical participants' protection. According to this approval, the name of the cases (platforms) and participants are anonymous. The research information sheet and consent form that were provided to participants were approved by the committee.

## 4.6 Chapter summary

This chapter presented the methodology applied in this research. According to the epistemology and ontology assumptions the research follows the interpretivism philosophy. Inductive reasoning was used to explore the phenomena and develop an explanation of the research questions. Based on the



previous choices, it was obvious that the qualitative methodology would be the appropriate choice for this research. More specifically, a case study design was chosen in this research. Five cases were selected to be investigated from three countries. Every case represents one open innovation platform. Semi-structured interviews, documents and web content are the data sources. The data was analysed based on content analysis. Member check interviews were conducted to validate the findings. Credibility, dependability, confirmability and transferability are checked to achieve the trustworthiness of qualitative research. Human research ethics approval was given by the University of Technology Sydney. The following chapter presents the results of the five case studies.

## Chapter 5: Case Study Results

This chapter describes the analysis of the five cases. As described in Chapter 4, each case represents an online public open innovation platform. The background of each platform is presented. Then, each platform is analysed according to the categorisation matrix developed in Chapter 4. Table 5.1 summarises information about each platform.

As discussed in Chapter 4, content analysis was chosen to analyse the qualitative data. Semi-structured interviews were used to interview participants. The platform names and the names and exact positions of participants are hidden for research ethics purposes. Platform names are referred to as platform A to E. Participants are referred to as responsible for platform A, responsible for platform B, responsible for platform C, responsible for platform D, and responsible for platform E. Where two or more participants were responsible for the same platform, they are referred to as responsible (person) 1 for platform A (A-1) and responsible (person) 2 for platform A (A-2) and so on. Each participant was given an information sheet about the research before conducting the interview. Table 5.2 shows the codes for the five platforms and interviewees. The interview questions were not about a specific project, but were based on any problem that the platform team can post on the platform.

**Table 5.1: Codes of platforms and interviewees**

Platform	Code	Interviewees	Code	Interviews
Platform A	P-A	Responsible 1 for managing the open innovation process through platform A	A-1	Semi-structured interview
		Responsible 2 for managing the open innovation process through platform A	A-2	
		Responsible 3 for managing the open innovation process through platform A	A-3	Member check interview
		Responsible 4 for managing the open innovation process through platform A	A-4	
Platform B	P-B	Responsible 1 for managing the open innovation process through platform B	B-1	Semi-structured interview and member check interview
		Responsible 2 for managing the open innovation process through platform B	B-2	Member check interview
Platform C	P-C	Responsible 1 for managing the open innovation process through platform C	C-1	Semi-structured interview
		Responsible 2 for managing the open innovation process through platform C	C-2	
		Responsible 3 for managing the open innovation process through platform C	C-3	Member check by emails
Platform D	P-D	Responsible for managing the open innovation process through platform D	D-1	Semi-structured interview
Platform E	P-E	Responsible for managing the open innovation process through platform E	E-1	Semi-structured interview

Before starting analysis, the recorded interviews were transcribed. The transcripts were translated from Arabic to English to meet research ethics requirements. The transcript for each interview was up to 16 pages. NVivo 12, data management software, was used in data analysis. The transcripts were inserted into the software, and the nodes feature was used to insert the codes into the software. Finally, the coding process was conducted according to the categorisation matrix developed earlier.

**Table 5.2: Information about the five platforms**

Open innovation platform	Year of launch	Country	Challenges determined by	Platform aim	Managed by	Innovative output
P-A	2018	Saudi Arabia	Challenge themes determined by external entity (public and private organisations)	Encourage innovators to transfer their innovative solutions to private business	A semi government authority	Product or service
P-B	2018	Australia	The internal platform team determines challenge themes	Seek innovative solutions to solve the city challenges	Local government	Product or service
P-C	2016	Australia	The internal platform team determines challenges	Solve problems related to transport systems by asking for a technical innovative solution	Local government	Service specifically applications
P-D	2015	United Arab Emirates	Challenges are determined by internal platform team	Support government innovation	Local government	Product or service
P-E	2016	Saudi Arabia	No challenges are specified. Community post innovative ideas for any problem they face.	Encourage community to participate in decision making	Local government	Service

The following sections are based on the interview analysis. P-A is managed by two responsible people who were interviewed: responsible person 1 for platform A (A-1) and responsible person 2 for platform A (A-2). Table 5.1 describes the codes for each platform and each interviewee.

## **5.1 Case 1: Online open innovation platform A (P-A)**

### **5.1.1 Background of platform A**

Platform A is in Saudi Arabia. The country has realised the importance of being an innovative country. Saudi Arabia depends heavily on oil for its economy. According to web-based platform the Saudi Vision 2030 emerged which changed the country's economic strategy to include innovation. Iqbal (2011) found that Saudi Arabia has good factors for innovation, such as human skills and government support; however, creative outcomes remain low. The problem might be a lack of an innovative procedural process. Iqbal (2011) suggested that policies with human capital can increase

creative outcomes. One of the Saudi Vision's main objectives is the enhancement of innovation. Open innovation is in line with the Vision's objectives, specifically the interaction of the government with citizens, as the Saudi open innovation platform encourages Saudi citizens to be among the local government projects' creators. Another objective is increasing the employment rate by supporting small to medium projects. This can be achieved by motivating citizens to innovate. In addition, this creates channels with citizens, which is accomplished through an open innovation platform. As sections 5.3 and 5.3.2 of the Saudi Vision 2030 document indicate, activating government interaction with citizens will facilitate communication channels with citizens (Kingdom of Saudi Arabia Vision 2030).

P-A is an online national platform in Saudi Arabia that has been established by a semi government authority, the SME General Authority in Saudi Arabia, which focuses on small to medium enterprises. The platform was launched in the middle of 2018. The aim of the platform is to encourage the Saudi community to contribute their innovative ideas and solutions. Platform objectives include to attract innovative solutions for challenges raised in the public and private sectors, to enhance the idea of innovation by posting challenges from different places, to build up an economic value along with innovative solutions, and to support innovators and talented people in the Saudi community. P-A aims to be the leading platform that allows community ideas to be transferred to a sustainable national project. The best solutions are encouraged to either join an existing organisation or establish an independent startup.

The main aim of P-A is to encourage innovators to transfer their innovative solution to private business through the concept of entrepreneurship. It is a national business innovation platform. As figure 5.1 shows the community can sign up in the platform and add their startup business if they have one by using **my project service**. Then, an automatic track will be set, in addition to suggesting resources and services that participants may need according to the stage of the startup business. The **innovation library** is another service that the community can use by viewing a set of knowledge materials that may support them in developing community skills in the journey of

business innovation, in addition to recent reports and practical studies that support making business decisions based on valuable data and information. There is a **set of innovation services** which is a list of services provided by government, private and non-profit agencies. There are a variety of free and non-free services for business innovation during the different stages of startups. The list of services is updated periodically; participants can send requests. For example, a prototype service assists participant to do a prototype for their service or product. Another example is providing co-working spaces, meeting rooms, an innovation lab, studio and training rooms for participants. The platform also presents innovation events around the country.

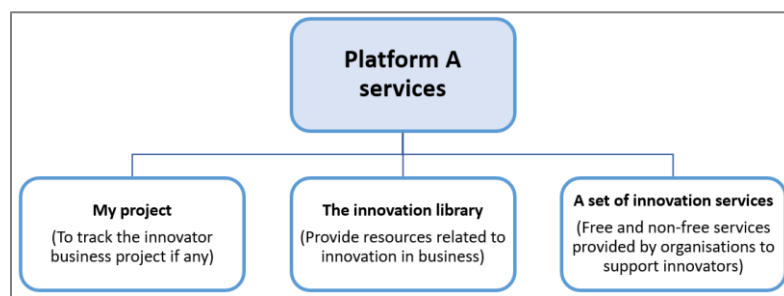


Figure 5.1: Services provided by P-A

The last service is **business innovation challenges** which allow public or private organisations to launch their challenge through the platform. Browsing the home page of the online platform shows the list of the latest challenges. Clicking on the challenge directs participants to the challenge provider such as a public or a private university. In 2019 the platform had two paths: challenges and ideas bank.

- **Challenges:** It is a competition to solve a specific problem, such as sharing an idea to help people with disability get a better education experience or sharing a digital solution to improve the education environment. Every challenge has a timeline for posting a problem, receiving solutions, announcing a winner, and awarding prizes.
- **Ideas bank (closed in 2021):** It receives community ideas that can improve services in many Saudi sectors and helps community voices be heard by decision makers. The community can either share or comment on ideas.

The ideas bank is no longer available on the platform, however there were thousands of ideas posted on the platform. When A-1 was asked about them, A-1 replied:

*“I don’t think the ideas bank will be re-opened for the community” (A-1)*

### **5.1.2 Stakeholders during the open innovation process through P-A**

Many people or stakeholders were involved during the whole process. McGrath & Whitty (2017) noted that a stakeholder is “an individual or group with a stake (interest) in the subject activity” and added that the definition can be applied for both private and public organisations. The following explains all the stakeholders engaging:

- **Community:** A platform for users who share their solutions for the problems that are posted on the platform.
- **Platform team:** A team from SME General Authority in Saudi Arabia and platform operator team.
- **External team (challenge partner):** External public or private entity that faces a specific problem and requires innovative solutions from the community. Their challenge is posted on the platform.
- **Technical team:** A team who works as technical support.
- **Impartial expert:** An expert in the problem field.

The teams are formed as described in Figure 5.1. As A-2 pointed out, the whole process from working on a challenge until announcing winners takes around 3 months. However, each challenge should set its own timeline:

*“Each challenge has a specific time, but most challenges take 3 months. A full month for the launch of the challenge and registration, after that the registration closes, and we enter the nomination stage, after which the winners are selected.” (A-2)*

### **5.1.3 How needs and problems are discovered**

First, the process is started when an external entity, either public or private, contacts the P-A team to state that they are facing a problem or many problems and seek an innovative solution for them. As

the external team is a team from either the public sector, such as the Ministry of Education, or from the private sector, such as a watch company, the users' needs are discovered by them. Thus, they extract users' needs and problems; then they contact the platform team with a set of problems and needs. Therefore, discovering needs and problems is not a responsibility of the P-A team. The platform team only discusses them with the external team to identify the final problem statement. However, A-1 added that they can discover users' needs only if the external entity asks them for a new service they want to be developed. Table 5.3 shows some coding examples of the discovering needs and problems phase.

**Table 5.3: Example 1 of categorisation matrix in P-A**

Category (Based on Double Diamond Model)	Sub-categories	Open innovation process						Research question
		Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	Solution diffusion	
Problem	Discover	Process of discovering community problems and needs	External team contact platform team to look for solution for their problems through the platform.  <i>“there is an entity that says that they want to present a challenge”</i>					Sub- question 1
		Responsible of discovering community needs	External team, public or private.					
		Process of conducting team meeting	Not applied.					
		Meeting duration	Not applied.					
		Tools and techniques used during this phase	Not applied.					

#### 5.1.4 How one specific problem is defined

A-2 described the process: *“there are frequent meetings and workshops between the platform team and the external team to filter all challenges, gather information about it and reformulate it several times and choose the appropriate challenge”* (A-2). The main goal of choosing a challenge is not to be too broad and to be easy to convert into a business. Some problems that cannot be selected to be solved through the platform are:

*“for example, the challenge has to do with international problems in countries that cannot be solved by proposing an idea for a small business, or, for example, a challenge that requires changing government policies in government systems.”* (A-1)



Then, one problem is specified and formulated as a statement of challenge. The platform team posts the challenge on the platform with the timeline of the whole process and instructions for the required solution. Table 5.4 shows examples of coding during the problem defining phase.

**Table 5.4: Example 2 of categorisation matrix in P-A**

Category (Based on Double Diamond Model)		Open innovation process							Research question
		Sub-categories	Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	Solution diffusion	
Problem	Define	Process of defining a specific community problem		Platform team and external team conduct workshops to discuss community needs and specify specific problem.  <i>“there are frequent meetings and workshops with the launching party for the challenge to filter all challenges, choose the appropriate challenge, gather information about it and reformulate it several times”</i>					Sub-question 2
		Responsible of defining specific community problem		Both platform team and external team.					
		Process of conducting team meeting		External team contact platform team to arrange workshops to specify one challenge. <i>“they present us with a great number of challenges. Then after that we do workshops. To reach two or three challenges”</i>					
		Meeting duration		Multiple meetings <i>“there are frequent meetings and workshops with the launching party”</i>					
		Tools and techniques used during this phase		Persona, brainstorming, workshops, discussions, filtration. <i>“we brainstorm current problems in workshops, and seek participants' opinion”</i> <i>“We also use Persona”</i>					

### 5.1.5 How solutions are developed

The solutions are developed first by the community. They find a challenge on the platform and click on it, then they are directed to the page of the external entity. Therefore, the format of presenting the challenge is the responsibility of an external entity web page. After the closing date of sharing ideas by the community, the technical team filters out incomplete or inappropriate ideas and sends them to the platform team. A-1 distributes the ideas to each member (platform team, external team, an expert) with a set of criteria. There is one specific criterion for each challenge, however there are common and fixed criteria set for all types of challenges which are creativity, novelty, and if the solution is already implemented and ready as A-2 noted:

*“the extent to which this idea is new, its creativity, the extent to which it differs from what is currently in place, and the extent of the readiness of the idea, for example an idea that has been implemented or implemented from a model, or that it, for example, started in the market but in its beginnings, and the extent of its achievement and solution to the problem.” (A-2)*

Then, a meeting is conducted, led by the platform team, to collect the members’ evaluation and calculate the score through an electronic rating system: 40% for the external team (probably one or two representatives), 30% for the platform team (mostly one representative), and 30% for the expert. A report is created by the platform team to record the output of the evaluation process. Then, the three winners are invited to a pitch showcase for five minutes of presentation and five minutes of questions. Then, a meeting is conducted to discuss and identify the three winners. In the case of conflict about the order of the three winners, the final decision is made by the external team. A-1 explained the reason:

*“The choice in this case is based on the needs of the client, and he is often a member of the team of the challenge, because he knows the needs of the client.” (A-1)*

### **5.1.6 How solutions are delivered**

The solutions may be implemented by the innovators or may not. In all cases the implementation is not done by the platform side. As A-1 noted:

*“Our job is finished once we announce winners and distribute prizes, however we can connect winners with the external entity.” (A-1)*

Even the external entity cannot guarantee the implementation of the solution. For example, if the external entity is private it can or cannot contract with one of the winners. On the other hand, winners can establish their own business and work separately on their solutions. As A-1 complained:

*“This is a problem facing us, which is the lack of implementation of many ideas. We are trying to take a non-compulsory agreement with implementation, but we cannot force them.” (A-1)*

The prototyping, testing and implementing phase is an issue in challenges launched on platform A. If the main concern is to solve problems with innovative solutions, the solution should be implemented at the end, unless the challenge is to solve a non-urgent problem. Figure 5.2 summarises the whole open innovation process through P-A.

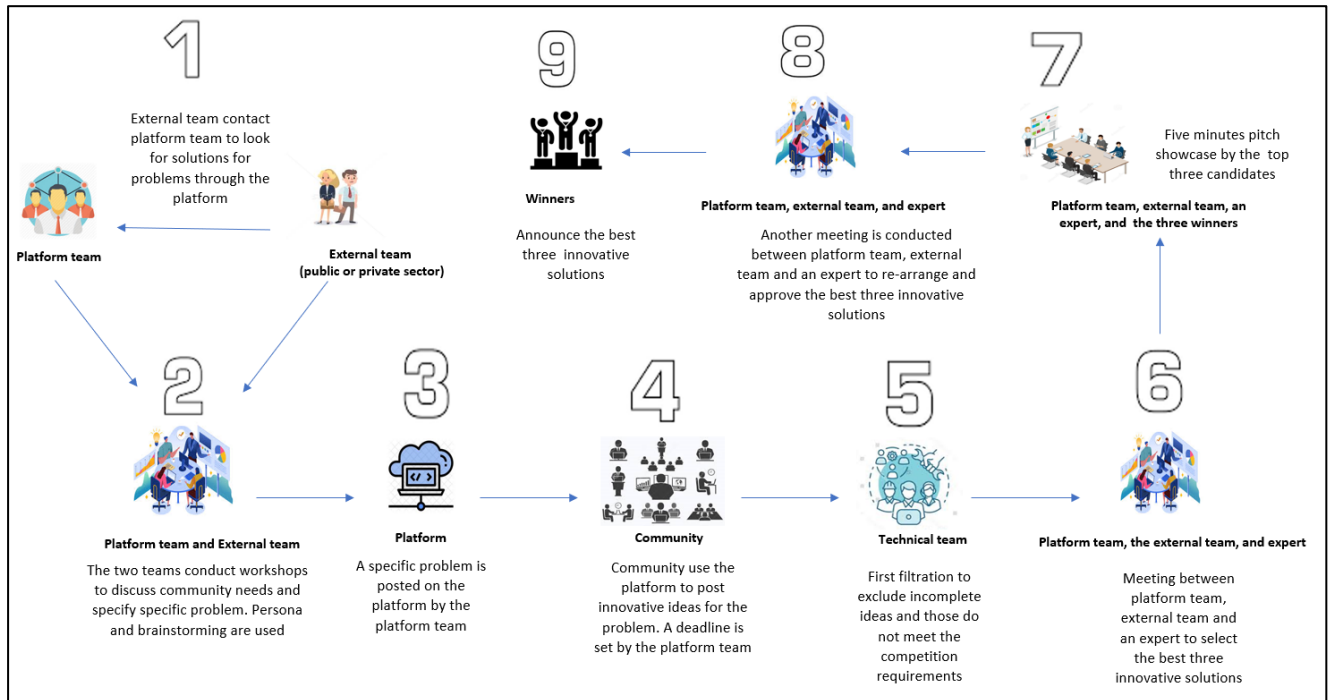


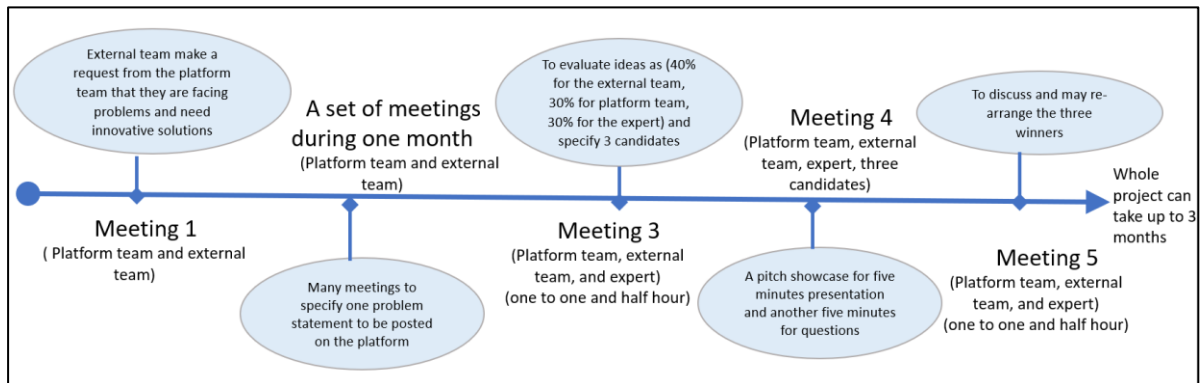
Figure 5.2: Process map of open innovation process through P-A

### 5.1.7 Using design thinking through open innovation process via P-A

A-1 stated that “we gather information about the problem and reformulate it several times” which means that they return to step 1 to collect more data about the problem. This means that the open innovation process has the same feature of design thinking which is **iteration**. Thus, when the two teams in P-A find there is a need to gather more information about the problem they return to the previous steps.

**Multidisciplinary teams** are employed in the whole open innovation process, which is the same feature as in design thinking. Four different perspectives (platform team, external team, an expert,

and community) are defining problems and developing solutions along with the community. Figure 5.3 describes how multidisciplinary teams are formed during the whole open innovation process.

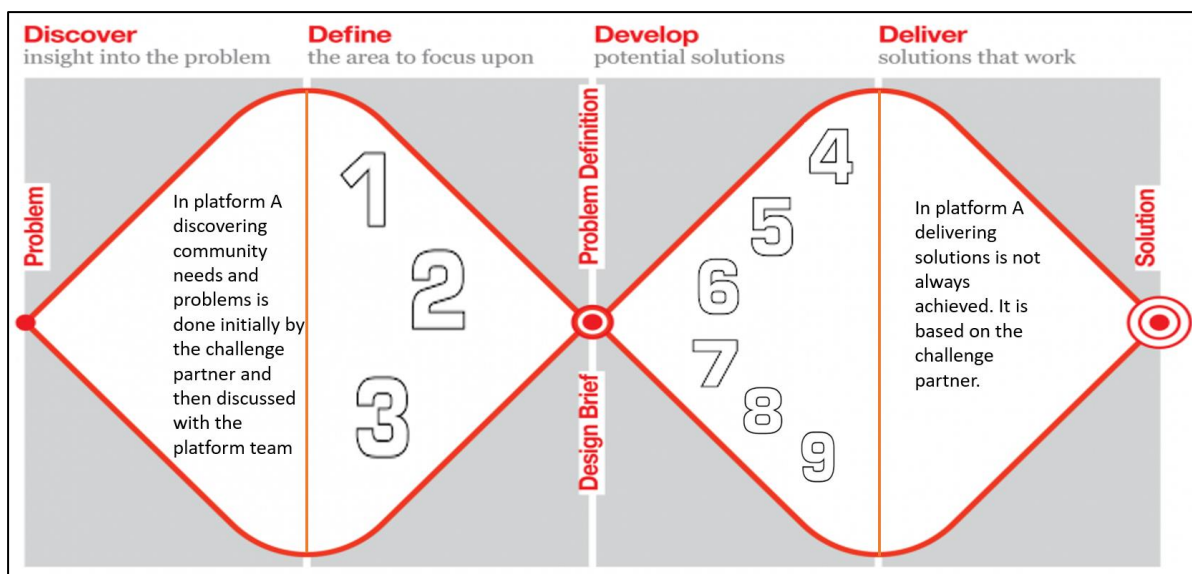


**Figure 5.3: Team interaction through open innovation process in P-A**

Table 5.5 describes the design thinking tools and techniques used during the open innovation process. For example, **brainstorming** is used in both the problem discovery phase and during selecting the final solution. **Focus groups** and **persona maps** are used during defining a problem statement to be a challenge. Figure 5.4 shows the linking between the process map of P-A and the Double Diamond design thinking model. The process map steps fit in two phases of the Double Diamond model which are the defining and developing phases. The discovering phase is conducted by the external team who are not interviewed here. On the other hand, the innovative solution is not always delivered to the community.

**Table 5.5: Use of design thinking tools and techniques through open innovation process via P-A**

Open innovation phase	Design thinking tools and techniques used	Uses
Identifying a specific problem	Workshops Brainstorming Discussions Persona maps Focus groups Filtering Gathering more information about the problem	Both external team and P-A team discuss the community problems and write one problem statement to be posted on the platform.
Evaluating ideas	Rating system Discussions	Every member scores a set of ideas. Then, an electronic system calculates the score.
Developing solution	A pitch showcase	To allow the top three candidates to present their solutions for 5 minutes, then they are asked questions for another 5 minutes.
Selecting final solutions	Brainstorming Comparing notes	To re-evaluate the three winners after the pitch showcase event and possibly re-order them.



**Figure 5.4: The relationship between open innovation process map of P-A (Figure 5.2) and Double Diamond design thinking model**

### 5.1.8 Member check results

As mentioned in Chapter 4, a member checking technique is used to explore the credibility of the results. About one year after the interviews we asked for a member check interview to check the validity of the results. Due to a change in employees’ responsibilities at P-A, interviews were held with two other responsible people. The interviews focused on a discussion of the findings of the analysis of the previous interviews and a review of basic information about P-A. After one month, the two people responded with a minor amendment on the findings as presented in Figure 5.5. The following changes were made:

- “External team” term is replaced by “challenge partner”.
- In step 2, they added “...identify roots challenges to reach a Challenge Statement”.
- In step 9 they added “... and award them with monetary prizes and recognitions”.

This means that in step 2, the challenge roots, a discussion about users’ problem and needs, are shared between the challenge party and the platform team.

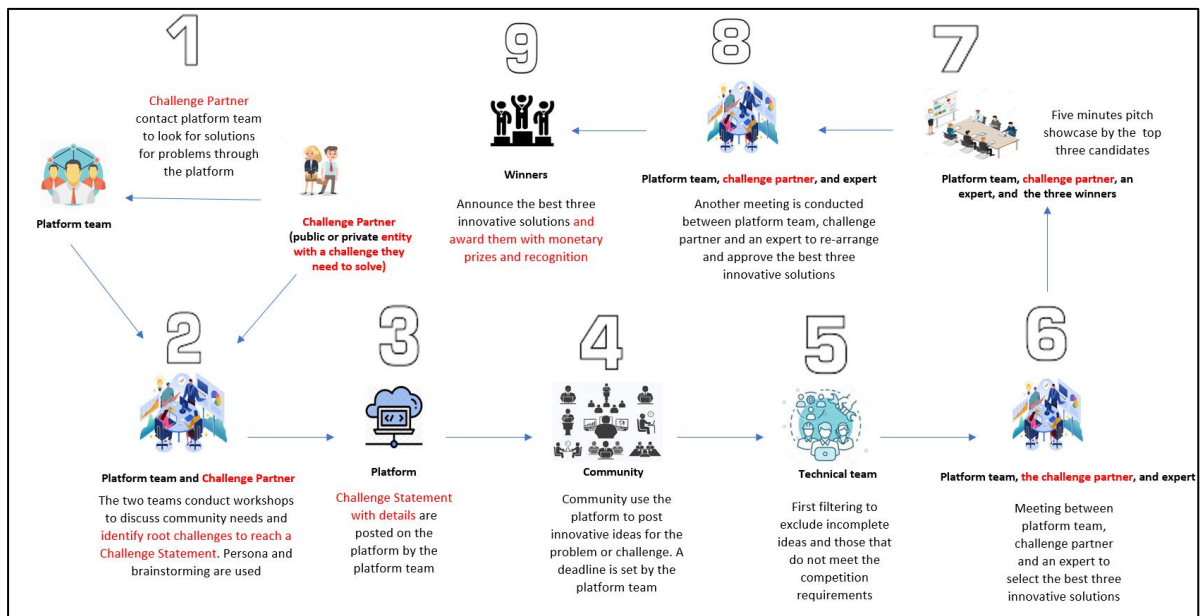


Figure 5.5: A refined process map of open innovation process through P-A (by member checking)

## 5.2 Case 2: Online open innovation platform B (P-B)

### 5.2.1 Background of platform B

P-B is located in Australia. It is part of a broad city website which has many subjects such as the city plan for 2026, multicultural communities, smart city, the city sustainability, city maps, and city economy, as well as an open data platform which includes open datasets related to the city such as transport and environment. The community can use the datasets for research and visualisation. P-B is managed by the local government of one of the largest cities in one of the most populous states in Australia. It was launched in 2018. The challenges are posted annually. Each year has a specific theme such as waste, health, or even COVID-19. They are seeking innovative solutions from the community to solve the city problems.

The challenges are posted on the platform; thus, the community can click on the challenge to fill out a form and attach related documents and submit their solution. Each participant can choose to indicate if they are a student, local community member, or entrepreneur. Participants are asked about the stage of ideas: finished, in progress, prototyping, or just an idea.

### 5.2.2 Stakeholders during the open innovation process through P-B

People involved during the open innovation process are:

- **Community:** Platform users who share their solutions for the problems that are posted on the platform. They can be innovators, entrepreneurs, students or community members.
- **Community's requirements team:** Working with the community to identify their needs by interviews, workshops and consultations (CityLab).
- **Platform team:** The internal team includes the team leader, developer, marketing expert, open data expert, and internal subject matter expert. They meet weekly during the challenge period.
- **Assessment panel:** Leader of the platform and internal experts. They join to specify the problem statement and to assess the final list of candidates. Experts change every year according to their experience about the annual challenge theme.

- **Judging panel:** Consists of platform leader, two government representatives, university partners, international partner, and internal decision maker (within local government). They meet in the pitch showcase to evaluate and vote for the final list of candidates, and change with every challenge.

### 5.2.3 How needs and problems are discovered

The community's needs and problems are discovered by conducting a number of workshops called CityLab. The CityLab is a place located in one of the official places managed by government. The team works directly with the community for about 12 months to discover and discuss new ideas. B-1 described the CityLab team: *"they do a lot of work in the community, you know, interviewing and testing ideas"* (B-1).

For example, CityLab worked on the waste and recycling recovery plan, and interviewed hundreds of people. They do consultation and workshops. In addition, they may discover problems from research related to the problem facing the community. The annual plan and budget process are also considered. The discovering process is not a responsibility of the platform team. They contact the CityLab to discuss community problems and needs.

### 5.2.4 How one specific problem is defined

After considering the output of the CityLab, research and annual plan and budget, the platform team sorts issues that are faced by the community into themes. A set of workshops and meetings are held between internal experts and the platform team to discuss the problems and select one theme to be the challenge statement. B-1 commented: *"the themes come to me. We workshop the themes to make a problem statement for the competition"*.

They specify one statement with instructions and criteria. Then, the problem statement needs to be approved by decision makers:

*"Before we post a challenge, it has to have been agreed on by lots and lots of people in the organisation, like lots of directors and councillors. And yeah, it's not simple."* (B-1)



Then, the challenge is posted on the platform with instructions and guidelines.

### **5.2.5 How solutions are developed**

After the closing date of the competition, the technical team sends the applications in an Excel sheet to the leader of the platform team. In the past the Smarty Grants platform was used to evaluate ideas, but now the leader finds it easier to organise the Excel sheet and add columns for judging. Then, the ideas are reviewed against eligibility criteria by the assessment panel to specify the final list. B-1 described the process:

*“It’s like an Excel spreadsheet where we have all of the ideas, all of the information they’ve given us and we give them to our judges. And in their own time, they review, they score them, they go through and make comments and review. And then what happens is once they’ve all got their scores together, then we meet all together in person for two hours and we deliver up to our top six are going to be. And then those top six will go to the pitch at the showcase end of competition.” (B-1)*

B-1 described some of the criteria used when assessing ideas: *“idea viable, has this idea used research to validate that it’s really solving the problem we use. So I guess a little bit I think about this research. Has this application done user testing, for example, has this application used evidence or research data to prove or to create to solve a problem?” (B-1)*

Then, after the agreement of the final list of candidates, a judging panel is invited to a pitch showcase. As discussed, the judging panel includes the platform leader, two government representatives, university partners, and an international partner. The final list of candidates, up to six or more, pitch their solutions for 4 minutes each at a pitch showcase event. Every panel member asks questions and scores on their own judging sheets and then they go into another room for 15 to 20 minutes to have a discussion and vote on who wins which prizes. Example of questions during the discussion may be “why did you give them nine out of ten?” or “why did you give them five out of ten?”.

In the case of conflict about the order of the winners, B-1 answered: *“that happens all the time”*, and added:

“There is no leader that says, ‘OK, that decision is a yes or no’. It’s always a discussion and depends on this score” (B-1).

At the end of this stage, the winners are announced and prizes are awarded. Tables 5.6 and 5.7 show some examples of coding during the developing solution phase.

**Table 5.6: Example 1 of categorisation matrix in P-B**

		Open innovation process				
Category (Based on Double Diamond Model)	Sub-categories	Idea generation	Idea selection	Idea development	Idea diffusion	Research question
Solution	Develop	Process of develop solutions for the selected problem	The technical team send the innovative solutions by Excel sheet to the platform leader <i>“we just receive them and they’re in a spreadsheet”</i>	Platform team leader send the solutions to the other members to score them separately.  <i>“in their own time, they review, they score them, they go through and make comments and review”</i>		Sub-question 3 and 4
		Responsible of develop a solution for specific community problem	Community	Platform team Judging panel	External team  <i>“we want to help the ideas grow to the next level”</i>  <i>“we encourage other bodies, other agencies like the universities, like business startup to work on this”</i>  <i>“We might not always have full control”</i>	
		Process of forming evaluation team meeting		B-1 responsible for inviting other teams for evaluation.  <i>“I’ve been in a number of different teams, so it’s not really one team that looks after it”</i>  <i>“I run it and I bring in different people during the duration of the project”</i>		

**Table 5.7: Example 2 of categorisation matrix in P-B**

		Open innovation process				
Category (Based on Double Diamond Model)	Sub-categories	Idea generation	Idea selection	Idea development	Idea diffusion	Research question
Solution	Develop	Disagreement among team members		Based on scores and discussion.  <i>“there is no leader that say, OK, that decision is a yes or no. It’s always a discussion and depends on this score”.</i>		Sub-question 3 and 4
		Number of final selected ideas		Three solutions.  <i>“the top three ideas have progressed”</i>		
		Tools used during this phase		Evaluation system (Smarty Grants platform, not using anymore) Discussions Brainstorming A pitch showcases  <i>“We used a platform called Smarty Grants”</i>  <i>“then those top six will go to the pitch at the showcase end of competition”</i>  <i>“And then they have a discussion around who wins, which prizes, which ones.”</i>		

### 5.2.6 How solutions are delivered

After announcing winners, the chosen solution should be delivered to the community. However, in P-B the solution delivery is not always achieved. Some of the winners of one challenge progressed to the implementation and delivery phase. However, in another challenge, the solutions were not delivered to the community, and the reason was the low budget. B-1 explained that it is complicated because it refers to the internal decision makers and the annual budget. Another reason is that the solution should be applied by an external entity such as universities, thus they are involved in the funding phase. For example, some of the solutions were sent to a university accelerator.

Another point is that when the community members fill out an application to submit their ideas, they are asked if they agree to share their ideas publicly in the platform after finishing the challenge. Therefore, any partner, collaborators or internal department can benefit from those solutions and request cooperation with the idea owner. Therefore, there are many points behind the delivery phase. As B-1 commented:

*“There are many factors in it. So, it’s very hard, it’s probably not one for me to be able to answer it, actually, because I don’t control the process.”*

B-1 added: *“So I guess it’s complicated. Yeah, hard to answer that one.”*

Figure 5.6 summarises the whole open innovation process through P-B.

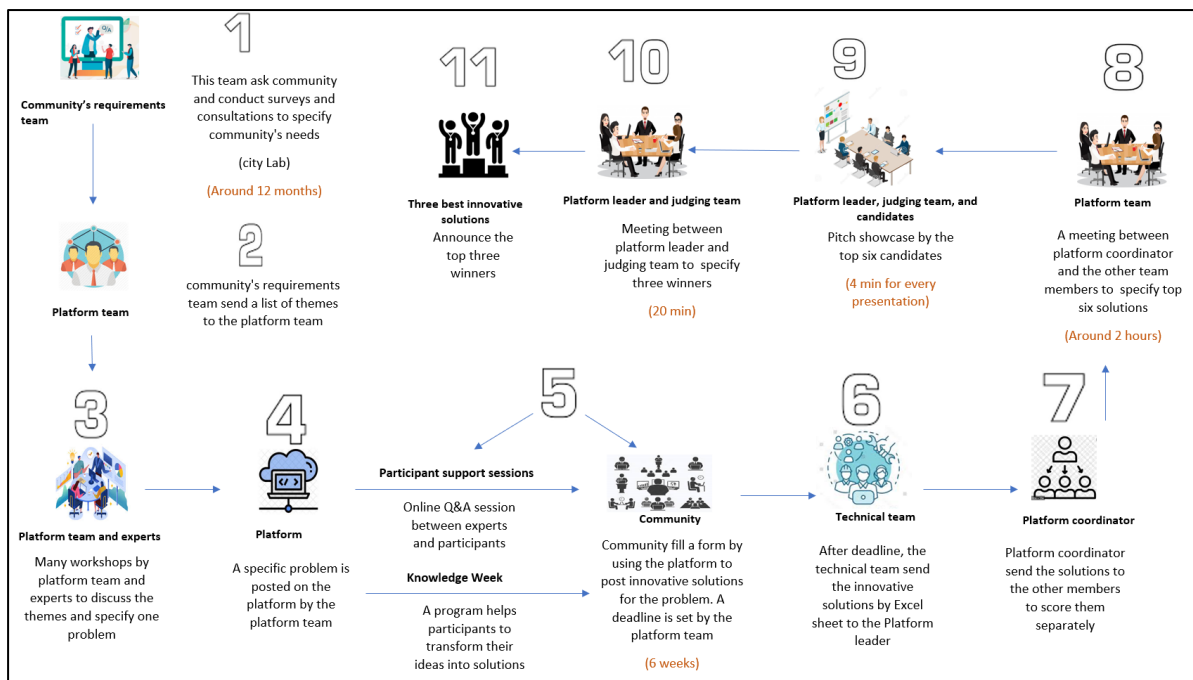
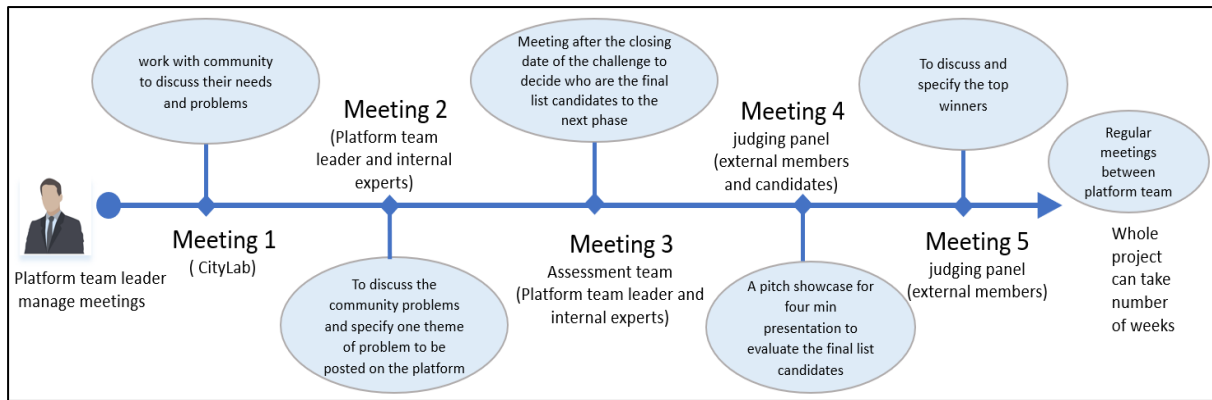


Figure 5.6: Process map of open innovation process through P-B

### 5.2.7 Using design thinking through open innovation process via P-B

One of the clear features that applied during the open innovation process in P-B is adopting the CityLab which centred around the human. The community members are the main component in this lab, which reflects the concept of design thinking of including humans during the process. In the CityLab, the community works to discuss the problems and needs. Therefore, P-B practises **empathy** with the community to identify the right problem.

There are four different teams during all the phases of the open innovation process: people working with the community in CityLab, another team discussing and identifying one problem, and a team who judges the final list of community solutions (Figure 5.7). They are from different departments and organisations and have different experiences. Thus, **multidisciplinary teams** are clearly practised.



**Figure 5.7: Team interaction through open innovation process in P-B**

Table 5.8 describes how P-B uses design thinking tools and techniques during the open innovation process. For example, using CityLab is an indicator of using a human centred approach which is the main concept of design thinking, by conducting workshops, interviews and discussion to encourage the community to discover problems and needs. Discussions and brainstorming are used during the whole open innovation process. In addition, participants support sessions and knowledge work as presented in stage 5 of Figure 5.6 and are used to assist participants to discuss the problem issues before posting their innovative solution which is definitely part of the design thinking process when participants and experts share their thoughts about the problem and potential solution. Figure 5.8 shows how the open innovation process in P-B is linked to the Double Diamond design thinking model. The whole open innovation applied through P-B fits into the design thinking principle, except the last phase (solution delivery) which, as discussed previously, is not always achieved.

**Table 5.8: Use of design thinking tools and techniques through open innovation process via P-B**

Open innovation phase	Design thinking tools and techniques used	Uses
Discovering community problems and needs	Human centred approach Workshops Brainstorming Discussions Interviews Research Feedback	CityLab works with the community who will use the final product/service to discuss their needs and problems, and prototype and test new ideas.
Identifying a specific problem	Workshops Brainstorming	Discusses the themes, then, specifies one problem.

	Filtering Consultation	
Evaluating ideas	Evaluation system (Smarty Grants platform not used any more) Discussions Brainstorming	Every member scores a set of ideas. Then, they discuss the final list of ideas.
Developing solution	A pitch showcase	Allows the final list candidates to present their solutions for 4 minutes.
Selecting final solutions	Brainstorming Comparing notes	Evaluates final list candidates after the pitch showcase event and possibly re-orders them.

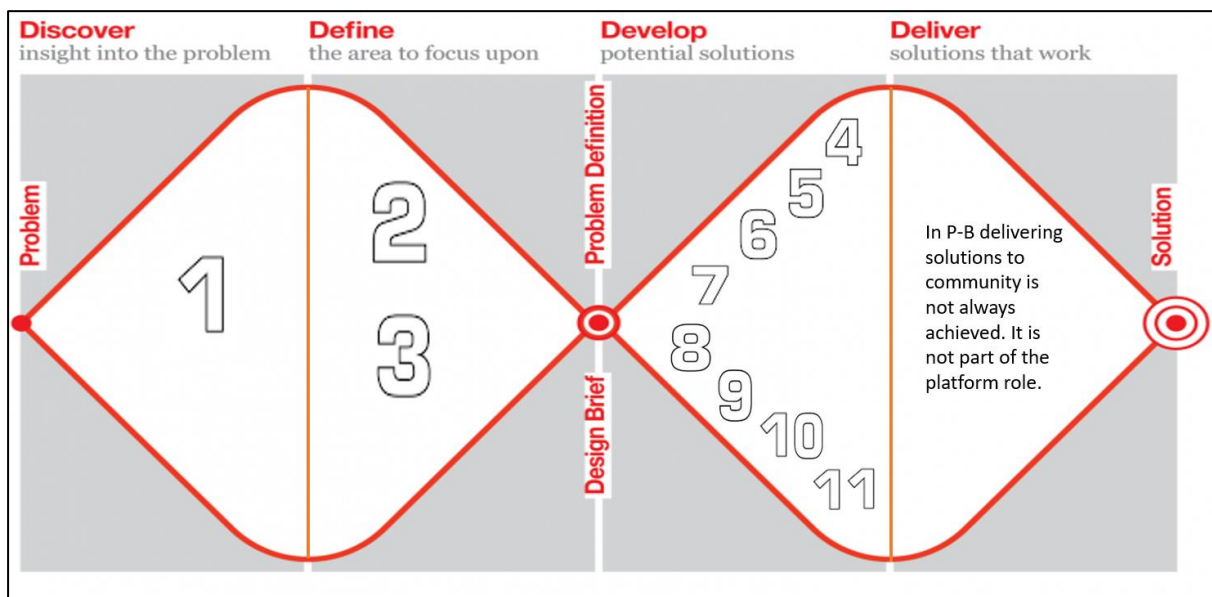


Figure 5.8: The relationship between open innovation process map of P-B (Figure 5.6) and Double Diamond design thinking model

### 5.2.8 Member check results

Member checking interviews were held with B-1 and B-2. The draft findings were sent to them beforehand by email and they asked for time to read and discuss the findings. After about one month they sent the file with small changes as presented in Figure 5.9. Similar to P-A, the changes were basically about use of terms not the process itself. Figure 5.9 shows the following changes in red text:

- Community requirement team is replaced by community engagement.
- Platform team is replaced by open innovation competition team.
- Phase 8 of the process map is changed to be assessment panel review instead of platform team review.

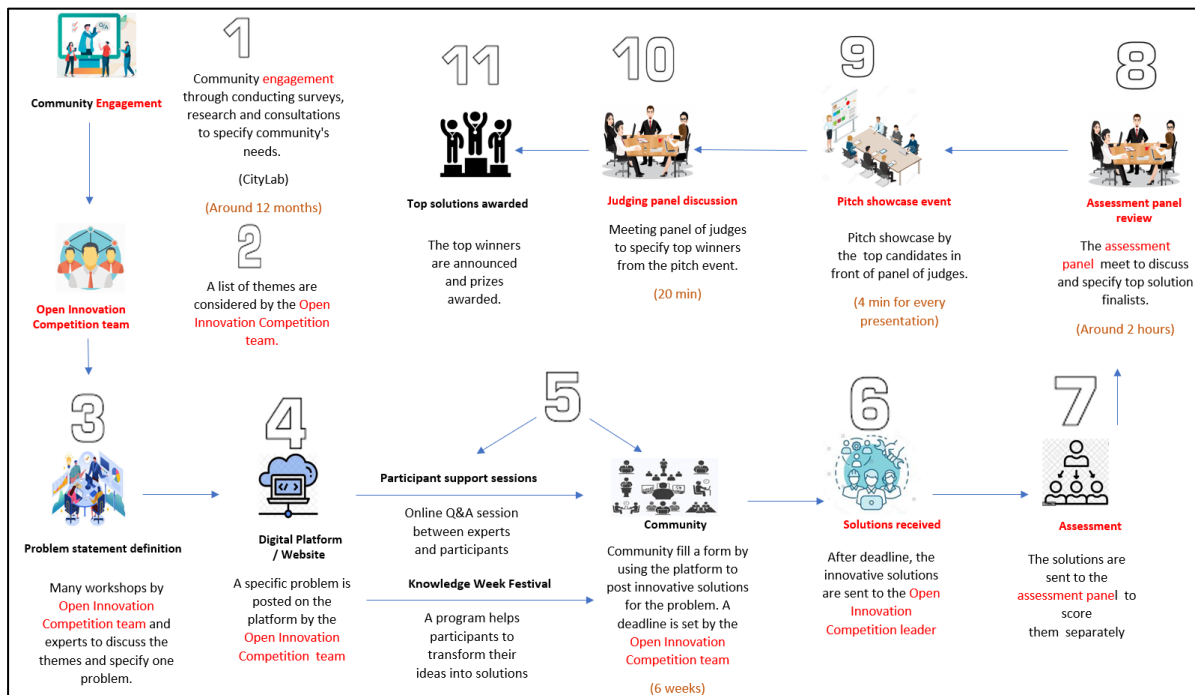


Figure 5.9: A refined process map of open innovation process through P-B (by member checking)

### 5.3 Case 3: Online open innovation platform C (P-C)

#### 5.3.1 Background of platform C

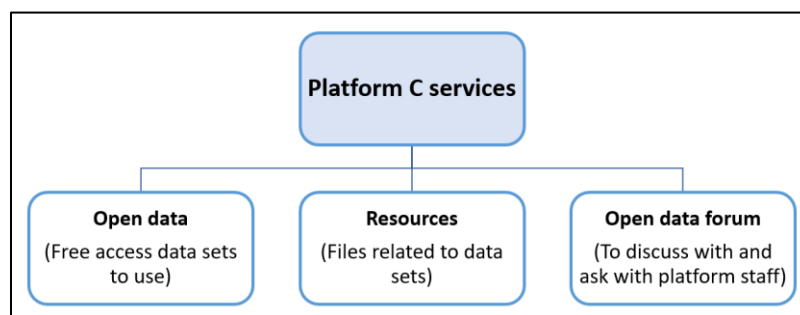
Platform C is located in Australia. It is an open innovation platform which is designed specifically for a transport system, thus it seeks innovative solutions for improving the transport system in a major city. The city has a future vision to use innovative technical solutions for the transport system. For example, the city plans to use artificial intelligence and machine learning to enhance service management and to reach zero emissions from the public transport system. Moreover, the vision is to be “a top-three global leader” in using technology to deliver transport services to the community.

Open innovation and community participation are a facilitator to all the future vision objectives. Closed innovation was applied before opening up for the community to participate. According to C-1 the situation becomes more effective as the community knows and has more experience than the employees of the transport system. For example, one innovator developed an application in the Chinese language which the platform team was not aware of. As C-1 stated:

*“So, yeah, it’s a very, very, very different world now than before and after. And a lot of that provides amazing solutions to customers that we could not reach.” (C-1)*

The web-based platform includes open data which is public for the community to check and use. This is part of the government policy to disclose government data. There is also an open data forum where interested people can ask about and discuss the dataset. There are resources and documents related to the dataset if needed. The community, such as innovators, developers and entrepreneurs, can sign in and use the data for research or developing apps. Figure 5.10 shows the services provided by the platform.

There is also a systematic way to innovate with the announcement of a specific challenge and asking for innovative solutions. The platform runs multiple challenges during the year as C-2 indicated: “it’s probably two or three a year”. Then, a timeline for receiving and announcing results is set. The main aim of the challenge is to improve the public transport system in the city.



**Figure 5.10: Services provided by P-C**

### **5.3.2 Stakeholders during the open innovation process through P-C**

The people involved through the whole open innovation process are listed:



- **Community:** The community in this platform who share their innovative ideas, including innovators, entrepreneurs or developers.
- **Platform team:** Internal team who manages the open innovation process on the platform.
- **Internal members:** Internal members who are working inside the organisation and can join through the open innovation process, for example by asking the platform team for innovative solutions for a specific problem.
- **Experts:** An internal or external expert in the problem field. Experts can be part of the internal team or judging panel.
- **Judging panel:** External members who present the showcase and select the final winners of a challenge.

### 5.3.3 How needs and problems are discovered

P-C is part of a broad organisation; thus, the community's problems can come from any internal department. Any department can ask the platform team for innovative solution for a specific problem. C-1 said:

*“someone will come up to us, like some internal department will come up to us and say, ‘hey, do you have any solutions for this?’” (C-1)*

Some problems that the community complains about, such as congestion in the city because of freight trucks, the platform team already knows about. Other problems can be extracted from community comments on social media as an example. C-1 indicated that usually no surveys are conducted:

*“Well, people give us feedback so we don't need to do surveys.” (C-1)*

There is a department called customer service which receives community feedback to transfer to top management to finally provide to the platform team. This feedback was basically how problems are discovered. However, interviewees did not extract community needs and they did not mention any department responsible for that. C-1 stated that they do not do surveys. Therefore, they rely on

community feedback and complaints. Table 5.9 presents some examples of the coding during the discovering problems phase.

**Table 5.9: Example 1 of categorisation matrix in P-C**

	Category (Based on Double Diamond Model)	Sub-categories	Open innovation process					Research question
			Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	
Problem	Discover	Process of discovering community problems and needs	Platform team receive problems either from community complains, internal departments, or observations.  <i>"someone will come up to us like some internal department will come up to us and said, hey, do you have any solutions for this?"</i>  <i>"So that's sort of been kind of the citizen complaint"</i>  <i>"people give us feedback"</i>					Sub-question 1
		Responsible of discovering community needs	Customer service department. Any internal department.  <i>"so many areas that look after customer feedback, but not our team. The other teams will ask for community submissions around certain topics."</i>  <i>"So, it could then be a different department. So, we've got Department of Customer Service, which is a totally different department. They may have some feedback"</i>					
		Process of conducting team meeting	Not applied.					
		Meeting duration	Not applied.					
		Tools and techniques used during this phase	Not applied.					

### 5.3.4 How one specific problem is defined

After receiving community problems from the channels mentioned previously, the problem statement which is a “challenge” is defined by the platform team. However, C-1 indicated that some of those channels, such as internal departments, come with the problem statement already defined by them. Sometimes the internal team from an internal department works on producing a problem statement in collaboration with the platform team. They spend about 4 weeks discussing and specifying one problem statement. The interviewees did not disclose much about this phase, however they were asked more about the techniques and tools used through this phase. Table 5.10 shows examples of the coding process for defining a specific problem in P-C.

**Table 5.10: Example 2 of categorisation matrix in P-C**

		Open innovation process						
Category (Based on Double Diamond Model)	Sub-categories	Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	Solution diffusion	Research question
Problem	Define	Process of defining a specific community problem	Workshops to discuss the themes and specify one problem.  <i>“we actually built a team internally, not our team”</i>					Sub-question 2
		Responsible of defining specific community problem	Platform team and internal members  <i>“it’s kind of collaborate that we come up with a statement that has to meet the needs of what we’re trying to achieve.”</i>					
		Process of conducting team meeting	Meeting and discussions.					
		Meeting duration	<i>“At least four weeks”</i>					
		Tools and techniques used during this phase	Workshops Brainstorming Filtering Discussion  <i>“it’s kind of collaborate that we come up with a statement that has to meet the needs of what we’re trying to achieve”</i>					

### 5.3.5 How solutions are developed

The problem is then posted on the platform and the community is allowed to participate. Similar to P-B, there is an online information session where experts can meet participants and answer their questions about the problem. Then, after the closing date of receiving community solutions, the analysis and developing process is started by selecting the solution that meets the problem requirements. The internal members with the platform team produce a short list of the candidates’ solutions. As C-2 indicated:

*“We initially what we do is that we have internal evaluation so that is in terms of the first step. So what we do is we create a shortlist internally. So that’s actually within that team in general.” (C-2)*

C-1 added as an example: *“There were 25 applicants. We would bring it down to 12, 13 applicants.”*

After that, the short list of around 10 candidates is invited to a showcase to present their innovative solution. A judging panel is also invited to evaluate the short list. The platform team provides the candidate list to the judging panel on the same day of the showcase because as C-1 indicated: *“So*

*we don't really want them researching the backgrounds of any of the ones coming beforehand or anything like that.*" They also ensure that candidates do not have any kind of relationship or conflict of interest with the panel.

The panel includes external members, as C-1 indicated: *"two or three external judges. So they're not from the organisation and they could be from a startup background. We put senior managers for other companies"*. The purpose of inviting external judges, as an interviewee stated, is not only their expertise of the problem statement as they cannot be from the transport field, but because the final product should be evaluated from different angles.

The showcase uses a scoring mechanism to answer the following questions: *"Does the team have the capabilities to actually deliver that thing? Do they do any thing in the past? They already have a business?"* (C-2) and added if they have the needed data and resources for the solution. Other criteria may be specifically determined for each challenge. The candidates present for 5 minutes and they are asked questions by the judging panel for another 5 minutes.

Unlike previous platforms, the showcase results are not announced to the community, rather the results are provided to the platform team again. The team uses the results as a guide and recommendation for further steps. As C-1 expressed: *"But the judging criteria and judging result are not given to the person. It is only given to us as a recommendation."*

Therefore, the first, second, and third candidates and the criteria used for each of them in the showcase are given to the platform team. Then, the platform team and internal members discuss the results and may re-order them. They use a sticky notes technique and a whiteboard as C-1 described: *"We give the three sticky notes with different colours"*. They give points for each of the candidates and discuss them. As C-2 stated about the technique, *"it's a bit of a freeform process"*. Thus, a discussion about choosing the final list can last for 15 minutes. Some questions might be asked or comments made during the discussion as C-2 described: *"I know this is the score currently accepted overall, but it's a big problem with this one and this problem in these things and they all go, 'oh, I thought about that'"* (C-2). Thus, the final decision of the winners is made by the platform team not

by the judging team. Sometimes they add more winners and this is based on the funding set for the launched challenge. On whether there is conflict between the members during the discussion, C-1 said *“It’s definitely happened”* and added *“most of the time we don’t get that”*. However, if it happens *“there’s just a conversation around it”* (C-1).

After the discussion between the platform team about the rating of the final list of innovative solutions, the candidates are invited to an incubator inside the organisation. The incubation process allows the solution to be tested and meet the requirements before launching them to the market, in addition to the visibility and security testing in the incubation process. However, it has happened that none of the participants who joined the incubation process passed it. For example, as C-1 commented: *“we have had two that they haven’t been able to continue because there is something that is a condition that they are unable to meet”*.

### **5.3.6 How solutions are delivered**

The solutions that passed the incubation process can progress to the implementation phase. P-C monitors the implementation of the product for 3 months as a trial. The development of the solution, which is usually an application, is funded by government. However, it is not always the case. Some of them are not funded, depending on the challenge. When the interviewee was asked about how one challenge can lead to multiple solutions, as the incubation process can have more than one solution to be tested, C-1 replied: *“For example, there were two apps that were put out on into the market. Both of them are quite different, even though they have the same information, both have different angles as to how they’re going to implement that. So there’s a lot of different ways to, you know, to get a solution to a problem.”* As mentioned not all the solutions can pass the incubation process. Therefore, there may be more than one solution for the same problem. Figure 5.11 summarises the whole open innovation process through P-C.

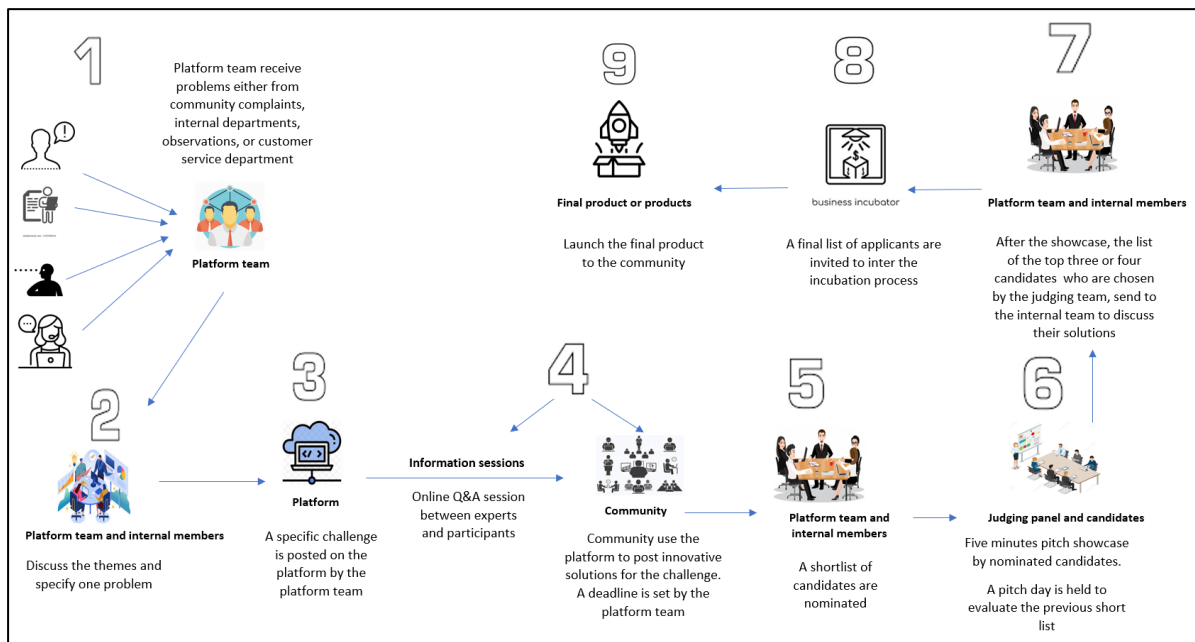
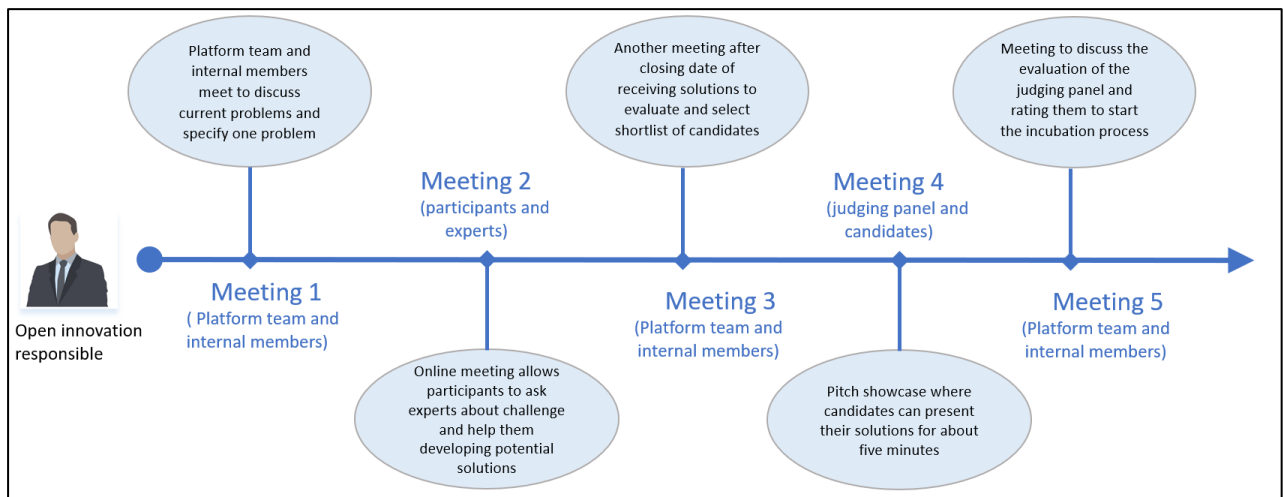


Figure 5.11: Process map of open innovation process through P-C

### 5.3.7 Using design thinking through open innovation process via P-C

Using design thinking principles in P-C is clear from different perspectives. First, when C-2 was asked if they use design thinking directly, C-2 replied “*Yea, in terms of the design of the actual challenge itself, that goes through a design thinking process*”. This means that the team understands design thinking, thus the members are practising it during the open innovation process as C-2 commented. Moreover, C-2 added about using accelerators along with the open innovation process: “*the team of the **digital accelerator** who often have the genesis of the whole innovation challenge and they go through all the design thinking, human incentive design processes.*”



**Figure 5.12: Team interaction through open innovation process in P-C**

Second, the use of **multidisciplinary teams** is obvious in Figure 5.12. As C-2 previously indicated, the accelerator team works with the open innovation team in the early stages of the open innovation process, and invites members from other departments inside the organisation to assist in defining the problem and evaluating solutions. The external panel is also invited to evaluate candidates through the showcase, and, as interviewees indicated, the judging panel members do not have to be an expert, they can be a company manager or entrepreneur. These factors all indicate the practising of multidisciplinary teams during the whole process of open innovation. Third, understanding community problems is practising **empathy** which is one of the main principles of design thinking. Fourth, practising the incubation process for the chosen solution for testing and prototyping the solution is an example of the **iteration** process which, in turn, is one of the design thinking principles.

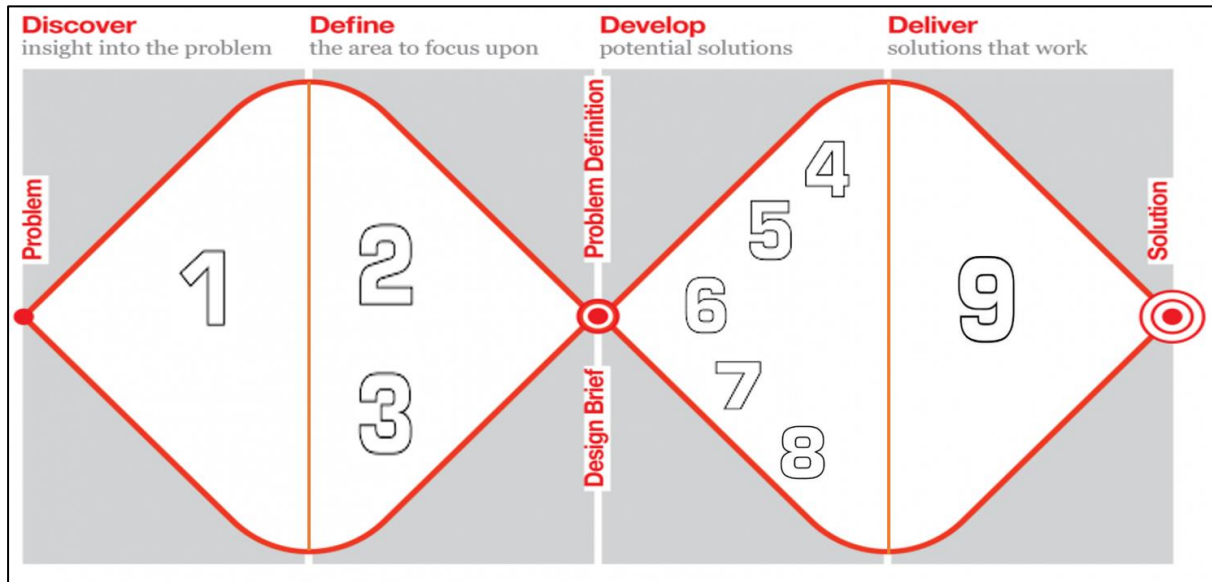
As in the previous cases, Table 5.11 depicts the tools and techniques used to confirm the applying of design thinking principles. For example, brainstorming is used during most phases of the open innovation process such as identifying problems and developing solutions. Sticky coloured notes are used to re-organise the solutions and enter them in an incubator. There is engagement with participants four times: first to identify problems, second to discuss a specific problem and possible solution, third to present in the pitch showcase, and fourth to enter the incubator.

**Table 5.11: Use of design thinking tools and techniques through open innovation process via P-C**

<b>Open innovation phase</b>	<b>Design thinking tools and techniques used</b>	<b>Uses</b>
Discovering community's needs and problems	Observation	To extract community's problems
Defining a specific problem	Workshops Brainstorming Filtering Discussion	To discuss the community problems, then specify one problem
Developing solution	Discussion Brainstorming Community engagement	To allow participants to discuss with experts the problems and their possible solution
Developing solution	A pitch showcase A scoring mechanism	To allow the final list candidates to present their solutions for 4 minutes
Developing solution	Discussions Brainstorming Sticky coloured notes and whiteboard	To allow every member to score a set of ideas, then discuss the final list of ideas
Incubation process	Testing and prototyping	To test the final solutions inside the organisation



Figure 5.13 indicates how the open innovation process in P-C was applied through a Double Diamond design thinking model. In contrast to previous cases, P-C has applied all the design thinking phases, starting with discovering community problems and ending with launching a solution to the community.



**Figure 5.13: The relationship between open innovation process map of P-C (Figure 5.11) and Double Diamond design thinking model**

### 5.3.8 Member check results

In this case, a member check was conducted by correspondence. The findings were sent by email to interviewees. They made one change in the terminology, of replacing the platform team with the Data and Innovation team, and approved all other results.

## 5.4 Case 4: Online open innovation platform D (P-D)

### 5.4.1 Background of platform D

Platform D is an open innovation platform located in the United Arab Emirates and managed by government. The interview was conducted with the main person responsible for the platform, however for ethics reasons the position is hidden. D-1 spent a long time during the interview explaining the Emirates government initiative in innovation. As D-1 indicated, the Emirates government has had an innovation vision for a long time, however 2015 was called the year of innovation. Even before 2015, they developed strategies and initiatives to develop the government

working system. Then, as D-1 continued *“we felt that people need the innovation portfolio and the innovation agenda in the United Arab Emirates”*. Then, the government established a centre for governmental innovation, which is concerned with the government innovation focus. They set a national strategy to drive innovation in the country. The strategy for national innovation focuses on different sectors of innovation such as innovation in education, innovation in health, innovation in space, innovation in the economy, and innovation in the environment. One of the focuses was to implement innovation in all sectors in the country in sufficient time. This is because the Emirates has a 2021 vision as D-1 indicated: *“In this year, we have global indicators, including that we want to be among the top ten in it”*. For example, the country target is to be the best education system, the best health system, and the best economy. Innovation is the best way to reach these targets. The government found that the basic elements for the success of the innovation process are the individuals, the government, and the private sector. To achieve that, the government assigned ambassadors as D-1 stated: *“we need ambassadors in each of the forty regions [subject areas] in the federal government”*. They called the ambassadors the Innovation Chief, and there was one for every sector in the country. The innovation chief is responsible for the innovation strategy in each sector. However, the sectors complained that they did not have funding for the innovation focus. Therefore, the government decided that *“1% of the federal government budget is spent on the innovation file” (D-1)*. Then, in order to teach people how to innovate, they launched the Government Innovation Diploma program tools for innovation, testing and application. A government centre for innovation was also launched and a framework was drawn up for how government departments should innovate. D-1 described the framework: *“In this framework, they learn how to develop the idea to the stage of adopting the idea, including testing and developing hypotheses of the idea. This system is still in use for five years, with development on it.”* Another aspect which is part of the government initiative is establishing an innovation month every year: *“we show the best experiences on the subject of innovations” (D-1)*. The country also has an innovative experience related to the ministry of the possibilities, through which they fulfil the challenges that are impossible to solve in the government sector by applying the innovation process.

In relation to open innovation, D-1 replied “*we use open innovation, whether from the world, from the state, from individuals, from governments, and from the private sector. We also have many partners to interact with the private sector to develop ideas.*” For example, there are government business accelerators to develop projects which involve the private sector, and they invite companies such as Dell and Microsoft to come up with solutions for them and develop them more. Thus, this is a practice of open innovation in government departments in cooperation with the private sector. P-D involves many services and according to D-1 the platform has more than 100,000 users of these platform tools. There is education material to learn about government innovation tools. In addition, as D-1 indicated “*in this platform we make the community share its ideas with some working for it*”. This means linking specialised experts and innovators to exchange their expertise and experiences in the world of innovation. The platform also contains successful innovative government cases and experiences which other government employees can benefit from. The platform also contains a monitor of innovations. For example, if someone has an innovative experience, it can be recorded, and the platform will study it and do an interview to see if it can be included in the annual report of the best innovations from the world. Seminars are held through the platform. Global experts and government employees participate to discuss problems in the public sector. For example, a government working framework after the COVID-19 pandemic is one of the seminar subjects. There is an innovation diploma program in cooperation with Cambridge University to enhance innovation in the community. There is a calendar showing innovative events around the world. Figure 5.14 summarises the most important services provided by P-D.

It is important to know that the government innovation is a broad project in the Emirates managed by the top management in the country. The project has many initiatives, one of which is P-D. The open innovation challenges were held first in 2016 via Twitter. Then the challenges were organised by the platform and D-1 is the person responsible for that. The challenge can be launched either by the platform or social media.

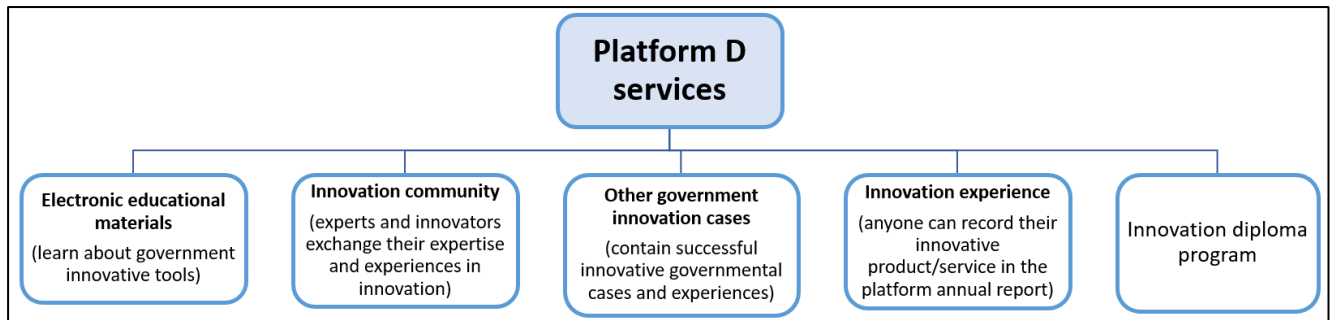


Figure 5.14: Services provided by P-D

### 5.4.2 Stakeholders during the open innovation process through P-D

The stakeholders involved through the whole open innovation process are:

- **Community:** Platform users who share their solutions for the problems that are posted on the platform. They can be innovators, developer, entrepreneurs, students and community members.
- **Internal members:** Members from any public sector such as the Ministry of Health who can join the open innovation process.
- **Challenge management team:** People who manage the whole process from discovering the problem until finding the solution. D-1 is the main responsible person of the team.
- **Judging panel:** A group of external members who are invited to evaluate the community suggested solutions. Some of them are expert in the challenge theme.

### 5.4.3 How needs and problems are discovered

As the first step of the open innovation process is to discover community needs and problems, in P-D there are many channels where problems can be extracted. For example, there is a government innovation lab where representatives of the public sector, such as the Ministry of Education, participate, in addition to top management and decision makers in the country, and community as well as “a community engagement lab” as D-1 expressed. In the lab they discuss the important issues in the public sector, and the community can participate through comments and question and answer online sessions. D-1 provided an example: *“for example, we take the example of the Ministry of Education, there are clients who need specific services. The Ministry of Education is the relevant*

*body that receives letters, not us, as the innovation centre. Then the Ministry of Education addresses us and we conduct an innovation lab workshop and put all the ideas they received and study their quality and effectiveness.”*

There are suggestion boxes in each ministry which are another channel of discovering what the community faces and needs. Social media is also a platform in which the community can express and comment about their needs and problems. The Council of Ministers meets on a weekly basis, thus any issues they discuss are also considered. There is a Department of Policies and Strategies that manages the strategies and policies of the various ministries in the country. They look at the nature of the ministries' work, services and performance. Therefore, as D-1 indicated *“From this standpoint we are aware of the needs of the ministries”*. Furthermore, Emirates has vision indicators which are challenges in which they want to reach a zero rate in plastic use, road accidents, carbon dioxide emissions, and child diabetes. This was part of the challenge themes that P-D launched.

#### **5.4.4 How one specific problem is defined**

D-1 did not mention exactly how a specific challenge is defined, however the government innovation lab is one way a challenge can be specified. As mentioned earlier, during the lab session a problem can be discovered and defined to be a challenge. As D-1 described, *“This way we operate a lab and launch a specific challenge. So, either through our monitoring of the situation, we launch the challenge or a specific body that requests a laboratory work, and then the challenge”*. The lab includes a set of workshops where brainstorming and discussion are done.

#### **5.4.5 How solutions are developed**

After launching the challenge, the community can submit their innovative solution. Then, after the closing date, the platform team conducts preliminary filtering. It is based on general criteria as D-1 explained: *“a preliminary filter to evaluate whether this idea serves a large level of society, if it serves it, we have included it, and if it serves a small group, we excluded it. Also, there are several factors in terms of quality in terms of whether this idea is new. In terms of impact. Also, in terms of spending, do you need an amount of money? If you need money, we exclude it as well”*. They also

classify the solutions as a product, application, service or site. Then, the platform leader sends the proposed solutions to the judging panel to score them. Then, the final list of candidates is invited to a pitch showcase to present their solutions. However, D-1 explained how they divided the evaluation process between the judging panel: *“we divided the evaluators into three evaluators who evaluated them on Sunday, then on Monday, Tuesday. Thus, we set a schedule for evaluation according to the sector that concerns the idea.”*

The platform leader provides each judging panel member with an iPad which has an evaluation system on it. Every candidate has one minute to convince the judging panel about their solution, then two or three minutes for the panel questions. At this stage as D-1 indicated, *“we searched for the ideas in which the testing and trial phase began”*.

After the presentations in the showcase, both the platform team and judging panel discuss the scores of each candidate based on the evaluation system. They produce another short list of candidates, about ten, to be progressed further. Then the platform funds the short list to develop their solutions. Then, D-1 described *“ten ideas that have been developed are selected and these ideas are really distinct. Then we worked on these ten ideas, let the community vote on social media, and the best idea was chosen and won an award.”*. When D-1 was asked about the situation if there is disagreement between members, D-1 said *“We have internal evaluators as well as external members. The benefit of internal reviewers is that they assess the internal viewpoint of an idea, when the evaluating team disagrees.”*. The evaluating team means the judging panel who are external members. Therefore, the final decision of the winners is made by the platform team. However, there is always a discussion around any disagreement to ensure every member agrees.

#### **5.4.6 How solutions are delivered**

The platform is not the sector that implements solutions, however they discover problems in the public sector and help find innovative solutions from the community. D-1 indicated *“We are just getting the idea to the testing phase. We just want to encourage innovators to test their ideas, but not to fully implement the idea. We are not an entity authorised to implement, but we are a government*

innovation centre concerned with spreading a culture of innovation.” Therefore, the platform is not responsible for delivering the solution to the community, however they fund the solutions to be tested. The solution is given to the public sector who has the problem, however D-1 did not mention if they follow up with the sector who has the problem to see if the innovative solution is delivered to the community. Figure 5.15 summarises the steps of the process of open innovation through P-D.

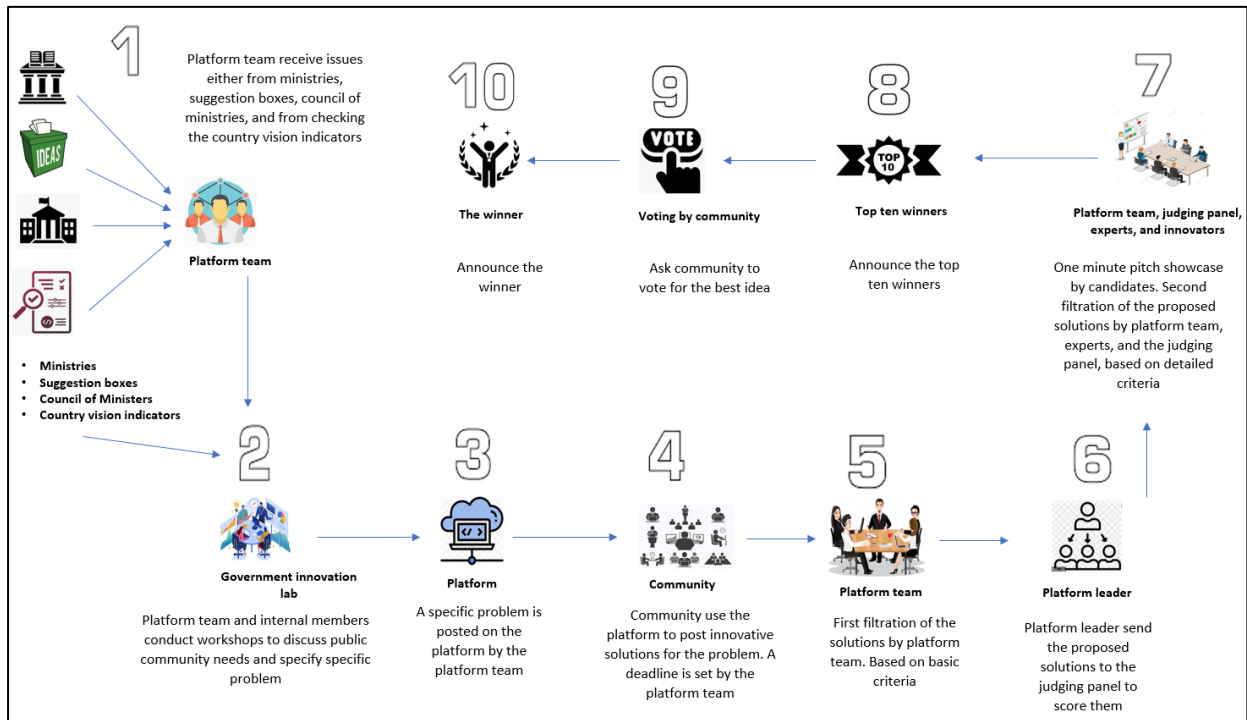


Figure 5.15: Process map of open innovation process through P-D

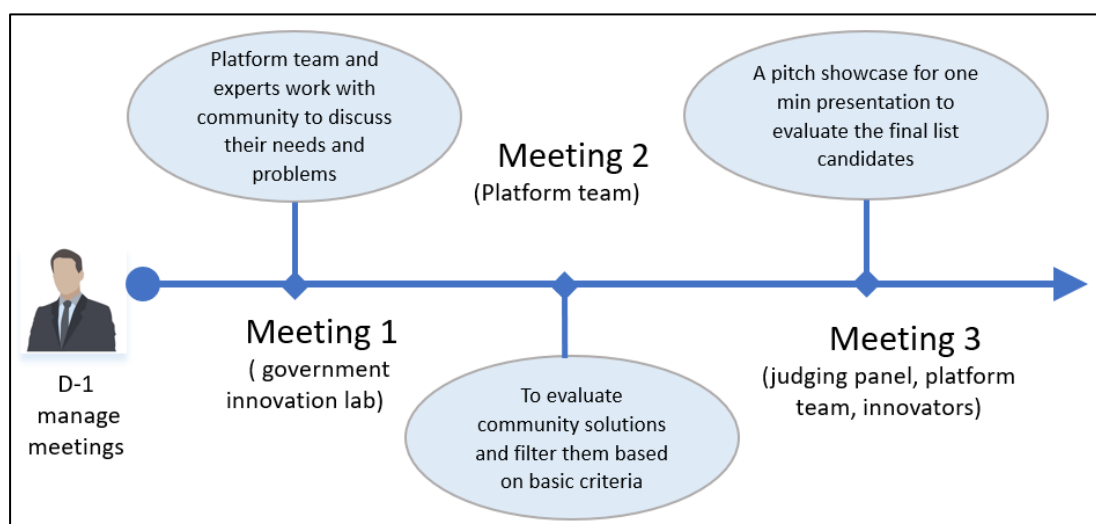
#### 5.4.7 Using design thinking through open innovation process via P-D

The above description of the open innovation process shows that design thinking principles are used through applying open innovation in P-D. More specifically, P-D focuses on **government design** as D-1 indicated: “We worked in partnership with **IDEO** based in San Francisco and for the first time in the world a government design system was put in place”. IDEO is an organisation for design thinking explained in Chapter 2. As D-1 defined it, “governmental design is a partnership with the community”. Furthermore, as mentioned previously P-D established a **government design lab** where the community participates in the process of designing the solution. Therefore, this lab is used to innovate solutions by using design thinking principles. In addition, there is, as D-1 described, a **government design mechanism** in cooperation with IDEO. “We took this mechanism with them and

developed it on the design of government services, not just in the private sector. We use the **user's journey** from the beginning of his need for the service until the launch of the service" (D-1). Thus, the user journey is used as a design thinking tool. Indeed P-D is practising **empathy** with the community to discover their needs and problems. D-1 said: "We are the country that most participates with the citizens. Social and community involvement is very important in making all decisions."

P-D understands the concept of design thinking while applying open innovation, and tried to build partnerships to use design thinking mechanisms such as with IDEO. In that regards, D-1 commented "There is an interconnection between design thinking and innovation. We distinguished design thinking among them that we generate ideas and these ideas are the ones that fall within the framework of innovation. So that you innovate in this idea by doing a test on it."

As described in the P-D stakeholders, there is a **multidisciplinary** team that changes each challenge. The team members are invited either from outside or inside the organisation boundaries, and there are international experts and teams. Figure 5.16 describes the teams' interaction through the open innovation process.



**Figure 5.16: Team interaction through open innovation process in P-D**

Table 5.12 summarises how P-D uses design thinking tools and techniques during the open innovation process, such as community engagement in the beginning to discover problems, then proposing a solution, and finally voting for the best solution.



**Table 5.12: Use of design thinking tools and techniques through open innovation process via P-D**

<b>Open innovation phase</b>	<b>Design thinking tools and techniques used</b>	<b>Uses</b>
- Discovering community needs and problems - Identifying a specific problem	Government innovation lab: - Workshops - Brainstorming - Discussions - Community engagement - Community empathy - User journey	To discuss the community needs problems, then specify one problem
Developing solution	A pitch showcase An evaluation system via iPad Discussions	To allow the final list candidates to present their solutions for one minute
Implementing solution	Testing and prototyping Community voting Community engagement	To test the final solutions inside the organisation then allow the community to vote for the winner

Figure 5.17 shows how each phase of the open innovation process of P-D is related to the Double Diamond design thinking model. The phases from 1 to 10 match the first three phases of the model. However, delivering the final solution is not the role of the open innovation process. P-D only tests the solution.

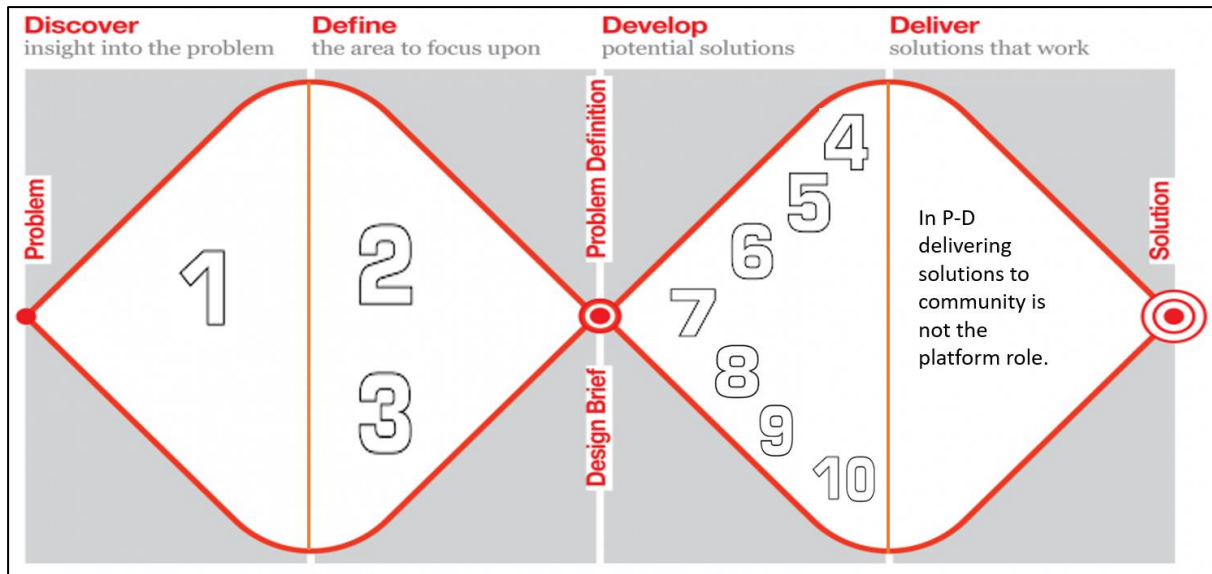


Figure 5.17: The relationship between open innovation process map of P-D (Figure 5.15) and Double Diamond design thinking model

## 5.5 Case 5: Online open innovation platform E (P-E)

### 5.5.1 Background of platform E

Platform E is located in Saudi Arabia. It is an open innovation platform managed by one of the public sectors in Saudi Arabia that is managed directly by the Saudi government. Therefore, the solutions in this platform are oriented for the purpose of that ministry. Closed innovation is applied by another platform in the ministry. It is designed specifically for employees' innovative solutions. However, in 2016 P-E was launched to encourage the community to participate in decision making. P-E is specifically designed to allow the community to sign in and publish their innovative ideas for any problem they face regarding that ministry. Unlike previous cases, there is no specific challenge published by the platform. Moreover, the community can vote for any other idea or solution that they agree with. The most popular ideas are presented first. The community can comment on any idea. The community can benefit from resources about innovation, creativity and open innovation through P-E. Figure 5.18 summarises the services provided by P-E.

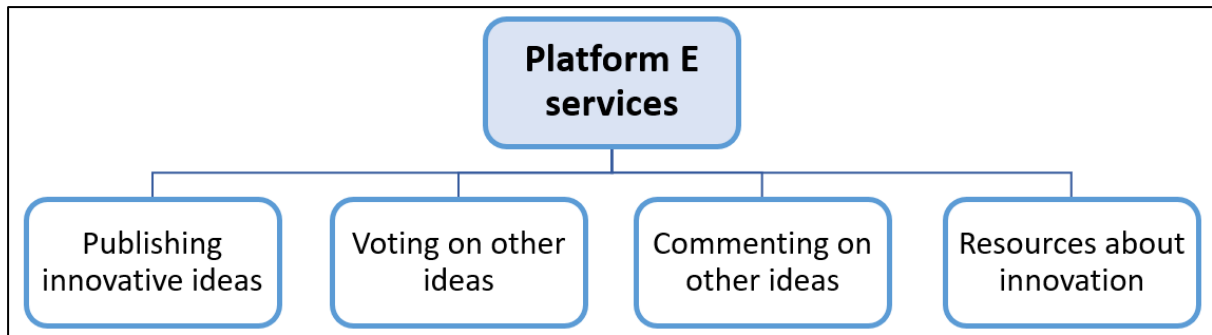


Figure 5.18: Services provided by P-E

E-1 indicated that before launching P-E, there was a call centre which was the only way of hearing the community voice. The call centre was “a weak channel” as E-1 described. In 2016, P-E was launched. In 2018, the ministry established an independent department to manage the platform. The main aim of the department is to transfer community innovative ideas into realistic solutions. When E-1 was asked about the situation before launching P-E, E-1 said *“We did not know the customer’s needs. We just made assumptions and expectations; each one puts himself/herself in the customer’s situation and assumed challenges”*. On the other hand, *“after hearing the customer’s voice, the situation differed. We have become more aware of the customer’s interests and where exactly the needs are and the areas of strengths and weakness”*. The top management of P-E is not relying on closed innovation compared to open innovation via P-E.

### 5.5.2 Stakeholders during the open innovation process through P-E

The stakeholders involved through the process of open innovation are:

- **Community:** Any person in the community who benefits from the services provided by the public sector managed by P-E. They can participate any time through P-E to suggest innovative solution for problems they face or even improve existing solutions.
- **Platform team:** Around six members from different departments in the ministry analyse and evaluate community ideas.
- **Marketing and communication team:** The team filters the community posts before evaluating them by the platform team.

- **Call back team:** Talks to the customer and tries to find out what complaints or suggestions the customer might have, then produces the Customers' Voice Report.
- **Technical team:** Is responsible for solving community posts on technical problems.
- **Custom clearance department:** Studies the analysed community ideas.
- **Decision maker:** Takes the final decision of implementing the community solution.

### 5.5.3 How needs and problems are discovered

As mentioned earlier, the community can post any idea as a solution for a problem or for improving an existing solution. Unlike previous cases, no specific challenge is shown for the community. Therefore, the platform team meet regularly to discuss community ideas for the many problems they face. When E-1 was asked how P-E discovers community needs and problems specifically because they are not asking community for a solution for a specific challenge, E-1 replied that they rely on several channels before assessing community ideas. Community-suggested solutions are called ideas because they are not yet implemented from the platform team perspective. One of the channels that the platform checks to consider community needs and problems is social media. The Customer's Voice Report uses an evaluation scale from 1 to 5. If the community evaluates a service as 3 or less, then the call back team calls them and asks them about the reason for the poor evaluation. The Customer's Voice Report is then produced. The platform can check the report monthly to be aware of community concerns.

### 5.5.4 How one specific problem is defined

In relation to the problem definition, P-E does not launch a problem (challenge), thus no problem is previously defined. However, as E-1 described, the platform team checks the community problems while starting to evaluate community ideas: *"At the time of choosing the ideas, we have two sources –activating the voice of the customer which indicates to me the number of complaints, and the other source is the number of proposals on the same point which is an indication of the need."* Therefore, they check the list of community complaints and suggestions, which was extracted from the previous discovery phase, with the community ideas on the platform.

### **5.5.5 How solutions are developed**

The marketing and communication team filter the community posts and send them to the platform team, which only does technical filtering related to incomplete or inappropriate ideas. The platform team meets once every two weeks to discuss the community ideas, and discusses about four to five ideas each meeting.

The team also checks the Customer's Voice Report to compare the proposed ideas with complaints and feedback in the report. Then, each member votes for the proposed solution that needs to be analysed. Then, each member evaluates the proposed solutions according to their allocated specialty and studies the business case, the strengths, weaknesses, opportunities, and threats analysis (SWOT), and the financial analysis. For example, if the proposed solutions are technical, the technical specialist will analyse it. E-1 described: *"We have 13 services that are divided among the team; each team member is tasked with three or four services in order to give them their full attention"*.

After that, the proposed ideas with the analysis are presented to the custom clearance department to discuss the ideas and how the community can benefit from them. There may be multiple meetings until they agree on the number of ideas that can progress further to be presented to the decision maker. E-1 explained: *"We review it with the custom clearance department and present the suggestion to them and whether it will have an added value. They have to decide initially before we present it to a decision maker"*. Sometimes, the platform team can ask external experts about some ideas.

Then, as E-1 commented, *"many ideas we studied have turned into projects"*. Therefore, proposed ideas are implemented at the end.

### **5.5.6 How solutions are delivered**

In P-E the proposed ideas that pass all the evaluation phases can be implemented and delivered to the community as a service. E-1 stated *"ideas that are not good end up in the drawers. On the other hand, there are ideas that were translated to projects which please the clients. One of those ideas is*

automatising services. Sometimes a simple idea is transferred to a project”. Figure 5.19 summarises the steps of the process of open innovation through P-E.

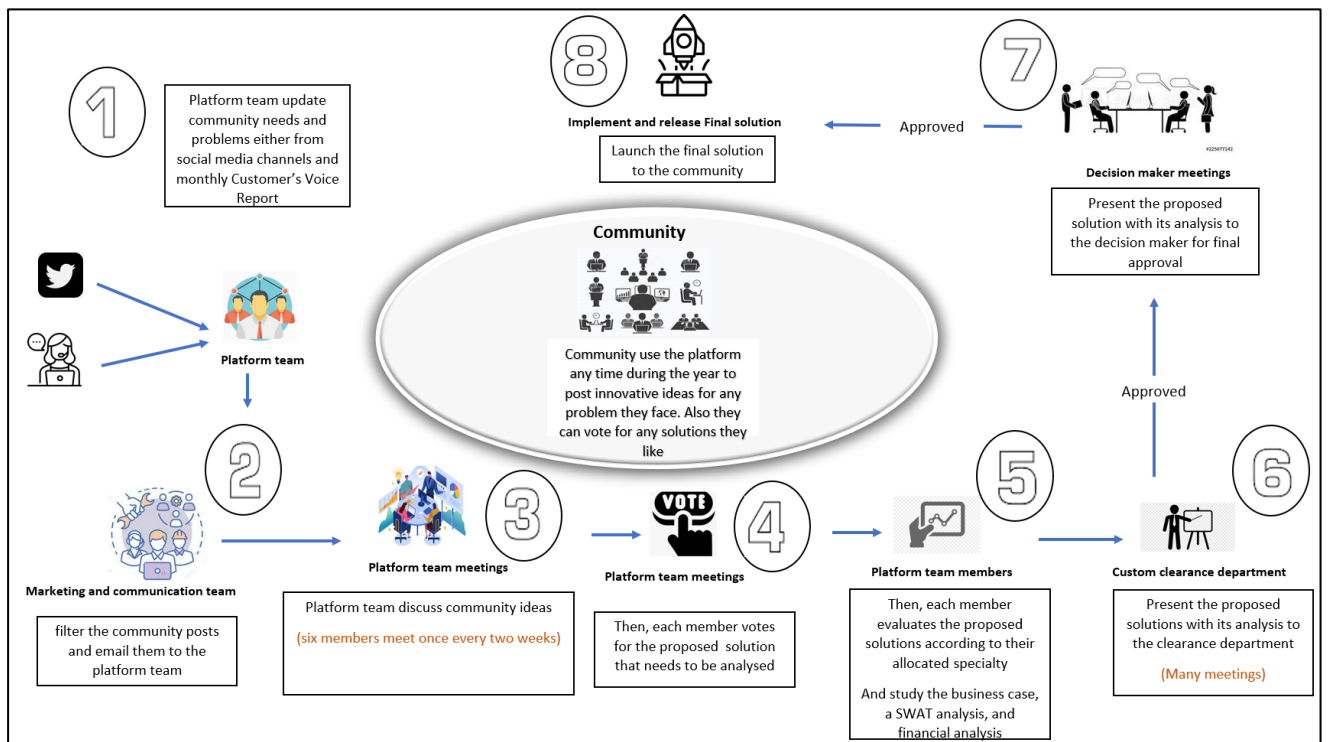


Figure 5.19: Process map of open innovation process through P-E

### 5.5.7 Using design thinking through open innovation process via P-E

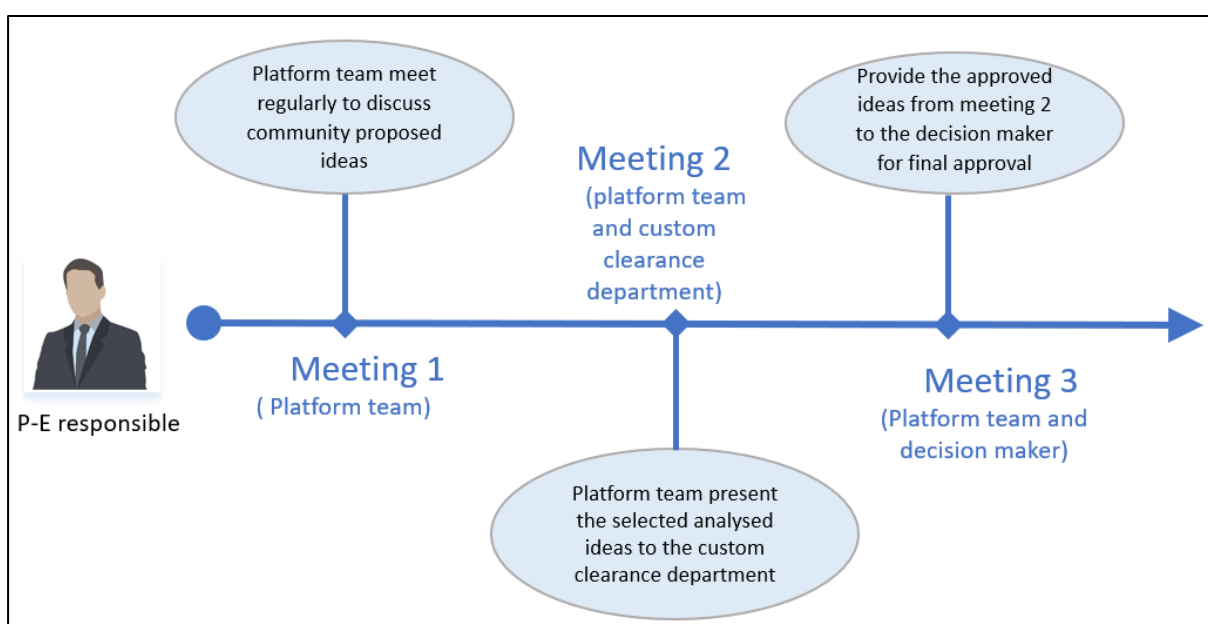
In relation to design thinking, P-E is a different case which, as mentioned, does not specify a specific challenge to be solved by the community. However, as E-1 was concerned about the community and communicates with them, P-E is definitionally practising a **human centred approach**. When asked about design thinking, E-1 replied “*We have just started using it. We have a project called the Innovation Lab. Of course, we started with workshops. We invited a great trainer in innovation and design thinking. We had a workshop with him and got to know the mechanism and extracted some ideas from the workshop based on design or thinking analysis*” (E-1). The innovation lab, which most of the previous cases were practising during the open innovation process, has just been started by P-E. However, it is clear that the innovation lab is not related to use of P-E. In the **innovation lab**, they invite people from outside and inside the ministry, in addition to hearing the community voice by using P-E and the Customer's Voice Report. However, the innovation lab was applied once

and in cooperation with external innovation and a design thinking trainee. Table 5.13 describes the design thinking tools and techniques used through an open innovation process via P-E.

**Table 5.13: Use of design thinking tools and techniques through open innovation process via P-E**

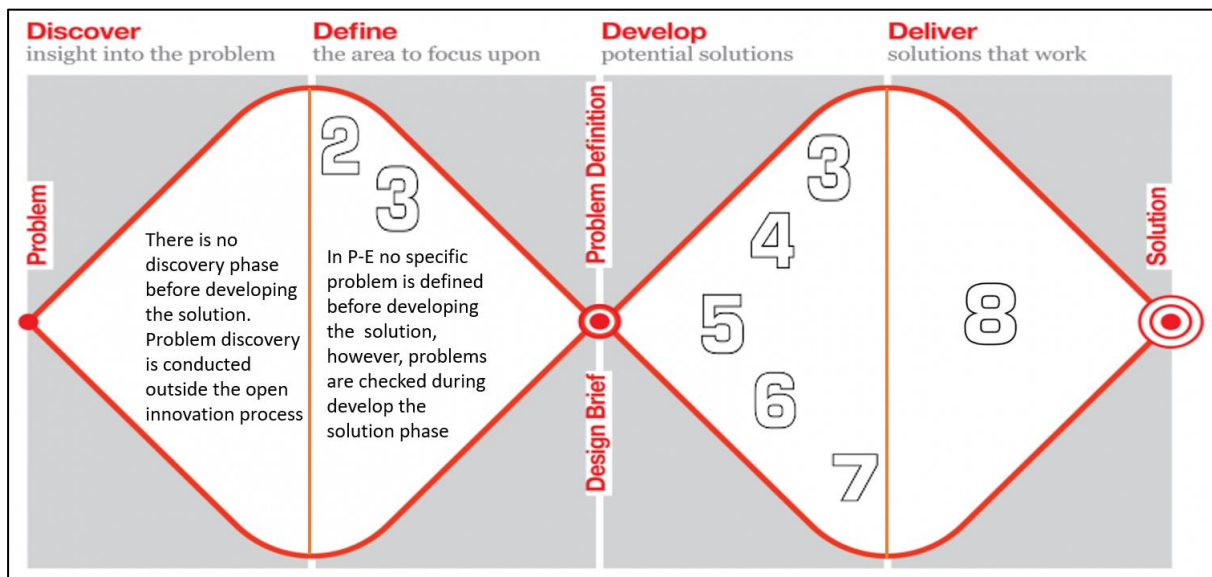
Open innovation phase	Design thinking tools and techniques used	Uses
Discovering community needs and problems while selecting solution	Community engagement by: - Customer’s Voice Report - Social media	To listen to community voice by evaluating services and by sending feedback
Developing solution	- Discussion - Brainstorming - Voting - Presentation	To enable platform team to analyse and evaluate community proposed ideas, and present the analysed solutions

On the other hand, using the Customer’s Voice Report is an indicator for including people during the open innovation process, although the invitation of external experts is rarely practised. Thus, internal multidisciplinary teams are communicating when practising the open innovation process. Figure 5.20 describes the internal multidisciplinary team interaction.



**Figure 5.20: Team interaction through open innovation process in P-E**

Figure 5.21 shows how the open innovation process map in Figure 5.19 is related to the Double Diamond design thinking model. Step 3, which is the platform team meeting to discuss community ideas, is related to both defining problems and developing the solution phase in the Double Diamond model, because during the meeting the team evaluates ideas and at the same time checks the problems that the community faces either from the Customer’s Voice Report or from feedback on social media. However, this does not follow the order of the Double Diamond model, where the problem should be defined (first diamond) before developing the solution (second diamond).



**Figure 5.21: The relationship between open innovation process map of P-E (Figure 5.19) and Double Diamond design thinking model**

## 5.6 Chapter summary

This chapter presents the findings of analysing the interviews held for the five cases. The presentation of findings was based on the two frameworks developed in Chapter 3. The interviews were analysed by the content analysis approach explained in Chapter 5. For each case, the following information was presented: platform background, stakeholders involved during the open innovation process, how needs and problems are discovered, how problems are defined, how solutions are



developed, and how solutions are delivered. The final section for each case was how each case uses design thinking during the open innovation process.

The first four platforms have a similar scenario of applying an open innovation platform while P-E has a different scenario. P-A, P-B, P-C and P-D post a specific problem on the platform and encourage the community to submit innovative solutions. On the other hand, P-E asks the community to post any innovative solution for any problem they face at any time.

**Therefore, P-A, P-B, P-C and P-D are web-based and function as follows:**

1. The platform raises a challenge that the community faces, such as a congested highway in the city.
2. The platform asks the community for ideas for innovative solutions.
3. The competition is closed, and the ideas are evaluated.
4. Candidates who provide innovative solutions are invited to presentations.
5. Finally, the winners are announced.

**In contrast, P-E is a web-based platform where all the innovative solutions are publicly posted by the community, and the community can vote for any suggested solution.**

The following chapter provides an analysis of web-based content and documents for the five cases, to complement the data from the interviews.

## Chapter 6: Analysis of Web-Based Platform Content and Documents

This chapter presents the analysis of the available documents provided by interviewees for each case, and analysis of the content of the platform. The additional analysis is to confirm and add more accordance and consistency to the data collected in the interviews (Yin 2009). It contributes to achieving credibility which is one of the trustworthiness criteria.

The aim of analysing such data is to explore the use of design thinking through applying an open innovation process. Therefore, the chosen content is related to any data indicative of the use of design thinking during the open innovation process. The analysis was based on the design thinking attributes presented in Chapter 3. This chapter contributes to answering the second main research question.

### 6.1 Case 1: Analysis of web content and document for P-A

The document is a report about P-A as a Saudi initiative for applying open innovation. The analysis of the content in the P-A, and in a document provided by A-3 led to a set of points related to the use of design thinking principles:

- **Linking the community problems with Saudi Vision 2030 and the strategies** of the external entity who has the problem is important to ensure defining the right problem facing the community.
- It is noticed from the previous and current challenges launched in the platform that there is a **virtual workshop** after launching a challenge. This to allow participants to produce the best innovative solution. This was not mentioned in the interviews, and the document indicates it has been recently added. The communication between experts and participants is the practising of **empathy** with the community, however this time about the solution not the problem.

- The platform organised a **workshop to teach the design thinking principles**: *“It provides a powerful framework for making human centred decisions”* (P-A web-based platform). The workshop had a fee and was for students who have innovative ideas. This clearly indicates the linking between open innovation and design thinking. P-A announced the workshop to publish the design thinking approach in the students’ community. Therefore, when the students face a problem and seek an innovative solution, they can use this approach. Although this research is looking for use of design thinking principles through the open innovation process and from the teams’ perspectives not the community, holding such workshops indicates the awareness of design thinking principles by the platform team.
- One of the main aims of P-A is to **engage the community** to provide creative ideas and innovative solutions with economic value. This clearly means using the community in solving problems. A **human centred approach** is not only in providing the solution, but also in defining problems.
- Among the skills that P-A seeks are **creative thinking skills** which means practicing design thinking.
- Most of the challenges that are mentioned in the document indicate forming **multidisciplinary teams** to evaluate the community’s ideas. This includes the platform team, external expert, and external team who launched the challenge as described in Chapter 5.
- The document indicates the importance of conducting a set of workshops with the external entity who want to launch the problem. These workshops are important to define the problem statement before launching the challenge. As described in Chapter 5, the **workshops are in cooperation between the external entity** who has the problem and the platform team. This stage is essential in design thinking.
- The document indicates an important issue which is the **implementation of the final solution**. A-1 mentioned in the interview that many solutions are not delivered to community. However, the document shows a solution for that by allowing the winners to

enrol at an internal centre that provides all the possible support for the winner such as turning the solution into a start-up and building a community for the innovators to exchange benefits between each other. Figure 6.1 presents how each point has been coded to the main category design thinking.



Figure 6.1: Coding of web content and document of case 1

## 6.2 Case 2: Analysis of web content and document for P-B

As mentioned in Chapter 5, P-B as a website is a broad community which include many subjects such as multicultural communities, smart city and city sustainability. However, the focus of the analysis is only about the sections of the document about open innovation. The document that was

analysed is a guide about open innovation challenges. The analysis of relevant pages and the document reveal many points regarding use of design thinking:

- **CityLab** that was mentioned in the interview is also mentioned in the platform content. CityLab is described in the website as “*We practise human centred design*”. It is a physical place where the community can join in and discuss their problem, in addition to testing possible solutions. During the workshops it is important to ensure the solution meets the community needs.
- A **hackathon** is another way of practising a human centered approach. It is an event where the community gather to solve problems. The challenges which are produced from the CityLab can be used in that event. They practise the ideation phase of the design thinking process.
- After launching a specific challenge on the platform, there is a **participant information session** which is an online session to allow participants to ask experts about challenge before submitting possible solutions.
- **The knowledge week** is a four day program in which participants prototype their solution before submitting it as a solution. The first day is to determine the audience of the solution which called “mapping”. The second day is about developing the right solution by sketching and generating many ideas until reaching the best solution. The third day is to decide and prototype the solution. The fourth day is to test the solution.
- According to the analysed document the open innovation process cannot be achieved without a clear definition and **understanding of the problem** which exactly matches the design thinking principle.
- The document mentioned that launching a challenge through the online open innovation platform requires having multiple groups of teams and experts such as a judging panel and teams from external organisations. Therefore, practising a **multidisciplinary team** is an important aspect related to design thinking.

- Inviting and contracting **external partnerships** are also an important part through the open innovation process.
- *“The success of an open innovation challenge relies heavily on **a well-articulated statement of the problem to be solved**”* is how the document describes forming a problem in the open innovation process, which refers to the second half of the diamond in the Double Diamond model. During this phase, the problem scope should be considered and all the people affected by problem should also be considered. All the activities applied in this phase matched the discovering phase in the Double Diamond model.
- Another aspect is to **invite experts when defining the problem**, in addition to the platform team, to ensure the right problem statement is formed.
- During the period of submitting ideas from the community, the platform team should be available to **communicate with participants** if they have issues. The team should also implement mentioned sessions to facilitate the communication channels.
- **Assessing the community’s ideas in stages** – *“Move to a deeper due-diligence phase before finally selecting the winner(s)”*– means practising a divergence and convergence strategy.
- *“Direct participants to other opportunities, and introduce them to potential investors, collaborators, sponsors and others.”* **Communication with winners** is essential in the P-B strategy. However, B-1 indicated in the interview that the solution is not always delivered to the community. Figure 6.2 shows how each point has been coded to the main category design thinking.

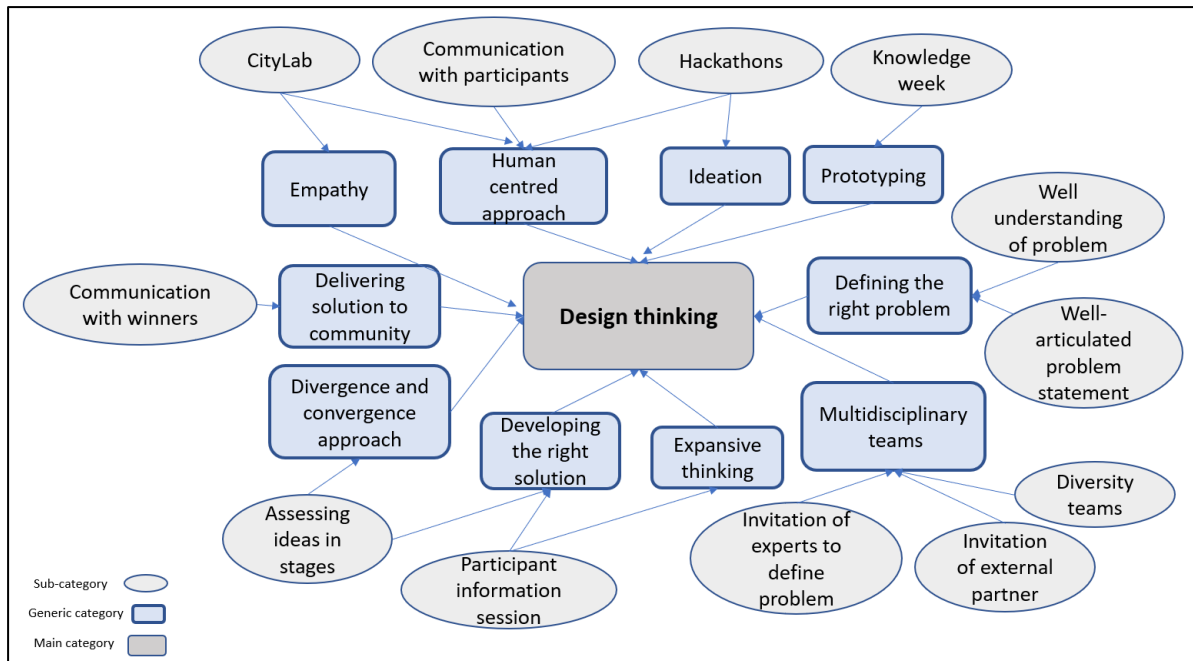


Figure 6.2: Coding of web content and document of case 2

### 6.3 Case 3: Analysis of web content and documents for P-C

As described in Chapter 5, the online P-C provides many services such as open data to be used by anyone who needs them, such as researchers and students. The analysis considers the content only related to the open innovation process:

- The description of the aim of launching the challenges is to **seek out best ideas**. Thus, **ideation** is practised during the open innovation process.
- Similar to P-B, there is an **information session** after launching the challenge, with sessions to allow participants to ask experts and the platform team about the challenge. This is practising a **human centred approach**, when participants are involved during the whole open innovation process.
- Unlike previous cases, the P-C website clearly indicates that the **final solution will be delivered to the community**, which means applying the last stage of the Double Diamond model, **delivering the solution**.
- Another aspect is the **diversity of teams**, either internal or external teams, which is related to using a **multidisciplinary team** in design thinking.

- The **incubation process** allows the winners after the pitch showcase to **test, prototype** and develop their solution before delivering the solution to the community. However, some solutions do not pass the incubation process, and therefore are not delivered to the community.
- The online platform mentioned a phase after passing the incubation process which is a **program** to support the winners and their solutions as a part of the organisation role. The benefits from the program are to receive social media support for the innovative solution, as well as funding support and wide opportunities to join a collaboration inside the organisation. This is a significant phase to ensure efficient **delivery** of the solution to the community.
- *“In order to realise our vision..., we are putting **the needs of our diverse customer groups at the centre of our innovations.**”* Having the community’s needs as a vision in the web-based platform of case 3 is an indication of the use of the **discovering community’s needs** phase of the Double Diamond model.
- *“Using human-centred design to develop solutions that suit passenger and freight customers, people with disability and communities”*. Therefore, the open innovation process through P-C clearly uses a human centered approach to develop solutions.

Figure 6.3 presents how each point has been coded to the main category design thinking.



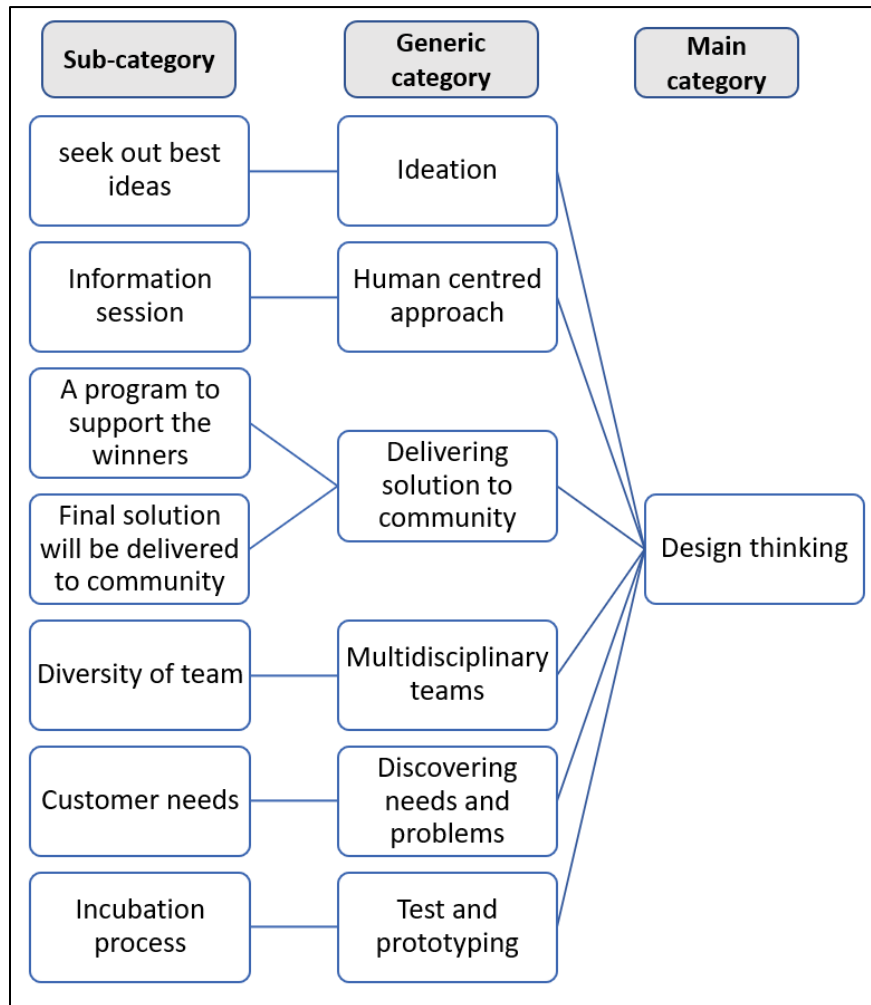


Figure 6.3: Coding of web content of case 3

#### 6.4 Case 4: Analysis of web content and documents for P-D

The web content of P-D is broad and has many services related to innovation in the public sector as described in Chapter 5. However, only the content that is related to practising open innovation by the community is analysed. A document about open innovation initiative in the Emirates is analysed.

The analysis has produced the following themes:

- The **government innovation lab** is a set of workshops and sessions. Part of the lab output is used to define the problem to be launched as a challenge as described in Chapter 5. The lab also uses creative ways to generate innovative ideas for the public sector. Participants include the community, decision makers and key responsible people in the public sector. The lab uses many design thinking tools such as dividing participants into teams to analyse, discuss problems and identify themes. Participants brainstorm the ideas and use interactive

presentations to present solutions and to develop an implementation plan. It is clear the lab practises most of the phases of the Double Diamond design thinking model.

- Similar to P-B, case 4 also practise **hackathons**, the name given to open innovation competitions. A hackathon involves the following features of design thinking:
  - Inviting multidisciplinary teams with different partners to join the hackathon such as universities, internal public sector and the private sector.
  - Training participants before the ideation phase, to assist them to use ideation tools.
  - Categorising the problems into themes.
  - Encouraging winners to use virtual innovators communities developed by P-D, and supporting them to work with public or private sectors. Winners will be invited to a funding and training program. However, delivering solutions to the community is not mentioned.
- Although delivering solution is not the P-D role, as analysed in Chapter 5, the web content involves instructions for testing the idea. This includes five questions that should be asked: Why are you going to do the test? What is your idea? When will the test start? When should it end? Who is involved in the test? How are you going to do the test? The steps assist participants to test and prototype their ideas.
- Another tool available in the web educates the community about innovation. The **innovation flowchart** is a table where the rows represent the innovation phases and columns are activities, requirements and objectives associated with each phase. This structured overview of this tool contributes to determining the progress of the process and setting the next steps. This flowchart represents the divergence and convergence approach in design thinking.
- It is also encouraged to use **SWOT analysis** which P-E uses when analysing the community's ideas. However, D-1 recommended using SWOT analysis not only to analyse ideas but even to analyse the challenge that any sector faces.

- A set of questions should be asked to **define the right problem**: What is the main problem, and why is it important? Who will be affected by the problem? What are the social and cultural factors that are related to the problem?
- Using a **causes diagram** can analyse the causes and effects of a new problem or identify gaps in an existing problem.
- Using the **shadowing people** approach means being with a person or group of people to discover problems by observing the individual's behaviour.
- **Interviewing** people can help understand their perspectives, and thus discover problems and needs. During or after interviewing, a **story tool** can be used to produce a story about specific participants. The tool can shed light on the most important issues from the interviews.
- Using a **target people tool** can help understand the needs of people and identify their categories.
- Using **personas** to draw a perspective of the fictional person who represents a target user of a service or product can help understand peoples' behaviour, needs, feeling, and experience.
- An **innovation workshop** is where all stakeholders are invited to discuss problem and needs and potential solutions. Stakeholders can be the community or users, partners, external or internal experts and decision makers.

Figure 6.4 presents how each point has been coded to the main category design thinking.

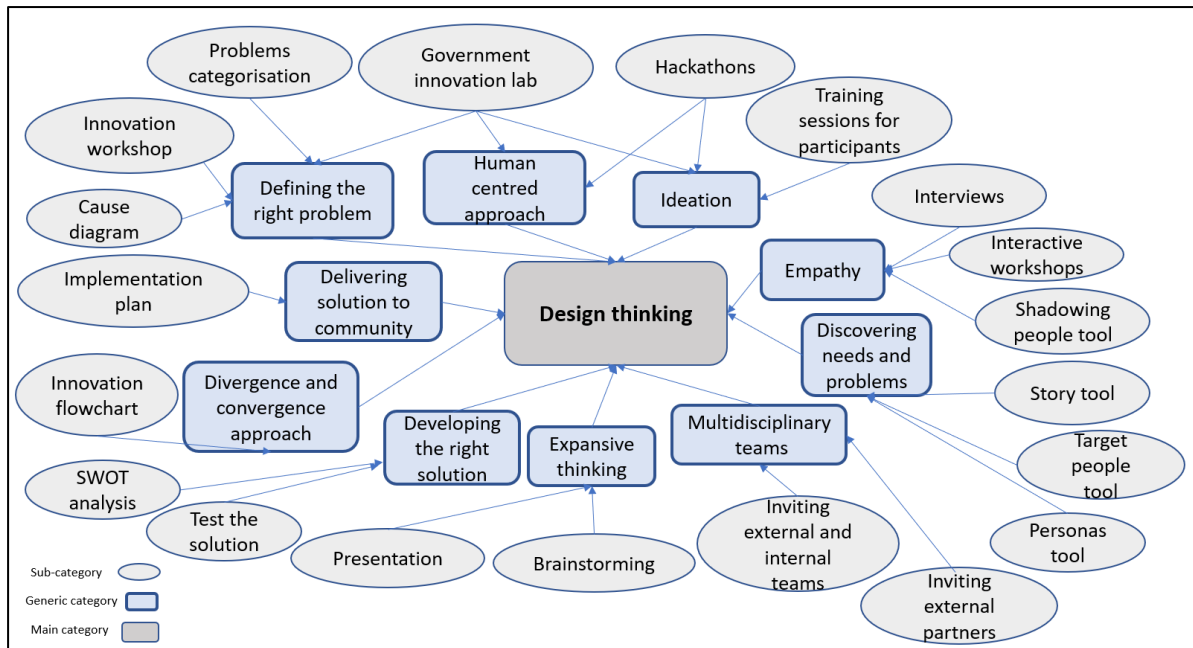


Figure 6.4: Coding of web content of case 4

## 6.5 Case 5: Analysis of web content and documents for P-E

As mentioned in Chapter 5, web platform P-E includes the community's ideas, and resources about innovation. The resources are available in English; however, most visitors of the platform are Arabic. There are two links: the first is for online learning, and the second is for articles and other resources about innovation. The analysis of the pages of the two links reveals the following points:

- A set of **design thinking techniques** are mentioned to be practised by the team during the innovation process (see Chapter 3). Some of the techniques are **mind maps, brainstorming, brainwriting and online whiteboard**. Brainwriting is when team are asked to produce one idea about a specific topic, then all the team members add their feedback on that idea. An online whiteboard can be used for collaboration within teams. It facilitates communication and performs tasks faster.
- There are four main points to **select the right problem** during the innovation process: “review existing information and priorities, ask why question, quantify success, and set expectation about the type of change”. Existing information includes customers' feedback and known issues.

- Applying open innovation has many benefits for organisations. For example, it creates new methods for **dealing with an organisation's challenges and opportunities to work with external partners.**
- It is important to specify the selecting criteria accurately when **assessing the community's ideas**, such as viability and feasibility. It is recommended to consider decision makers' views.
- **Involve experts and all stakeholders** during the open innovation process, and use presentation tools to discuss the community's ideas with them.
- **There are five points that should be asked before launching a challenge:** first, the main reason for launching the challenge, such as is it for improving a product or service or creating a new product or service; second, the exact details of the solutions the organisation needs; third, determining the target people who can provide the innovative solution; fourth, specifying the right incentive for participation either monetary, recognition, or social; and five, the solution evaluation criteria should be specified.
- Open innovation should include **multidisciplinary** teams, although there may be issues in inviting people with different perspectives to participate in one process. These issues may arise from cultural or geographical reasons, or people may even refrain from sharing knowledge. Therefore, it is vital to apply collaboration and communication skills in multidisciplinary teams.
- **Innovation labs** can play an essential role in the open innovation process by inviting all stakeholders to brainstorm ideas for problems then develop innovative solutions. All aspects of the open innovation process can be practised during the innovation lab session.
- There are many **benefits in applying open innovation and including the community.** For example, the community has tacit knowledge about products and services, and they know more than other people inside the organisation because they are the end users of service/product, therefore, they know the problem and the possible solutions. Moreover, the community has an incentive to innovate as the people face challenges with the product or

service on a daily use. The community is **tolerant of mistakes**; thus, they can test more than one idea until they reach the right solution.

- As external users or the community have tacit knowledge and may not be experts, it is important to learn how to extract the problems and the needs from them. **Design thinking tools and techniques** can be used.
- **Collaborating and assisting the community** when they develop solution is recommended, such as cooperating with the community to prototype their solutions. Innovation labs can play an essential role in that situation.
- To get successful open innovation via an open innovation platform the following should be achieved: selecting the **right problem** to reach the right solution, offering **valuable rewards**, ensuring **effective communication** with participants and external teams, and providing **enough time** for the problem to be solved effectively. Taking into consideration choosing the right problem is the first driver for a successful open innovation process via communities.
- “It can also be beneficial to include customers in these hackathons to get fresh solutions that already match the end-user’s needs”. When using **hackathons**, a set of principles should be practised: good determination of the **right challenge and** inviting **multidisciplinary perspective teams**. As **participants come from different disciplines**, using tools such as **design thinking tools** can be effective to assist them to generate innovative solutions.

Figure 6.5 presents how each point has been coded to the main category design thinking.

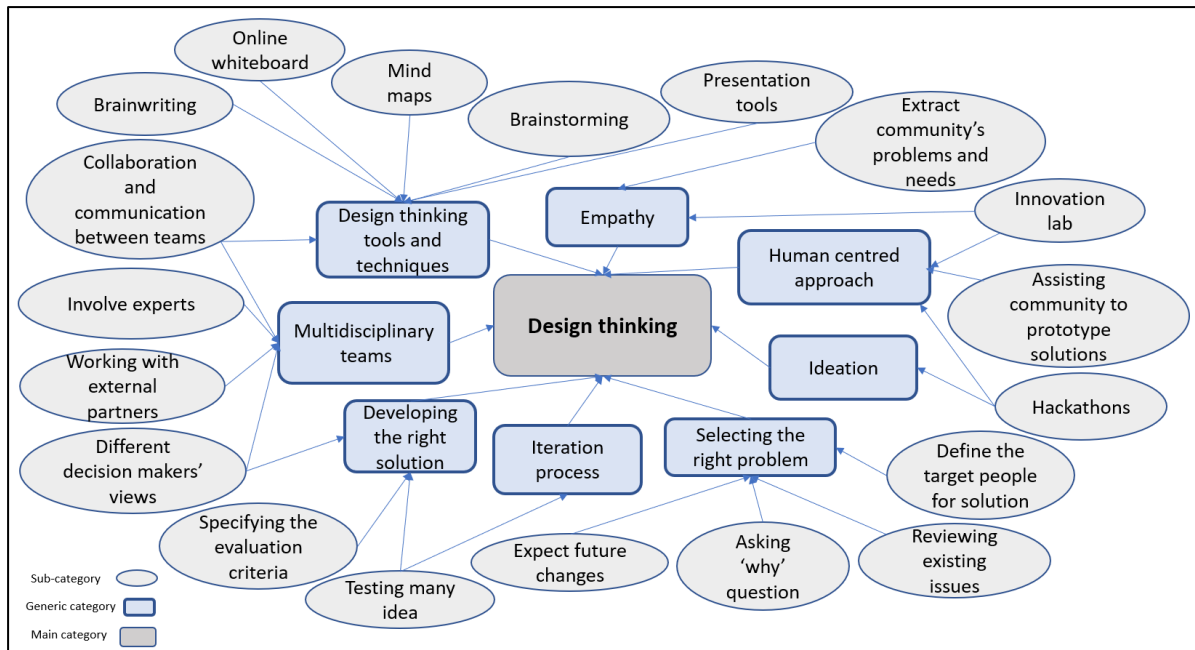


Figure 6.5: Coding of web content of case 5

## 6.6 Chapter summary

This chapter presented analysis for each case using a content analysis method. Each case has a web-based platform, in addition to some documents. The analysis aimed to discover more about how each case uses design thinking principles while applying open innovation through the platform. The following chapter discusses the results from the analysis.

## **Chapter 7: Discussion**

This chapter discusses the results presented in Chapters 5 and 6 as each case was analysed separately. This chapter provides a discussion and recommendations from analysing the five cases. Section 7.1 discusses how each case embodied design thinking through the open innovation process. Section 7.2 discusses the design thinking attributes applied in each case. In Sections 7.3 and 7.4, the final conceptual framework is developed and propositions are confirmed. Finally, in Section 7.5 a summary and recommendations are drawn from this chapter.

### **7.1 Applying design thinking through the open innovation process**

#### **7.1.1 Discovering communities' problems and needs**

The five cases discover needs and problems in different ways. They use interviews, surveys, consultation, community feedback, and the country's vision. Only P-A discovers problems outside organisation boundaries, in cooperation with the private or public sector. This is a diverging phase when the problem area is expanded and the platform practises empathy with the community. The analysis of the web content of the cases (Chapter 6) reveals that more tools can be used during this phase although they were not mentioned during the interviews, such as user shadow and story tools in P-D. Overall, the discovery phase in the Double Diamond model is practised as the initial phase of the open innovation process. The following design thinking attributes are practised during this phase: human centred approach, multidisciplinary collaboration, and multimodal communication. For example, innovation labs in P-B and P-D gather people from different areas, including the community, and group them in one place to discuss the community's problems.

P-E does not ask for community needs and problems at the beginning of the open innovation process; instead, it allows the community to post the solution for the problem they face. While reviewing the community solutions, the team checks a list of community needs prepared previously, such as a Customer's Voice Report. Thus, there are two scenarios for that process: the first scenario is where the platform specifies the problem (P-A, P-B, P-C and P-D), and the second is when the problem is not specified (P-E).



Therefore, design thinking can be combined with open innovation to discover communities' problems and needs in P-A, P-B, P-C and P-D.

### **7.1.2 Defining a specific community problem**

The second phase of the Double Diamond model is to practise a convergent phase to define a specific problem called a challenge. P-A, P-B, P-C and P-D set workshops with external people such as public organisations or internal department in the same platform organisation to define a specific problem to be solved by the community. On the other hand, P-E does not apply this phase, as P-E lets the community define the problem they face while suggesting a solution for that problem. Determining one specific problem requires many brainstorming techniques, which all four cases need to do. In addition to brainstorming, P-A uses persona, and P-D uses user journey. Multimodal communication skills and multidisciplinary team collaboration are applied during this phase. For example, in P-A, the platform team and challenge partner collaborate to define one problem. Platform teams with experts in P-B, P-C and P-D collaborate to define one challenge. In P-C teams discuss and filter many themes for about 4 weeks before specifying one challenge to be posted on the platform. In summary, the most used technique at this phase is brainstorming. However, the analysis of the five cases' web content indicated that more tools and techniques could be used to define the right problem, such as asking a 'why' question, cause diagram, and problem categorisation.

Therefore, all cases except P-E use design thinking to define a specific community problem.

### **7.1.3 Developing a solution for a specific problem**

In design thinking, solution development includes implementing, testing and prototyping the final solution (Dekker 2020). The developing solutions phase in the Double Diamond model complies with idea generation, solution selection, and solution development in the open innovation process. Idea generation is when the community is encouraged to post ideas through the platform, which all the five cases do. P-B and P-C conduct sessions to assist participants in doing experimentation before submitting the idea. P-C allows winners to enter incubators to prototype the final solution.

Not all cases do prototypes after announcing winners, such as P-A, whose role finishes once they announce the winners. In P-B, the prototyping is conducted only if they intend to implement the solution. P-E uses SWOT analysis to analyse and then select the right solution. Solutions are not consistently implemented in P-A and P-B, as they mentioned it is not their role, but they try as much as they can to implement the solution for the sector that needs the solution. P-D is only responsible for testing the solution but not delivering it to the community. The web content analysis confirmed the same results of the interviews related to testing, prototyping and implementing the final solution for each case. For example, the web content and documents analysis of P-B and P-C confirmed the use of participant information sessions to assist participants to develop the right solution before submitting it to the platform.

All the cases use multidisciplinary teams to either collect solutions or implement them, which are in line with the stages of the design thinking approach. Overall, the five cases use design thinking to select the best solutions.

#### **7.1.4 Delivering the final solution to the community**

This phase includes the final testing of the product or service and delivering it to users (Design Council 2015b). This phase involves evaluation and acquiring feedback from the final users (Design Council 2015a). Iteration repeats at this stage until reaching the right solution (Design Council 2015b). P-C is the ideal case that practises that by applying an incubation process for the winners, in which the key solution is tested for delivery to the community, in addition to evaluating the final solution. However, not all the cases do that. The interview analysis of P-A indicated that the implementation solution does not always occur. The analysis of P-A web content indicated that the administration overcame that by providing support for winners to assist them in launching their solutions to the community. Similarly, P-B and P-D do not consider delivering the solution to the community. However, P-D tested the solution. P-E confirms that the selected solution that passes the testing should be delivered to the community.

The web analysis indicated that if the solution is not implemented in P-B, they can direct the winner to another party that can benefit from that solution. P-C has a program after passing the incubation process to support winners such as ads on social media or even inside the organisation to support internal collaboration. P-D also offers an implementation plan through the innovation lab to ensure delivering the solution to the community.

In summary, the solution is not always delivered to the community in three cases, but only in P-C and P-E. This may be because of the nature of these cases which are mostly managed by government, and thus finance is an issue. Table 7.1 summarises how each case applies the Double Diamond model through the open innovation process.

**Table 7.1: Applying Double Diamond model through an open innovation process in the five cases**

		Open innovation process					
Double Diamond Model		Process before posting a problem	Problem posted on the platform	Idea generation	Solution selection	Solution development	Solution diffusion
Problem	Discover	P-A, P-B, P-C, and P-D: Discover community's needs and problems					
	Define	P-A, P-B, P-C, and P-D: -Themes identification -Problem specification	P-A, P-B, P-C, and P-D				
Solution	Develop			P-A, P-B, P-C, P-D, and P-E	P-A, P-B, P-C, P-D, and P-E	-In P-C and P-E solutions always are implemented -In P-A and P-B sometimes implemented -P-D only test the solution.	
	Diffuse						-Solutions is diffused to community in P-C and P-E. -Sometimes in P-A and P-B -Not the P-D role.

## 7.2 Evaluation of practising design thinking attributes

According to the design thinking attributes presented in Chapter 3, the following points explain how each design thinking attribute is applied in each case based on the results in Chapters 5 and 6.

### 7.2.1 Problem solving

The way of solving very complex problems is usually a description of design thinking, often called wicked problems (Lindberg et al. 2012; Micheli et al. 2019). The main aim of the five cases is to

solve complex problems, either by improving an existing solution to provide an innovative solution, or by finding a complete solution for an existing problem. However, the specific aim for each case is different. For example, P-A has challenges that aim to encourage the community to develop their startup. P-A can solve problems for the public and private sectors. P-B is seeking solutions for city challenges such as environment and education. Similarly, P-D encourages the community to solve problems in the public sectors. On the other hand, P-C has a specific goal to solve transport system challenges in the state. P-E is looking for solutions for problems in the commerce field. Therefore, solving a problem is the main aim of using a public online open innovation process in the five cases.

The methods for discovering problems are slightly different in each case. For example, P-B and P-C discover the community's problems and needs internally, which means by internal departments through using different tools and techniques such as observations, surveys, consultations, workshops, and interviews. Similarly, P-D obtains problems from various sectors in the country, in addition to checking the country's vision document. On the other hand, P-A welcomes any private or public organisation to discuss and present their problems through P-A. Finally, although P-E does not launch a specific problem through the platform, they check the Customer's Voice Report before evaluating the community's ideas. It is clear that all the five cases use open innovation to solve wicked problems which are hard to solve in traditional linear ways (Rittel & Webber 1974). Rittel & Webber (1974) added that wicked problems usually occur in the social context which precisely reflects the nature of problems that emerge in the public sector.

### **7.2.2 Human centred approach**

As mentioned in Chapter 2, a human centred approach is one aspect of design thinking (Brown & Katz 2011; Liedtka 2015; Martin 2011). This means the focus when solving a problem is on customers' needs and experiences instead of a product-centric orientation. Therefore, customers, communities or citizens who benefit from products or services can play an essential role through the early stages of design thinking (Beverland, Wilner & Micheli 2015).

For the cases in this study, the analysis indicated many points regarding including community through the open innovation process. All the five cases include community in the first stage of the open innovation process when discovering problems and needs. Some of them, such as P-B and P-D, allow the community to brainstorm the problems with decision makers through conducting a city lab which is based on human centred approaches. As indicated by McGann, Blomkamp & Lewis (2018) innovation labs practise design thinking in designing public policies. Moreover, innovation labs allow the community to generate ideas and test and prototype them such as in P-B and P-D. P-B and P-C invite the community to generate ideas, and test and prototype solutions. P-D only invites the community to ideate through the platform. P-C is the only platform that includes participants through the whole process of open innovation, until implementing the solution. On the other hand, P-B sometimes invites the winner to implement the solutions.

### **7.2.3 Iteration and experimentation**

Design thinking is an iterative process. This includes iterative thinking and learning by making mistakes until reaching the right solution (Beckman & Barry 2007; Beverland, Wilner & Micheli 2015). All five cases practise iteration and experimentation in different ways. For example, P-A confirmed that the first stages of open innovation include refinement many times until reaching the right problem. P-B and P-C conduct information sessions between participants and experts to experiment on the participants' solutions. Moreover, P-B, P-C and P-D launch innovation labs where they practise iteration and experimentation by discussing problems, and generate and test possible solutions. P-E also practises iteration by testing possible solutions. P-C uses an incubation process for the winners to prototype the final answers. According to Beverland, Wilner & Micheli (2015), end users should be involved through the experimentation process, which four of the cases do. Only P-E does not include users.

### **7.2.4 Multidisciplinary collaboration**

All five cases clearly include multidisciplinary teams through the open innovation process. Including interdisciplinary collaboration in design thinking provides more valuable solutions rather than a team from the same discipline (Davis 2010). The formation of teams is varied in each case, however

there are similarities in forming the judging panel which is usually a group of people from outside the organisation except in P-E where all the team panel members are from within the organisation. According to Luchs (2015) and Carlgren, Rauth & Elmquist (2016) it is possible in design thinking to invite multidisciplinary people from outside the organisation, which most cases do. Conflict negotiation is another aspect of multidisciplinary collaboration that all of the five cases face when asked if there is a conflict when they choose winners. Although conflict in decisions does not affect the track of the open innovation process, it boosts a collaboration atmosphere and presents different perspectives between the multidisciplinary members. The judging panel members, who are usually invited from outside the organisation, differ with each challenge launched through the platform. This is because each challenge has a specific and different theme. Although the platform team does not change, different internal experts can be invited each time such as in P-B, P-C and P-E.

On the other hand, there is a lack of coordination and collaboration in P-A and P-B between the platform team and the external entity who posts the challenge in diffusing the final solution to the community.

### **7.2.5 Multimodal communication skills**

Multidisciplinary team collaboration needs healthy communication skills. Multimodal communication skills include verbal and visual (Luchs 2015). As mentioned earlier, all the five cases have teams from different fields, either internal or external. Thus, communication skills should exist. Based on how the meetings are managed in each platform as Chapter 5 showed, the meetings in P-B have different forms of communication. For example, the communication during the CityLab includes face-to-face, oral, discussions and presentations. The platform team leader managed the meetings to ensure sufficient communication between all the team members. There is also an online communication between the technical team and platform to send the participants' ideas to the platform team, which occurs in P-A, P-B and P-E. Furthermore, in P-A the external entity contacts the platform team to discuss problems they face, which need sufficient communication skills between two different organisations. Professional communication skills are also needed when there is a conflict between the judging panel in deciding the final winner in all five cases. All of them are

aware of this point; thus, they have a policy to address that issue such as voting in P-D or giving the platform the final approval.

On the other hand, there is multimodal communication between participants and the platform management team. P-A, P-B, P-C and P-D communicate with participants differently, such as when the platform asks them to submit solutions, or as in P-B and P-C when they conduct information sessions between participants and experts. The pitch showcase in P-A, P-B, P-C and P-D is a healthy practice of communication by oral presentation between the judging panel and participants.

There is a lack of communication between the P-D platform team and the public organisation in the diffusion of the final solution to the community. The platform is only responsible for testing the solution and may fund the solution; however, the platform is not responsible for diffusion to the community and getting feedback from them.

### **7.2.6 Ability to visualise**

Visualising ideas and solutions is an important aspect of design thinking (Kimbell 2011). According to Kernbach & Nabergoj (2018) visual thinking can occur through the whole process of design thinking. As Luka (2019) stated, visualisation is the mother of all design thinking tools. Using a set of visualisation tools and techniques is an indicator of practising visualisation (Carlgren, Rauth & Elmquist 2016; Kernbach & Nabergoj 2018).

P-A uses persona maps to visualise the users' needs and problems, thus facilitating discussion to define the correct problems. P-B uses feedback to visualise community concerns. P-C uses sticky coloured notes and whiteboards to visualise all the possible suggested ideas and select the right one. Moreover, the P-D web content analysis reveals a set of tools for visualisation such as a story tool, personas, a target people tool, and a shadowing people tool. More specifically, the tools can be used to visualise community problems and needs. Similarly, the web content analysis of P-E showed a set of visualisation tools can be used through an open innovation process such as presentation tools to discuss the community's ideas with experts. Brainwriting tools can be used to visualise multiple perspectives of ideas.

### **7.2.7 Tolerance of ambiguity and failure**

Designers should be tolerant of failure, as they do a lot of experimentation to reach the right solution (Glen et al. 2015). Moreover, ambiguity can exist in wicked problems, thus people practising design thinking should accept that ambiguity (Micheli et al. 2019). Bearing failure can open many opportunities for more innovative solutions (Kolko 2015). To infer the tolerance of five cases, it can be noticed that all the five cases are seeking solutions for wicked problems; they find a solution to reveal the ambiguity of that problem. Another point is the experimentation phases, when the suggested solution is experimented with before approval. For example, P-B and P-C launch a knowledge week where participants can experiment on their suggested solutions before submitting them through the platform. P-C does a prototype after announcing the winners. Analysing the web content and interviews indicated that innovation labs are also a way for failure to occur until reaching the right solution. Therefore, it is clear that the stakeholders of the five platforms are tolerant of ambiguity and failure.

### **7.2.8 Using design thinking tools and methods**

As explained in Chapter 3, many design thinking tools can be used during each phase of the Double Diamond model. However, a study by Micheli et al. (2019) indicated a set of standard tools and methods used in design thinking: ethnographic methods such as interviews and observation, personas, journey maps, brainstorming, mind maps, visualisation, prototyping, and experiments. Liedtka, King & Bennett (2013) indicated similar tools. It is stated that tools and methods clearly represent the previous design thinking attributes (Micheli et al. 2019). Interviews, observations and personas embody the human centred approach and empathy with end users. Multidisciplinary collaboration and user visualisation can also appear through applying personas. Similarly, journey maps represent empathy, a human centred approach, interdisciplinary collaboration, visualisation, and iteration by testing many users' journeys. Brainstorming serves the multidisciplinary collaboration, iteration and experimentation by assessing the suggested ideas. Mind maps embody multidisciplinary collaboration, accepting ambiguity, and visualisation of the user perspective.



Iteration, experimentation, a human centred approach, and interdisciplinary collaboration can be found using visualisation tools and prototyping.

All the five cases use most of the design thinking tools. P-A uses brainstorming, personas, and a pitch showcase to visualise the community’s solutions, and comparing notes to select winners. P-B uses interviews, surveys, brainstorming, comparing notes, a pitch showcase, and experimentation. P-C uses observation, brainstorming, sticky coloured notes and whiteboards to score ideas, experimentation, prototyping, and a pitch showcase. P-D uses observing community, brainstorming, user journey, and a pitch showcase. Finally, P-E uses observing community, brainstorming, voting to select ideas, and using presentations to present solutions. In summary, brainstorming and observing the community have been used by all the five cases. The pitch showcase is used in most cases except P-E. Table 7.2 shows that all the design thinking attributes are applied through the five cases. Iteration and experimentation are not practised by P-E, due to the nature of using the open innovation process, which is slightly different from the other cases.

**Table 7.2: Using design thinking attributes through the five cases**

Design thinking attributes								
	Problems solving	Human centred approach	Iteration and experimentation	Multidisciplinary collaboration	Multimodal communication skills	Ability to visualize	Tolerance of ambiguity and failure	Using design thinking tools and methods
P-A	√	√	√	-Multidisciplinary applied -Lack of coordination between platform team and external entity regarding diffusing final solution	√	√	√	√
P-B	√	√	√	-Multidisciplinary applied -Lack of coordination between platform team and external entity regarding diffusing final solution	√	√	√	√
P-C	√	√	√	√	√	√	√	√
P-D	√	√	√	√	-Multimodal communication applied, however; -There is lack of communication between platform team and external entity regarding diffusing the final solution	√	√	√
P-E	√	√	Iteration is not applied, it is linear process	√	√	√	√	√

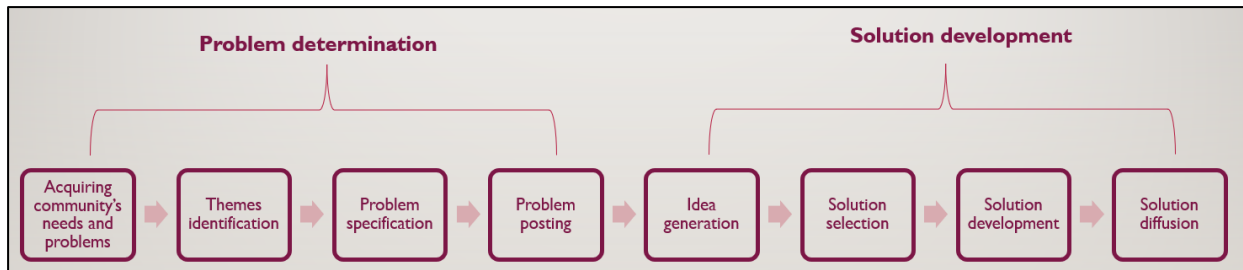
### 7.3 Revised conceptual framework

The previous discussion shows that public online open innovation platforms allow a local community to be part of an open innovation process by sharing their innovative ideas about a specific problem. However, capturing community needs before issues are posted is an essential phase that is ambiguous in the open innovation literature. In previous studies, open innovation in a community was applied by seeking innovative solutions without exploring ways to capture community needs as an initial phase before designing a product or service (see Figure 7.1).



**Figure 7.1: Traditional innovation process through online open innovation platforms in the public sector**

The results proved that there is a missing step in the open innovation process through public online open innovation platforms: how the problem is determined concurrently with using design thinking. The analysis showed many methods are used to discover and capture community needs and concerns, such as interviews, workshops that include consultations and recent research on the problem field, suggestion boxes, social media and monitoring country vision indicators, and using innovation labs which mainly apply design thinking techniques. Therefore, as Figure 7.2 shows, the process is divided into two parts: the first part presents how the problem is determined, and the second part explains how the solution is generated. In comparison to Figure 7.1, in which the innovation process is started by posting a problem through the platform, the analysis of four cases (except P-E) proved that community needs should be captured. A list of themes is generated. The themes are discussed, and brainstorming is applied until one problem is specified. Afterwards, the selected problem is posted on the platform.



**Figure 7.2: Revised innovation process through online open innovation platforms in the public sector**

The initial conceptual framework developed in Chapter 3 is reviewed, in addition to showing how each case uses design thinking in Chapter 5. The final conceptual framework is presented as shown in Figure 7.3. It explains how each process of the Double Diamond model is applied through the open innovation process. The first phase of open innovation, which is acquiring the community's needs, is linked with the discovery phase of the Double Diamond model, which means that design thinking attributes and tools can be applied through this phase to lead to a better understanding of community needs which is called empathy. Theme identification, problem specification, and problem posting are linked with the problem definition phase in the Double Diamond model, which means the three phases can use design thinking to better determine the right problem. On the other side, the solution development part of the open innovation process, which includes idea generation by the community, solution selection by the judging panel, and solution implementation, can be used from the development phase in the Double Diamond model. Finally, solution delivery is linked with solution diffusion which includes final testing and providing the final solution to the community.

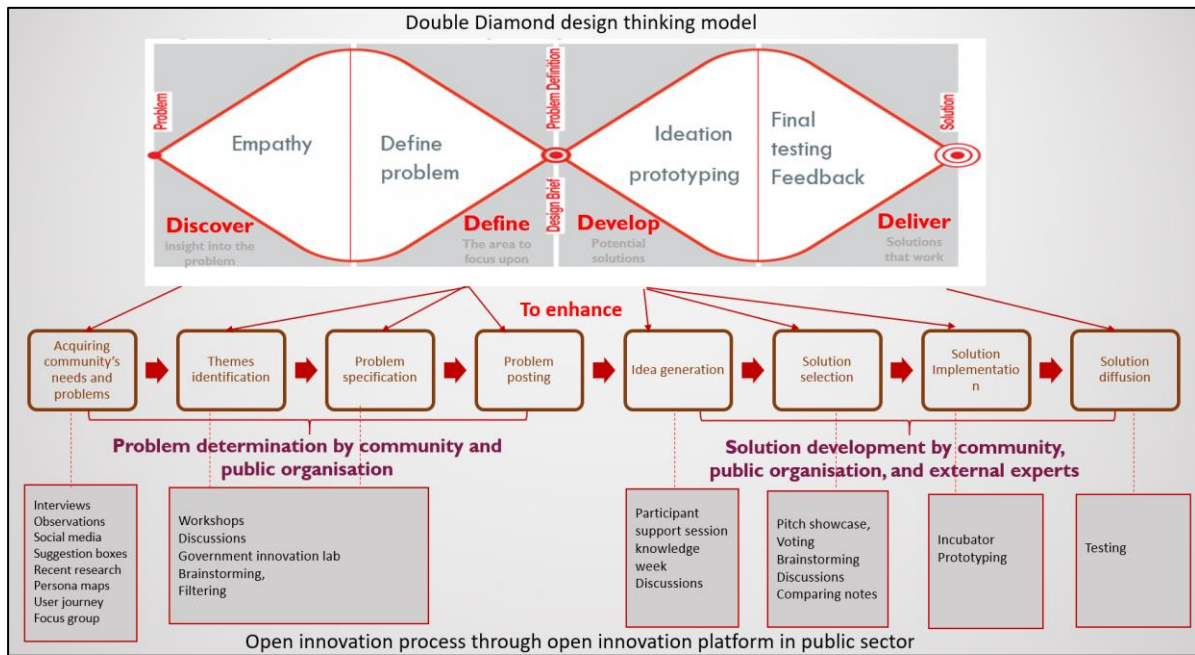


Figure 7.3: Final conceptual framework of using design thinking through an open innovation process in the public sector

## 7.4 Evaluation of propositions

The following propositions were developed in Chapter 3:

- The current phases of the open innovation process that are reported in the literature can be extended and the problem identification phase can be added to the current open innovation process.
- The concepts of the design thinking approach are embedded in driving open innovation in the public sector.
- Tools and techniques used in different phases of design thinking are applied in the open innovation process.

According to the previous discussion, it can be confirmed that design thinking can be used through an open innovation process specifically applied in the public sector. It was obvious that P-C has the best practice through the whole process of applying design thinking. Other cases such as P-A, P-B and P-D partially practise design thinking. There are some limitations regarding delivering the final solution and some design thinking attributes. Therefore, it can be noticed that the more design

thinking is applied, the better the application of open innovation. Overall, all propositions are confirmed.

## 7.5 Summary and recommendations

The following points are a summary and recommendations from the previous discussion:

- It is recommended that the open innovation platform is applied and managed by public organisations with a specific focus such as the Ministry of Education and the Ministry of Health in P-D and P-E, as that organisation will ensure delivering the final solution to the community. On the other hand, if the platform is only operating the open innovation process and does not control the whole process, this will lead to uncertainty in delivering the final solution to the community.
- It is recommended that a specific problem is specified before asking the community for a solution. This will ensure the proper determination of the problem as design thinking aims to.
- P-C is the best example of practising design thinking and diffusing the final solution to the community in a well-organised approach, as well as practising all the design thinking attributes. Therefore, the more design thinking is applied, the better the application of open innovation.
- The final solution in P-A and P-B is not always delivered to the community due to a lack of coordination and collaboration between the platform team and the external entity that launches the challenge.
- There is a lack of communication between the P-D platform team and the public organisations who need the final solution. P-D is only responsible for testing the answer, but not ensuring its diffusion to the community and getting a feasible solution.
- P-E has a different scenario of practising the open innovation process. Thus, it is not practising design thinking as it should be. For example, P-E does not determine the right problem at the beginning of the process. Further, P-E practises open innovation as a linear process.

- It was noticed from the interviews that not all people practising open innovation have enough knowledge about design thinking, even though they practise it. Therefore, there is a need to educate people in the public sector to practise design thinking to ensure the best practice of open innovation.

## **Chapter 8: Research Contribution and Recommendations for Future Studies**

This chapter presents the contribution of this research, both in theory and practice. It outlines the limitations of this study, makes suggestions for further research and draws a conclusion.

Drawing from the literature, this study proposed a conceptual framework that depicts how open innovation is conducted in the public sector and points out that the steps of design thinking are used in driving open innovation. The proposed framework is confirmed by interviewing open innovation experts in different countries and analysing the content of five platforms. The study contributes to the body of knowledge theoretically and practically.

### **8.1 Theoretical contribution**

**The confirmed fit of the conceptual framework that depicts different phases of open innovation and activities in each step validates the theoretical contribution of the research.**

Recent studies affirmed that more research attention had been paid to implementing open innovation in the public sector, and there is a lack of understanding about the open innovation process in the public sector (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021).

This exploration advanced the understanding of conducting open innovation in the public sector. The proposed and validated conceptual framework demonstrates how open innovation is undertaken in the public sector and provides a wealth of information about activities, tools and techniques undertaken in the open innovation process and tools and techniques applied in conducting activities. This study showed that concepts of the design thinking approach are embedded in driving open innovation in the public sector. Tools and techniques used in different phases of design thinking can be applied in the open innovation process.

**This study adds to the literature on open innovation by revisiting the open innovation process and extending the current phases of the open innovation process reported in the literature.**

Accumulated evidence from the literature showed that little is known about the existence of the problem identification phase, and it was overlooked in previous studies. In addition, there is a lack of understanding and clarification about the solution diffusion phase of the open innovation process in the public sector (Franco, Presenza & Petruzzelli 2021; Kollwitz & Dinter 2019; Temiz 2021; Wang et al. 2021; Yuan & Gasco-Hernandez 2021).

In this research, interviews and content analysis revealed that the problem determination phase is conducted before the “problem posted” step. The activities undertaken in the problem determination phase include acquiring the community’s needs and concerns, identifying themes and specifications, and defining the problem. This study also shows that activities in the solution diffusion phase develop and test a prototype of the best solution, which are in line with activities conducted in the “delivery phase” of the design thinking approach.

## **8.2 Practical contribution**

**This research provides a framework that guides organisations in undertaking open innovation.**

Previous studies have stated that a lack of awareness of the open innovation process in the public sector is a barrier to adopting such platforms (Mergel 2018).

This qualitative study of five cases or platforms provided insights into the lived experience of people conducting open innovation in the public sector. By proposing and validating a conceptual framework of open innovation in the public sector, this study enables organisations to understand the open innovation process better. This can motivate organisations to apply open innovation to address complex issues. The exploration approach provides a clear road map for stakeholders and enables them to be familiar with activities that should be implemented in each phase. In addition, the proposed conceptual framework sheds light on the required skills and resources for undertaking the activities. This can support organisations to adopt strategies for better supplying and managing



required resources and provide opportunities to equip open innovation practitioners with the skills necessary for conducting open innovation in the organisations.

**This research lays the groundwork for opportunities for the community to be considered as co-decision makers for value creation.**

This study provided a comprehensive picture of open innovation implementation in the public sector. It addressed the concern of the organisations that are reluctant to use open innovation due to existing ambiguity in the process and can motivate them to open the door to external sources and, by tapping into the knowledge of the community, can bring more value to the organisation and involve the community as co-decision makers.

### **8.3 Implications for researchers**

**The proposed conceptual framework is an excellent starting point for researchers interested in open innovation.**

Recent studies have reported that the diversity of a community's background led to a lack of coordination among community members (Bertello, Bogers & De Bernardi 2022) and collaboration between organisations working together to achieve a solution by applying open innovation (Hameduddin, Fernandez & Demircioglu 2020; Mergel 2018).

This study revealed that organisations could harness the power of the design thinking approach in conducting open innovation in the public sector. On the other side, the literature stated that design thinking is a user-centric and structured approach that supports coordination between stockholders from diverse backgrounds and provides opportunities for them to address complex problems in an organised way. This combination can tackle the lack of coordination in open innovation previously reported in the literature.

## **8.4 Limitations and recommendations for future studies**

### **Broadening the sample of the study**

This research studied five open innovation platforms in three countries. Future researchers are encouraged to consider looking at more open innovation platforms in various countries and have a larger sample size, including those entities that work with platform teams to launch the problem on the platform.

### **Conducting empirical investigations**

This study has applied a qualitative approach to explore the open innovation process in the public sector and proposed a conceptual framework that depicts the design thinking approach embedded in the open innovation process and techniques applied in different phases of the design thinking approach that can be used in the open innovation process. It is recommended that future studies empirically test the conceptual framework in the broader population and empirically show the benefits of harnessing the power of design thinking in open innovation.

### **Conducting comparative studies in countries with different economic, cultural, educational and political conditions**

This study investigated platforms in three different countries. It is recommended that future studies investigate the open innovation process with particular attention to the users' culture, education and policy backgrounds and circumstances, and compare results in different national contexts based on the research model proposed in this thesis.

## **8.5 Summary**

To conclude, this study comprehensively examined the conduct of the open innovation process in the public sector by proposing a conceptual framework that depicts activities, tools and techniques applied in open innovation in the public sector, which are informed by concepts of the design thinking approach. The latter empowers an organisation to understand the essential tools and techniques required to conduct open innovation and to better implement open innovation.

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## **Appendix A: Interview questions (English version)**

### **Scenario and questions of the semi-structured in-depth interview:**

Hello Mr./Mrs. ....

First, I would like to thank you for agreeing to participate in my research. Second, I want to confirm that your answers will be securely stored and will be used only for the purposes of this research. Moreover, if you feel that you do not want to complete this interview, then you have the right to stop this interview at any stage. Further, if you want to skip any question, you can do so.

Are you ready to start the interview?

Can you introduce yourself, please?

### **Closed and open innovation:**

1. Can you talk about your platform?
2. When has your organisation decided to seek ideas from outside the organisation? Do you think this has been effective? How?
3. Does your organisation implement innovative ideas proposed by people inside the organisation? How?
4. How would you compare the situation before your organisation started to invite ideas from people outside your organisation and after that?

### **Discover and identifying community needs and problems:**

5. Can you explain how you take into account community needs and problems in your process of selecting ideas?
6. How do you identify community needs?
7. How do you discover community problems?

8. Who is responsible for identifying and discovering community needs and problems?
9. Can you tell me about the meeting for discussing community needs and problems?
10. Do you update community needs? If yes, what criteria do you use?

**Evaluation team:**

11. For how long have you been a member of the evaluation team?
12. How many members participate on the evaluation team?
13. How often does the evaluation team meet? Weekly? Monthly?
14. Are the team members from the same field of idea evaluation? What is your field?
15. How long does each meeting last?
16. How do you inform each other about the meeting? Is there a leader?
17. Is the meeting recorded?
18. How many ideas do you discuss in one meeting?
19. How do you start your meeting? Are there specific topics for every meeting?

**Process of ideas evaluation and selection:**

20. How do you present ideas during meetings? Via the platform, presentations, papers, other?
21. Can you tell me about the first step of presenting the ideas?
22. How do you include or exclude a specific idea?
23. How do you identify an idea as worthy of presentation?
24. Does every member take responsibility for a specific number of ideas? Or how do you manage the presentation of ideas?
25. How does your team handle disagreement among members about a specific idea?
26. How do you make the final decision about a selected idea?
27. What is the role of the open innovation platform in the evaluation process?
28. How do you decide if a specific idea can be implemented in the real world?
29. Do you categorise ideas? How?
30. Do you use design thinking or any other specific strategies when you select ideas?

31. Do you use a specific list or criteria when you choose ideas? Can you explain further?
32. Is there a specific list of community needs that you follow while selecting ideas? What is it?
33. What if the selected idea is very good but it does not match community needs?
34. Do you invite experts to evaluate specific ideas, for example, digital ideas?
35. How many ideas do you choose in the end?
36. What is the process of implementing the selected solution?
37. How do you deliver the selected solution to the community?

**Thank you for your time.**

## Appendix B: Interview questions (Arabic version)

### مخطط أسئلة المقابلة

أستاذة...../مرحبا أستاذ

أولا أتقدم بشكرك على قبولك المشاركة في هذا البحث. ثانيا أود التأكيد على أن أجوبتك ستكون مخزنة بشكل آمن وسوف تستخدم فقط لأغراض البحث. إذا كنت تشعر بعد رغبتك بإكمال هذه المقابلة سيكون لك كامل الحق في إنهاء هذه المقابلة في أي وقت. أو إذا كنت ترغب بعدم الإجابة على سؤال معين فسيكون لك الحق أيضا بحذف هذا السؤال.

اذن نستطيع الآن البدء بالمقابلة..

هل يمكنك تقديم نفسك؟

الابتكار المغلق والمفتوح:

1. هل يمكنك التحدث عن منصتكم؟
2. متى قررت منظمتك جلب أفكار من خارج المنظمة؟ وهل تعتقد أنها فعالة؟ كيف؟
3. هل ما زالت مؤسستك تنفذ أفكار مبتكرة مصدرها الأشخاص يعملون داخل المنظمة؟ كيف؟
4. كيف يمكنك مقارنة الموقف قبل استيراد الأفكار من أشخاص خارج المنظمة وبعد ذلك؟

اكتشاف وتعريف احتياجات ومشاكل المجتمع:

5. هل يمكن أن توضح كيف تأخذ في الاعتبار متطلبات المجتمع أثناء اختيار الأفكار؟
6. كيف تكتشف متطلبات أو مشاكل المجتمع؟
7. كيف تحدد متطلبات أو مشاكل المجتمع؟
8. من هو المسؤول عن اكتشاف وتعريف احتياجات المجتمع؟
9. هل ممكن ان تخبرني عن اجتماع لمناقشة متطلبات ومشاكل المجتمع؟
10. هل تقوم بتحديث اهتمامات أو متطلبات المجتمع؟ إذا كانت الإجابة بنعم، حسب ماذا؟

اجتماع فريق تقييم أفكار المواطنين:



11. منذ متى وأنت عضو في فريق التقييم؟
12. كم عدد أعضاء فريق التقييم؟
13. كم عدد مرات الاجتماع؟ أسبوعي؟ شهرياً؟
14. هل جميع أعضاء الفريق من نفس مجال تقييم الفكرة؟ ما هو مجال عملك؟
15. كم مدة الاجتماع؟
16. ما الذي يتم استخدامه لإبلاغ بوجود اجتماع؟ هل هناك قائد للاجتماع؟
17. هل يتم تسجيل الاجتماع؟
18. كم عدد الأفكار التي يتم مناقشتها في اجتماع واحد؟
19. كيف يبدأ الاجتماع؟ هل هناك موضوع محدد لكل اجتماع؟

### عملية تقييم واختيار الأفكار:

20. كيف يتم عرض الأفكار خلال الاجتماع؟ بواسطة المنصة، العرض التقديمي، الأوراق، أخرى؟
21. هل يمكنك أن تخبرني عن الخطوة الأولى في عرض الأفكار؟
22. على أي أساس يمكنك تضمين أو استبعاد فكرة محددة؟
23. كيف تتحقق أن فكرة معينة تستحق التقديم؟
24. هل يتحمل كل عضو بالاجتماع مسؤولية طرح عدد محدد من الأفكار؟ إذا كان نعم كيف سيتم ادارتها؟
25. ماذا لو كنت متفقاً على فكرة معينة بينما لم يوافق عليها عضو آخر؟
26. كيف تتخذ القرار النهائي بشأن الفكرة المختارة؟
27. ما هو دور منصة الابتكار المفتوحة في عملية التقييم؟
28. كيف تقرر ما إذا كان يمكن تنفيذ فكرة محددة على العالم الحقيقي؟
29. هل تصنف الأفكار؟ كيف؟
30. هل تستخدم التفكير التصميمي Design Thinking أو أي استراتيجيات معروفة عند اختيار الأفكار؟
31. هل تستخدم قائمة أو معايير محددة عندما تختار فكرة؟ ماهي؟
32. هل يوجد قائمة احتياجات للمجتمع تتبعها عند اختيار الحل؟
33. ماذا لو كانت الفكرة جيدة جداً ولكنها لا تتوافق مع مصالح المجتمع؟
34. هل يتم دعوة خبير في مجال ما لتقييم أفكار محددة؟ على سبيل المثال، فكرة رقمية؟
35. كم عدد الأفكار التي يتم اختيارها في النهاية؟
36. ماهي العملية المتبعة لتنفيذ الحل النهائي؟

37. كيف تقومون بنشر الحل للمجتمع؟

انتهت الأسئلة شكرا لك

## Appendix C: UTS Human Ethics approval

HREC Approval Granted - ETH19-4450

📎 1 ✓



Research.Ethics@uts.edu.au

To: Research Ethics; Igor Hawryszkiewicz; Areej Fahad A Alqahtani



Wed 7/22/2020 3:54 PM

Dear Applicant

**Re: ETH19-4450 - "An Exploration of Using an Open Innovation Process for Selecting Ideas in the Public Sectors"**

Thank you for your response to the Committee's comments for your project. The Committee agreed that this application now meets the requirements of the National Statement on Ethical Conduct in Human Research (2007) and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application on the condition that all letters of organisational consent are provided prior to the commencement of the recruitment process.

You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all [UTS policies and guidelines](#) including the Research Management Policy.

Your approval number is UTS HREC REF NO. ETH19-4450.

# Appendix D: Participant information sheet (English version)



## PARTICIPANT INFORMATION SHEET FOR AN EXPLORATION OF USING AN OPEN INNOVATION PROCESS FOR SELECTING IDEAS IN THE PUBLIC SECTORS. (UTS HREC RF NO. ETH19-4450)

### WHO IS DOING THE RESEARCH?

My name is Areej Fahad ~~A Alqahtani~~ I am a student at UTS. My supervisor is:  
Prof. Igor Hawryszkiewicz  
Professor of Computer Sciences at School of Information, Systems and Modelling  
Igor.Hawryszkiewicz@uts.edu.au

### WHAT IS THIS RESEARCH ABOUT?

This research aims to find out how evaluation teams evaluate and select citizens' ideas using an open innovation platform. Additionally, how do evaluation teams identify citizens' values when they select ideas? Do the evaluation team values match citizens' values that are derived from the platform content? The main research output is to develop a model to describe the process of evaluating citizens' ideas in the context of open innovation platforms.

### WHY HAVE I BEEN ASKED?

You have been invited to participate in this study because you are a member of the team that selects citizens' ideas from among a huge number of ideas posted on an open innovation platform. Your participation will add value to this research as the research findings will benefit your organization by making available to you a universal model of evaluating citizens' ideas. The data will be used in PhD research and may be published in a journal and/or presented at a conference.

### IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to participate in a one-hour semi-structured interview that will be audio recorded and transcribed. The interview will be conducted online. You will have an opportunity to review the transcript.

### ARE THERE ANY RISKS/INCONVENIENCE?

No harm to you is expected to result from this study; however, participants may be embarrassed when asked about the final stage when the team makes a final decision. This is because team members need to agree to select a specific number of ideas. Moreover, some interview questions may lead to negative or critical answers.

In all cases, you have the right to not answer any question that you do not want to answer. Your decision to participate in this study will not impact your position at the organization as your answers will not be shared with any other participants.

### DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

### WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researcher. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting on areejfahada.alqahtani@student.uts.edu.au or call me on Australian number [REDACTED] or Saudi number [REDACTED]

If you withdraw from the study, the transcripts will be destroyed

### CONFIDENTIALITY

By signing the consent form, you consent to the research team collecting and using personal information about you for the research project. This information will be treated confidentially. Participants will not be identified by name and will be given pseudonyms. Your information will be used only for the purpose of this research project. We plan to compile the results of this research in a thesis, which may be published and/or presented at a conference.

# Appendix E: Participant information sheet (Arabic version)

[تحتار]

ورقة معلومات المشاركين لاستكشاف استخدام عملية ابتكار مفتوحة لاختيار الأفكار في القطاعات العامة.  
(UTS HREC RF NO. ETH19-4450)

من يقوم بهذا البحث؟

اسمي أريج فهد القحطاني، طالبة في جامعة التكنولوجيا، سيدني.  
ومشرفي هو: البروفيسور إغور هاويرزكيويفيتش  
أستاذ علوم الحاسوب بكلية المعلومات والنظم والنمجة  
Igor.Hawryszkiewicz@uts.edu.au

ما الهدف من هذا البحث؟

يهدف هذا البحث إلى معرفة كيفية تقييم فرق التقييم واختيار أفكار المواطنين باستخدام منصة ابتكار مفتوحة. بالإضافة إلى، كيف تحدد فرق التقييم قيم المواطنين عند اختيار الأفكار؟ هل تتطابق قيم فريق التقييم مع قيم المواطنين المستمدة من محتوى المنصة؟ ويتمثل نتائج البحث الرئيسي في تطوير نموذج لوصف عملية تقييم أفكار المواطنين في سياق منصات الابتكار المفتوحة.

لماذا سنلت؟

لقد تمت دعوتك للمشاركة في هذه الدراسة لأنك عضو في الفريق الذي يختار أفكار المواطنين من بين عدد كبير من الأفكار المنشورة على منصة ابتكار مفتوحة، وستصنف مشاركتك قيمة لهذا البحث، حيث ستفيد نتائج البحث مؤسستك من خلال توفير نموذج عالمي لك لتقييم أفكار المواطنين، وسيتم استخدام البيانات في أبحاث الدكتوراه، ويمكن نشرها في مجلة / أو تقديمها في مؤتمر.

إذا قلت نعم، ما الذي يترتب على ذلك؟

إذا قررت المشاركة، فسأدعوك للمشاركة في مقابلة شبه منظمة، مدتها ساعة واحدة يتم تسجيلها وتحويلها بالصوت، وسيتم إجراء المقابلة عبر الإنترنت، وسيكون لديك فرصة لمراجعة النص.

هل توجد أي مخاطر / مضايقة؟

لا يتوقع أن ينتج عن هذه الدراسة أي ضرر؛ ومع ذلك، قد يشعر المشاركون بالحرج عند سؤالهم عن المرحلة النهائية عندما يتخذ الفريق قرارًا نهائيًا، وذلك لأن أعضاء الفريق بحاجة إلى الموافقة على اختيار عدد معين من الأفكار، علاوة على ذلك، قد تؤدي بعض أسئلة المقابلة إلى إجابات سلبية أو ناقدة.  
في جميع الأحوال، يحق لك عدم الإجابة عن أي سؤال لا تريد الإجابة عليه، ولن يؤثر قرارك بالمشاركة في هذه الدراسة على وضعك في المؤسسة، حيث لن يتم مشاركة إجاباتك مع أي مشاركين آخرين.

هل يجب علي أن أوافق؟

المشاركة في هذه الدراسة طوعية، والأمر متروك لك تمامًا، سواء قررت المشاركة أم لا.

ماذا سيحدث إذا لم أوافق؟

إذا قررت عدم المشاركة، فلن يؤثر ذلك على علاقتك بالباحث، إذا كنت ترغب في الانسحاب من الدراسة بمجرد أن تبدأ، فيمكنك القيام بذلك في أي وقت دون الحاجة إلى إبداء سبب، عن طريق التواصل على [areejfahada.alqahtani@student.uts.edu.au](mailto:areejfahada.alqahtani@student.uts.edu.au) أو الاتصال بي على الرقم الأسترالي [ ] أو الرقم السعودي [ ].  
إذا انسحبت من الدراسة، فسيتم إتلاف وتلك المقابلة.

الخصوصية؟

من خلال التوقيع على نموذج الإقرار، فإنك توافق على قيام فريق البحث بجمع واستخدام المعلومات الشخصية الخاصة بك لمشروع البحث، وسيتم التعامل مع هذه المعلومات بسرية، ولن يتم تحديد المشاركين بالاسم، وسيتم تسميتهم بأسماء مستعارة، وسيتم استخدام معلوماتك لغرض هذا المشروع البحثي فقط، حيث تخطط لتجميع نتائج هذا البحث في أطروحة يمكن نشرها و / أو عرضها في مؤتمر.

# Appendix F: Consent form (English version)



## CONSENT FORM FOR AN EXPLORATION OF USING AN OPEN INNOVATION PROCESS FOR SELECTING IDEAS IN THE PUBLIC SECTORS. (UTS HREC RF NO. ETH19-4450)

I \_\_\_\_\_ agree to participate in the research project: An Exploration of Using an Open Innovation Process for Selecting Ideas in the Public Sectors (UTS HREC RF NO. ETH19-4450) being conducted by Areej Alqahtani, areejfahada.alqahtani@student.uts.edu.au  
Mobile [REDACTED] or [REDACTED]

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree to be:

Audio recorded

I agree that the research data gathered from this project may be published in a form that:

Does not identify me in any way

May be used for future research purposes

I am aware that I can contact Areej Alqahtani if I have any concerns about the research.

\_\_\_\_\_  
Name and Signature [participant]

\_\_\_\_/\_\_\_\_/\_\_\_\_  
Date

\_\_\_\_\_  
Name and Signature [researcher or delegate]

\_\_\_\_/\_\_\_\_/\_\_\_\_  
Date

## Appendix G: Consent form (Arabic version)

[شعار]

### استمارة موافقة لاستكشاف عملية ابتكار مفتوحة لاختيار الأفكار في القطاعات العامة (UTS HREC RF NO. ETH19-4450)

أوافق أنا \_\_\_\_\_ على المشاركة في مشروع البحث: استكشاف استخدام عملية الابتكار المفتوح لاختيار الأفكار في القطاعات العامة (UTS HREC RF NO. ETH19-4450) التي تجريها أريج القحطاني،  
areejfahada.alqahtani@student.uts.edu.au، جوال رقم [ ] أو [ ]

لقد قرأت ورقة معلومات المشارك أو قرأها أحد لي بلغة أفهمها.

أفهم أغراض وإجراءات ومخاطر البحث كما هو موضح في ورقة معلومات المشاركين.

لقد أتيت لي الفرصة لطرح الأسئلة، وأنا راضٍ عن الإجابات التي تلغيتها.

أوافق بحرية على المشاركة في هذا المشروع البحثي كما هو موضح، وأفهم أنني حر في الانسحاب في أي وقت دون التأثير على علاقتي مع الباحثين أو جامعة التكنولوجيا في سيدني.

أفهم أنه سيتم إعطائي نسخة موقعة من هذا المستند للاحتفاظ بها.

أوافق على أن:

يتم تسجيل صوتي

أوافق على أنه يمكن نشر بيانات البحث التي تم جمعها من هذا المشروع بصورة:

لا تعرفني بأي شكل من الأشكال

يمكن استخدامها لأغراض البحث في المستقبل

إنني أدرك أنه يمكنني الاتصال بأريج القحطاني إذا كان لدي أي مخاوف بشأن البحث.

\_\_\_\_\_  
التاريخ

\_\_\_\_\_  
اسم وتوقيع [المشارك]

\_\_\_\_\_  
التاريخ

\_\_\_\_\_  
اسم وتوقيع [الباحث أو المفوض]

تعهد بصحة الترجمة: أعهد أنا يوسف سحاري مترجم معتمد من قبل الهيئة الوطنية الأسترالية للمترجمين ورقم الاعتماد هو (CPN5023X) بأن الترجمة صحيحة ومطابقة للنص الإنجليزي المرفق أدناه.

معلومات المشارك واستمارة موافقة – النسخة الأولى، مارس 2020