The Role of Design Thinking in Innovation Centres and Hubs

by

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Abstract

This study explored how design thinking plays a role in innovation centres and hubs around Canada, with a focus on social innovation.

The work involved exploring how and why the design thinking approach is used in innovation centres and hubs. The research incorporated the expert interview method, which addressed the perspective of senior experts of innovation centres and hubs on the research question: What is the role of design thinking in innovation centres and hubs? A thematic analysis with deductive and inductive approaches was completed to examine the data collected from the interview sessions.

The results of this thesis provide beneficial insights to better understand the systematic approach of innovation centres and hubs. These organizations can benefit from a comprehensive understanding of the work processes of the innovation ecosystem across Canada and systematic strategies of other centres and hubs' approaches. On the other hand, this thesis helps the design community better comprehend the impact of the design thinking approach in the absence of professional designers.

The researcher has presented a comprehensive conclusion of the research project and explained the study's key takeaways, considering the limitations and possible opportunities for this field of research. Finally, the researcher has provided recommendations for future research that can particularly help researchers in design thinking, social innovation, and innovation centres and hubs to determine future topics.
Keywords: Design Thinking, Innovation, Social Innovation, Innovation Centres and Hubs, Design for Social Innovation.

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Chapter 1: Introduction

Innovation can be described as humans' effort to address different issues with novel and effective ideas where people prefer to employ their intrinsic creativity and creative abilities to construct and achieve something new when presented with unknown surroundings (Manzini, 2015). When members of a Creative Community – groups of individuals doing little, innovative, exceptional things together to alter people's lives and add value to society, the environment, and business – share ideas and values and build collaborative relationships, innovation can happen because of this collaboration and diverse experiences and knowledge (Fassi et al., 2013).

In line with this perspective, social innovation can be described as a collaborative process of community members to address complex socially recognized goals innovatively, where the notion of innovation is being widely applied to social issues in attempt to improve people's lives and society's quality of life (Manzini, 2014). In a more intricate context such as a community, issues are more complex than before and requires a focus on social innovation. Researchers define the term "social innovation" in various ways (Fassi et al., 2013; Manzini, 2015; Mulgan et al., 2007) but they all implicitly accept the fulfilment of social needs and the rise of social inclusion as a cornerstone, regardless of their different definitions.

Different groups of individuals who have similar interests are termed stakeholders. As the number of stakeholders in social innovation initiatives grows, so do their perspectives and needs; and as a result, these projects get increasingly challenging (Mulgan et al., 2007; Murray et al., 2010). In such a circumstance, it is conceivable that

an increasing number of people confronted with a problem will perceive an opportunity and devise a novel social innovation that takes into consideration the various needs of the stakeholders (Manzini, 2015). Social innovation is thus explicitly for the benefit of society and all stakeholders of a project.

Linked to innovation and social innovation is the recent emergence of innovation centres and hubs to support small and medium-sized businesses and individuals to innovate new ideas and advance sustainable development goals. These centres and hubs can vary in size and shape; however, the main common goal of these organizations is to gather all stakeholders of a project to address various complex issues by collaboration (Berger & Brem, 2016; Greenwood & Steenhoven, 2017). Innovation centres and hubs go beyond traditional means of forcing creativity like that of accelerators or incubators. They intensify the convergence of all the components required for innovation by bringing them all together in one location and serving as a catalyst for their interaction (Greenwood & Steenhoven, 2017). They are inventor and entrepreneur communities where unexpected meetings may stimulate innovation. Innovation centres and hubs accommodate a wide range of people by providing an interactive and educative environment.

According to the researcher's field investigation, there is no significant and official difference between innovation centres and innovation hubs, and it only depends on the overall strategy of these organizations for what they call themselves. The only difference that can be made in the definition of these two titles is the difference in terms of size and amount of service provided. Innovation centres are usually larger and offer much more diverse resources and services to members of their community. On the other

hand, innovation hubs are usually smaller organizations that have a more limited target community, such as university hubs whose members are university students. As a result, this research uses the term “innovation centres and hubs” to refer to these organizations collectively.

Different approaches are used in the innovation process and the term design thinking has become known as one such approach that addresses everyday problems and complex social issues (Docherty, 2017; Sanders & Stappers, 2008). Design thinking is a methodological approach and a mental attitude (Manzini, 2015); it is a mindset that incorporates abductive, integrative, and continuous reasoning (Brown, 2009; Liedtka, 2017; Luchs et al., 2016). Approaches to social innovation are consistent with design thinking concepts, which appear to have essentially comparable features to participatory design (Manzini, 2015); for example, involving stakeholders in the process.

Design thinking also comes with a set of tools that encourage cooperation, quick learning, and rapid prototyping for those that use it. As such, it can have different effects during the innovation process for social innovation projects. For example, design thinking in the very first stage leads to a good understanding of the stakeholders. Also, in the ideation stage, creating trust and confidence between participants creates dialogue-based conversations. Design thinking mindset is formed by combining different methods from other disciplines, which have a more substantial impact when combined and implemented. In her article, Liedtka (2017) points out that design thinking derives its power from individual elements, tools, and methods used in a harmonious and consistent blending process.

This method makes a significant contribution from a one-dimensional to a multi-dimensional process, including additional insights from various perspectives and stakeholders (Liedtka et al., 2017). In addition to the impact of design thinking as a collection of ideas and methodologies for innovation, a growing portion of design practices are focused on advocating social change and working at the intersection of governments, organizations, and innovation groups (Amatullo et al., 2019). Design is, without a doubt, one of the most productive grounds for innovation especially social innovation (Docherty, 2017; Manzini, 2015). Research has shown that design thinking skills and abilities have considerable beneficial impacts on social innovation, team learning, and process satisfaction, and they give solid evidence of design thinking's beneficial function (Docherty, 2017; Liedtka, 2017; Lyytinen et al., 2019). The concept of design thinking and its similarities with the process of social innovation has led to the use and further research on design thinking in social innovation, such as Ezio Manzini's (2015) book "Design, When Everybody Designs: An Introduction to Design for Social Innovation".

From the point of view of the design thinking approach, complex social issues should be answered in an integrative, iterative fashion and with the presence of all stakeholders during the process. The design thinking approach helps participants share their experiences by providing various tools for observation, collaboration, prototyping and learning. Design thinking is often promoted as an effective approach towards innovation, especially when multiple stakeholders are involved during the process (Chick, 2012; Manzini, 2015). As a result, design thinking appears to be a good fit for

facilitating creative solutions to the complex and hard civic concerns that our communities and society as a whole confront (Docherty, 2017).

Although the design thinking approach has received much attention in recent years in innovation and social innovation, there is still limited information about its role in innovation centres and hubs. This research seeks to understand how design thinking is used in innovation centres and hubs. What is the purpose of using design thinking in these centres and hubs? What forms/aspects of design thinking produce the best results at these innovation centres and hubs? These are just some of the key questions that have guided this investigation.

It is important to understand what approach is used in the process. Business or marketing methodologies are very pervasive in innovation projects, but design thinking plays a vital role as an approach and communication tool centred in dynamic and creative environments (Chick, 2012; Fassi et al., 2013). "We shape our tools and then they shape us," says Marshall McLuhan, which may be a good metaphor for the relationship between design and innovation (Culkin, 1967, p. 72). The term refers to the whole process of change, although it can be considered how design thinking can become a system for change. Therefore, one of the final benefits of this research is to understand the systemic strategy of innovation centres and hubs to develop a design thinking model specific to their goals and objectives. Who uses design thinking in innovation centres and hubs? Is there anyone in these centres and hubs who has used this approach but is not aware of it? Why do they use this approach and how do they use it? These additional guiding questions led the study towards having a closer look at the people involved in the innovation process within these innovation centres and hubs.

Understanding who is involved in the process, their experience, and what else they are adding to the project is essential. In social innovation and co-design projects in which all community members participate with a common goal, how they participate can be very crucial. Gorb and Dumas (1987) state that stakeholder participation is sometimes in the presence of designers and sometimes even without designers; and sometimes it is not even called design. This is important because people with different backgrounds can help enrich projects, although it can also create challenges. The presence of people with different experiences and specialties leads to forming an interdisciplinary project. Therefore, knowing the participants is very important to determine the strategic solutions of the projects, especially if it is in the presence of non-experts. Design without designers is of this category, so a proper understanding of project participants is crucial.

The participation of stakeholders in different stages of a project is fundamental in the social innovation process. This multi-dimensional and complex construct of social innovation projects is similar to co-design, a process in which everybody is involved as a co-designer in the project. In some cases, co-design refers to the combined creativity of cooperating designers. Sanders and Stappers (2008) refer to co-design in a broader sense as the collaboration of designers and those who aren't educated in design in the creation process. Participatory and collective approaches are mainly used to address complex issues such as social innovation. In addition to a deeper understanding and analysis of the participants in social innovation projects, this research allows people to voice their experience in innovation centres and hubs and with using the design thinking approach.

Through the research gaps identified in the literature review, and in line with the researcher’s interests, the overall question this thesis seeks to address is:

What is the role of design thinking in innovation centres and hubs?

This thesis also addressed some research objectives like how and for what purpose the members and the community of innovation centres and hubs use this approach. To provide a community response to the research question, the researcher examined the role of members and innovation centres and hubs representatives in determining the role of design thinking within these organizations. Members' and staffs' background, approach and field of work, and tools used can be determining factors in this review. However, the researcher only interviews senior experts of the innovation centres and hubs in this study. This was done because these high-level representatives have comprehensive knowledge regarding the strategic policies and procedures of these centres and hubs, and more inclusive information on how design thinking is used within their respective organizations.

The other part of this study addressed the question of how the design thinking approach is used in innovation processes in innovation centres and hubs. At what stage of the innovation and social innovation process does design thinking play a role, and what design tools are primarily used in these processes? Which principles of the design thinking approach are most applicable for activities involving various stakeholders like innovation and social innovation?

Design thinking has been widely used for problems of increasing complexity, from product to enterprise design. Due to how designers and others are tackling a growing spectrum of social, cultural, and environmental concerns, design methods, processes, tools, and terminology are evolving. The use of "design thinking" (Brown, 2009), and other current design approaches such as "design for social innovation", is

resulting in socially creative solutions, which in turn is giving design and designers new social importance (Manzini, 2015).

Individuals and small enterprises benefit from the innovative tools and methods used in innovation centres and hubs to develop their businesses; simultaneously, they prioritize people and environmental sustainability. Design thinking, led by a human-centred approach, can help achieve these initiatives. Therefore, understanding how design thinking is used in innovation centres and hubs can help build a better understanding of its role in this type of setting.

Knowing the role of design thinking in innovation centres and hubs can help improve and advance socially recognized goals. It can help academics interested in design thinking as well as innovation centres and hubs, their members, and the broader innovation community to take a more holistic view of design thinking in their practice. Academic researchers can further explore different methods of the design thinking approach and the development of models specific to innovation centres and hubs. The centres and hubs themselves can use the data and analysis of this research to develop and advance their work processes and determine their future strategic goals. And they can also collaborate with academics to explore practical ways to use design thinking in their organizations to provide greater benefit to those they serve.

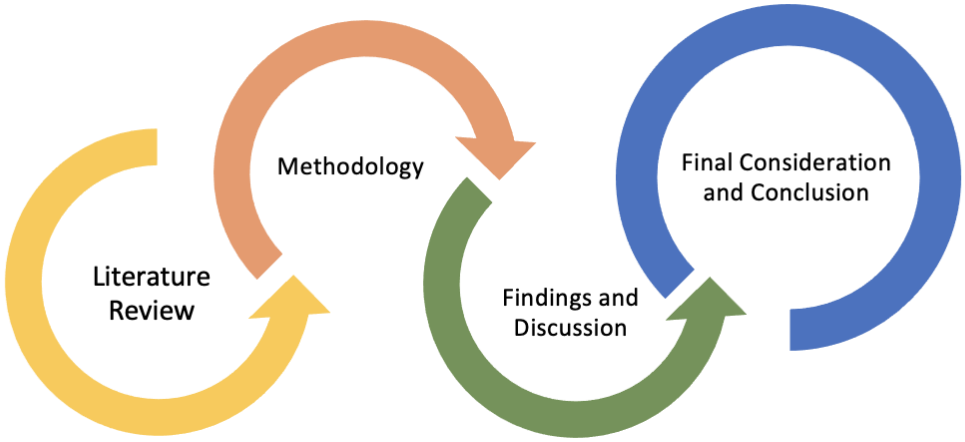

FIGURE 1 THESIS PROCESS

This thesis is structured in five main sections. Chapter two covers theoretical content in the form of a Literature Review, and it explores design thinking's current standing and influence for innovation. From there, the research methods are described, and the researcher's interviews with ten experts and officials from different innovation centres and hubs around Canada are explained. Results of these interviews, which provide field information about the use of design thinking in innovation centres and hubs, can be found in chapter four. This chapter also addresses the research question and discusses the reality of using the design thinking approach in innovation centres and hubs. Lastly, in chapter five, the researcher shares the insights about design thinking and innovation centres and hubs gained through this study and outlines further considerations regarding this research.

Chapter 2: Literature Review

2.1 Overview

This thesis evolved from the researcher's personal interest in the growing phenomenon of communal centres of innovation typically referred to as innovation centres or hubs, and the idea of design for the social good. The literature review included an exploration into topics that could be expected to form part of the approaches used in collaborative communal settings (including design centres and hubs), such as articles and definitions on innovation, participatory design, and co-design. The readings evolved to focus on social innovation as an overall approach to solving larger and more complex problems in society that many of these centres and hubs wish to tackle through their community projects, and design thinking as a useful and implementable method for conducting innovation in centres and hubs by members who come from a variety of non-designer backgrounds including the field of business. This literature review aims to achieve a comprehensive understanding of the approaches and work processes of innovation centres and hubs, while at the same time focusing on the design thinking approach to provide a picture of its role in these organizations.

Firstly, the researcher examines previous studies on innovation centres and hubs. Secondly, the literature in relation to innovation with particular focus on social innovation has been studied. Lastly, by examining the concept of design thinking, the researcher presents a critical evaluation of where this form of thinking and approach fits within the context of innovation and social innovation processes.

2.2 Innovation Centres and Hubs

Innovation centres and hubs are organizations that aim to support individuals and small- and medium-sized businesses to innovate by bringing together diverse stakeholders and providing a wide range of resources to address social scale issues. An innovation centre or hub can take various shapes, but its primary purpose is to assist and promote individuals in the innovation sector by gathering the different talents required to get goods and services from researchers to the marketplace (Greenwood & Steenhoven, 2017).

According to Berger and Brem (2016), innovation centres and hubs are designed to be an exceptional environment on the planet in which to be an innovator. Innovators who are changing the world may use innovation centres' and hubs' co-working, community, and acceleration services (*What Is Social Innovation?*, n.d.). For example, innovators can rent different workspaces and meeting rooms; at the same time, members can also use the services of counselling and trainers. Innovation centres and hubs claim to play an essential role as principal organizations that strive to promote innovation. There are many criteria and variables to measure the success of an innovation, and the purpose of having innovation centres and hubs is to help innovators create the right conditions. Innovation centres and hubs aim to provide this space by creating a suitable platform for cooperation, convergence, and participation, offering essential resources needed to operate an innovative process.

Among all types of innovation centres and hubs, they can be divided into two categories (Figure 2): academic-oriented (knowledge centres) and business-oriented (entrepreneurship centres) (Youtie & Shapira, 2008). The academic knowledge hub

institution can combine activities with multiple goals in a variety of boundary-spanning organizational forms to foster advanced research, education, and innovation. In their article, Youtie & Shapira (2008) examine the case of a university, looking at why universities are more likely to seek institutional involvement in the production and sharing of human capital, knowledge, leadership, and other resources, to be able to address the problems and opportunities of their regions. They investigate how a university has evolved from a knowledge factory to a knowledge centre to advance technological innovation and economic development.

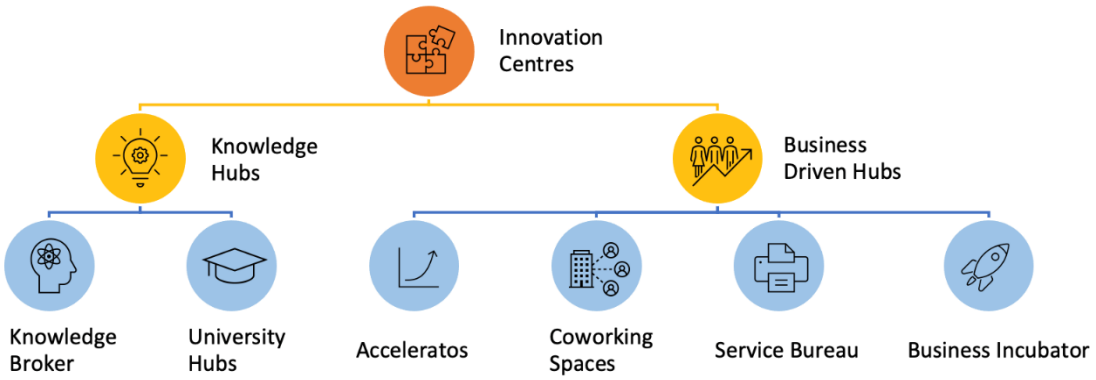

FIGURE 2 DIFFERENT TYPES OF INNOVATION CENTRES AND HUBS (SHARIFI, 2021)

Business-driven hubs are more than simply incubators or accelerators; they're new approaches to fuel innovation (Greenwood & Steenhoven, 2017). They improve the convergence of all the necessary components for creativity by gathering them together in one place and serving as a stimulant for their interaction. Spontaneous encounters can ignite innovation in these communities of inventors and entrepreneurs. Successful innovation requires a certain amount of serendipity, and hubs provide the circumstances

for this by creating opportunity, as an example, for the collaboration and convergence that cities require to maximize their innovation capability and harness the social and economic benefits of global innovation locally (Berger & Brem, 2016; Greenwood & Steenhoven, 2017).

With the rising demand for creative solutions to complex issues, such as climate change, growing mental health crises, and world hunger, innovation centres and hubs have been formed to help and support the innovation process. In order to avoid becoming lost in today's highly competitive economic climate, these innovation centres and hubs are developing as a relatively new approach for individual innovators and small/medium-sized businesses to transform the way innovation is formed and expanded throughout the world (*What Is Social Innovation?*, n.d.). Such platforms aspire to be the best place to work as a social innovator. Collaborative working environments, community networking, and acceleration services are typically available as a form of support to community members. Although, according to research, innovation centres and hubs operate in all areas of innovation, but the focus on social and participatory innovation is one of their main goals (Domanski et al., 2020).

2.3 Innovation

Humans tend to employ their natural creativity and creative skills to develop and achieve new things when faced with challenges and uncertainty: they innovate. Based on the combination of two main factors, today's innovation formed. Of course, the first is the nature of the issues, which need to be considered in various dimensions and at levels of

high complexity, from daily life to the most problematic social issues. The second is the widespread use of new technologies, communication networks, and organizational change potential. In such circumstances, it is conceivable that an increasing number of people, when confronted with a problem, will perceive an opportunity, and devise a novel solution (Manzini, 2015). Instead of complicated definitions, Mulgan et al. (2007) used a simple definition of innovation: "New ideas that work". The researcher distinguishes this definition of innovation from improvement because improvement requires gradual change over time. It also distinguishes between innovation and creativity, which, although creativity is a principle for innovation, does not involve the hard work and execution that turns innovation into sustainable ideas (do Adro & Fernandes, 2020). Therefore, it is necessary to first discuss the concept of innovation in the field of business, design, and the social sector (Figure 3).

From a business perspective, innovation has become nothing less than a survival strategy as the focus of economic activity in the industrialized world changes inevitably from industrial production to knowledge generation and provision of services (Brown, 2009; Mulgan et al., 2007). Innovation is more of a top-down definition from a business perspective and, as such, is the sum of activities and ideas that experts and those seeking change offer by examining society. Although in many organizations the users and the community are involved in the innovation process, if the process is done by experts, decision-makers or political activists, the innovation is largely top-down (Manzini, 2014). In the business world, more companies compete to be innovative in a globalized environment and with ever-increasing technologies.

From a design perspective, innovation and creativity are the main pillars of the design thinking process. According to experts, one of the basic principles is based on the importance of idea generation (Brown, 2009). A variety of design tools and methods have been developed to help designers and those using the design approaches to enhance creativity. There is a growing consensus that design can be a form of innovation that provides a set of skills, tools, and techniques that lead people to new innovative social solutions or improve existing ones (Chick, 2012). Due to the changing and increasing range of social and cultural challenges, design and design thinking has moved more towards the presence of users and stakeholders throughout the project. Co-design in a broader sense refers to the creativity of designers and people who have not been trained in design but are collaborating in the design development process (Manzini, 2015; Sanders & Stappers, 2008).

In the social sector, innovation starts with a community of people whose members come together around shared values and ideals and build a common identity. A network of people is a group of individuals who have connections to each other, but the purpose is more about deep and meaningful relationships. When a varied yet linked group gathers in a supportive environment, innovation may emerge. It occurs when different points of view collide in a group setting (Toivonen, 2016). Innovation in social sectors can be described as innovative activities and services that are driven by the objective of satisfying a social need and are primarily produced and disseminated by organizations with a social mission (Mulgan et al., 2007). In the social sector, researchers are confronted with huge challenges that have proven difficult to solve in the past: sanitation, sustainability, poverty, and so on.

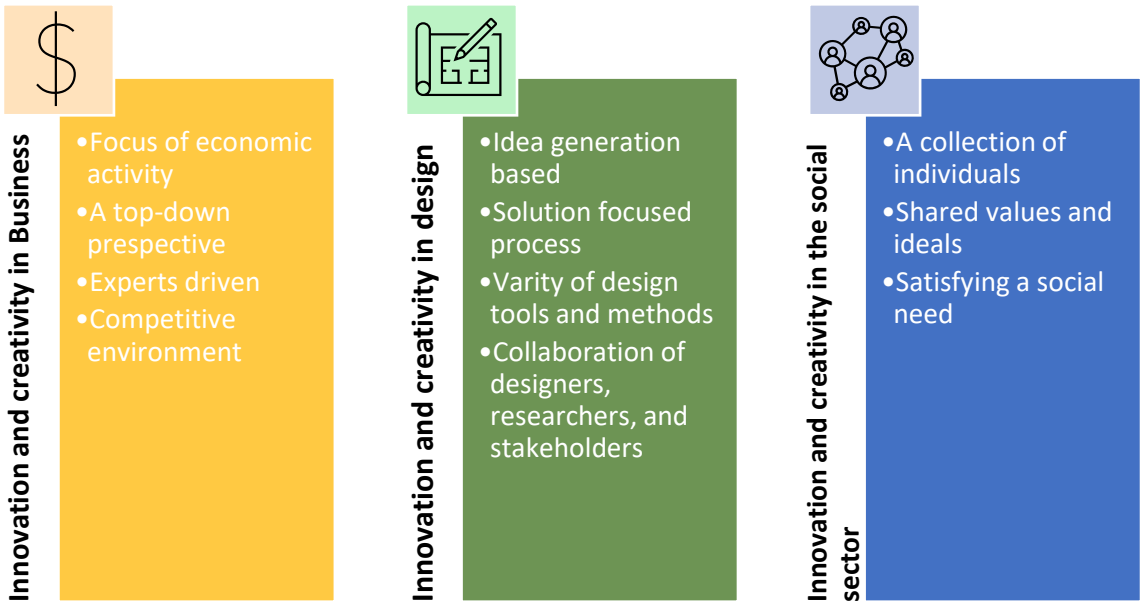

FIGURE 3 COMPARISON BETWEEN DEFINITIONS OF INNOVATION AND CREATIVITY IN BUSINESS, DESIGN, AND THE SOCIAL SECTOR (SHARIFI, 2021)

Innovation has been drawing the attention of economists largely because of increasingly frequent technological advances, supported by ever-greater demand for economic benefits at all costs. A linear innovation model understands that innovation begins with basic research, then goes on to applied research, development, finalizing production, and diffusion. The result of the success of these innovations takes the form of economic development, equal rights, freedom, and in short, a better and safer world for all (do Adro & Fernandes, 2020).

To address problems in an organized community, leaders have historically defined challenges, recruited specialists to do research and analysis, and then presented viable solutions and recommendations, which is known as "Innovation I" (Figure 4) by

designers (Liedtka et al., 2017). It is possible that a growing number of individuals presented with a problem may see an opportunity and design a creative remedy in this situation (Manzini, 2015). However, the more significant number of people and stakeholders are associated with a problem, the more complex it becomes (Liedtka et al., 2017; Manzini, 2014). Therefore, responding to these issues becomes much more complicated and requires more resources than usual. Innovation experts have introduced the concept of social innovation to address complex social problems, in which stakeholders are actively involved in the process. More like social innovation, design thinking emphasizes the presence of stakeholders in the process.

Rather than top-down management recognizing a problem and seeking expert opinion for answers, Liedtka et al. (2017) argue for identification and successful solutions based on a more holistic method called Design Thinking Innovation II Process. From the beginning, the Innovation II Process appreciates and involves a wide range of essential stakeholders (Figure 4). Using a varied group to discover difficulties and address them creatively has its advantages. Design for social innovation, according to Manzini (2015), is the professional designers' contribution to a co-design process aimed at social transformation.

"We define social innovations as new ideas (products, services, and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society's capacity to act" (Murray et al., 2010, p. 3). From the perspective of design and designers thinking, Manzini (2014) defines social innovation as "a process of change that arises from the creative recombination of existing assets from social capital to historical

heritage, from traditional handicrafts to advanced technology, with the goal of achieving known social goals in a new way" (p. 57).

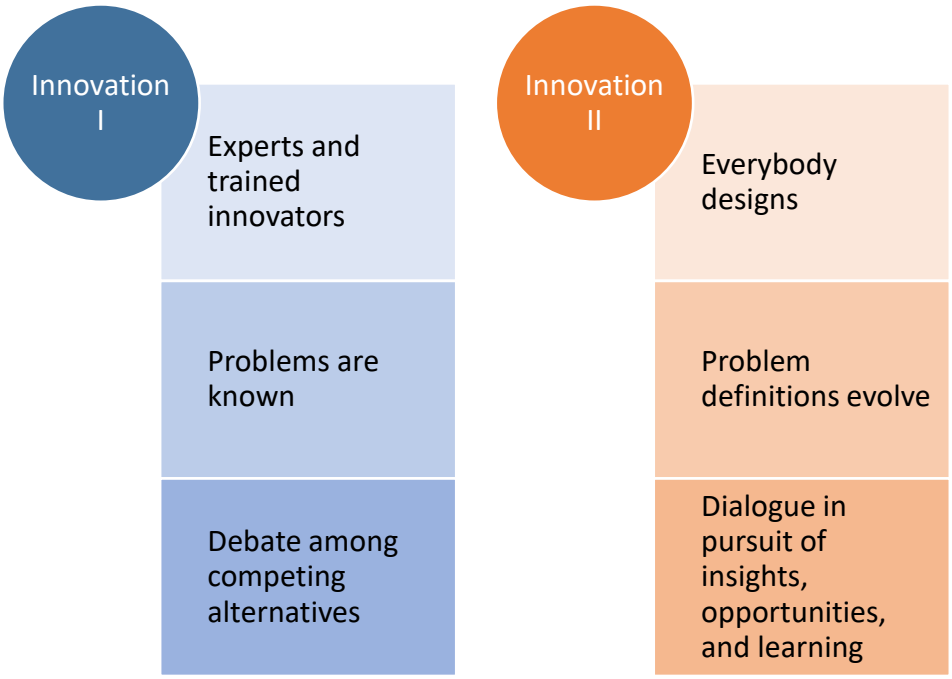

FIGURE 4 COMPARISON BETWEEN DEFINITIONS OF INNOVATION I AND INNOVATION II (ADAPTED FROM LIEDTKA ET AL., 2017)

Social innovation is innovation explicitly for society's benefit. The general population is motivated by a desire to fulfill social needs that are often overlooked by traditional forms of private market provision and are frequently underserved or unmet by state-run services (Murray et al., 2010). Social innovations can take the form of new products and services, just like any other invention; but they can also take the form of a concept, an idea, a social movement, an intervention, or a mix of these things (Chick, 2012).

A systematic and extended notion of innovation has been developed by researchers in the socio-economic sector, in which various social agents beyond businesses may be inventive. Social innovation is a necessary but insufficient palliative compensation in the face of inequality and deeper fundamental issues (Adro & Fernandes, 2020). Social innovation is one of the many methods that allow businesses to acquire access to external information to speed up their innovation processes, gain access to new markets, and connect with external knowledge sources (Crupi et al., 2020). Firms may extend their knowledge base and improve their inventive performance by exploiting external information sources, according to Crupi et al. (2020).

Despite the differences among definitions of social innovation, many authors refer to different types of social innovation that are inspired by Innovation I and Innovation II. Manzini (2014) points out that social innovation exists in three modes: top-down, bottom-up, and hybrid (Figure 5). In the top-down type, the innovation process, like Innovation I, is done by experts. In this type of social innovation, society and other resources are used to advance the idea and implement it. The local community and stakeholders drive the second type of bottom-up social innovation. Individuals who work together to develop, improve, and succeed in solutions for new and sustainable ways of life. Finally, a hybrid type of social innovation exists that is a mixture of the collective cooperation of a local community and experts to address well-known issues in the social dimension.

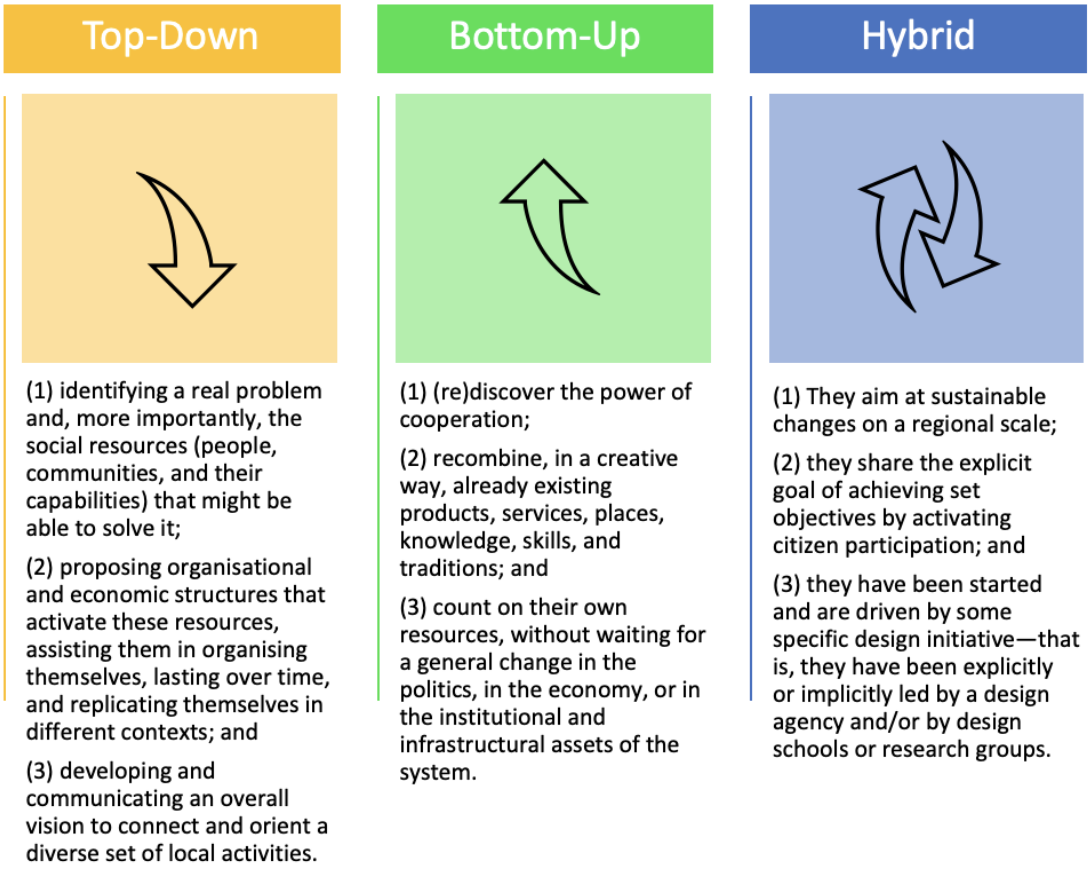

FIGURE 5 DIFFERENT PROCESSES OF SOCIAL INNOVATION: TOP-DOWN, BOTTOM-UP, AND HYBRID (ADAPTED FROM MANZINI, 2014)

In this study, the researcher tries to look at social innovation from the perspectives of design thinking and the business world. Chick (2012) emphasizes that more interdisciplinary approaches to design thinking promote problem-solving and system transformation through collaborative action. Manzini (2015) also states that design thinking is formed from the activities of interdisciplinary teams in which people with different backgrounds also participate to solve a problem. Innovation, especially social

innovation, has an interdisciplinary nature, which makes it important to look at the integrated definitions of this concept for this project. Examining the process of social innovation at innovation centres and hubs requires an understanding of this concept from a business perspective. Also, addressing this issue from a design perspective and examining the role of design thinking requires an understanding of the concept of social innovation from a designer's perspective.

2.4 Design Thinking

Design thinking has been interpreted and defined in various ways, and the meaning of this concept continues to evolve. Today, design thinking challenges the approach and absolute focus on design by professional designers. Design thinking has been recognized over time as a collaborative effort between designers, researchers, and stakeholders in the face of complex problems (Chick, 2012; Sanders & Stappers, 2008). As Sanders (2008) points out, the participation of users and stakeholders in the design process alongside the designers forms the realm of generative design. The design has always been human-centred, although a shift from design "for" users to design "with" users over time has evolved into co-design (Sanders & Stappers, 2008). Although there is a significant difference between design thinking and the co-design approach, it should be noted that both affect each other. Hence, a change in the designer's approach also changes the concept of design thinking.

Brown (2009) considers that design thinking is constantly maturing. He compares design thinking with the designerly way of thinking, which includes the designer's

mentality of empathy, optimism, repetition, creativity, and ambiguity. Although thinking in a designerly way requires learning very specialized skills, anyone can approach the world like a designer (Brown, 2009; Manzini, 2015). But design thinking has different meanings from different points of view: from the designers' mindset and set of attitudes to the process of using various tools and methods to provide creative solutions.

Brown (2009) is the CEO of IDEO, design and consulting firm, which has developed the design thinking process and used it in many projects. This design process, which has also entered the business world, consists of five phases: empathy, definition, ideation, prototyping and testing. Brown (2009) believes that this non-linear process can pave the way for innovation in the face of difficult problems. Overall, these stages should be viewed as distinct modes that contribute to the overall design process rather than sequential procedures.

Sanders (2008), on design thinking, states that the use of different tools and methods is the reason for using design thinking. She goes on to say that by shifting the traditional design process to co-design, designers will provide non-designers with tools to enable them to participate actively in the process. Sanders (2014) also adds that designers and non-designers collaborate to make sense of the future by employing design tools. Designers who have specifically acquired the specialized skills of design thinking play a key role in the development of such tools and ultimately the design process that influences the definition of design thinking. As mentioned earlier from a practical point of view, design thinking is a human-centred process and approach. Experts consider that design thinking is a concept that integrates the needs of individuals, technical possibilities, and business success metrics using a designer toolbox.

In recent years, the definition of design has become more and more a way of thinking and a set of attitudes. Manzini (2015) states that design thinking is a methodological and mental attitude that helps designers, researchers, and social actors face wicked challenges. Amatullo et al. (2019) also describe design thinking as a set of attitudes that designers and people who use design thinking should consider. Authors continue to emphasize that these mindsets promote the skills of designers as a unique set of cognitive explorations used in group decision-making techniques. Hence, design thinking is a mindset used to deal with problems in a designerly way.

Design thinking helps people who use it to look at things like a designer. This understanding of design thinking means having a thorough knowledge of design tools, methodologies, and skills that can be used for social innovation (Chick, 2012; Manzini, 2015). However, these elements are evolving due to the way designers and others deal with a growing range of social, cultural, and environmental concerns (Chick, 2012; Sanders & Stappers, 2014); and in turn, this creates a new social significance for designers and their way of thinking and attitudes.

The primary and perhaps most valuable principle of design thinking is to involve all stakeholders, making it a critical approach for social innovation (Sanders & Stappers, 2008). Co-designers, referred to in a broader sense as a collaborative group of designers and non-experts in design (Figure 6), work together in the collective creative process and call it co-design (Chick, 2012; Lee, 2008; Sanders & Stappers, 2008). Nevertheless, the discipline of collaborative innovation in design, or co-design, has been around since the 1970s (Sanders & Stappers, 2008). There are several reasons why co-designing concepts and methods have taken so long to influence the world. To begin, one must think that

everyone is creative in order to accept co-creativity. This is not a widely held concept, especially among individuals in the business world.

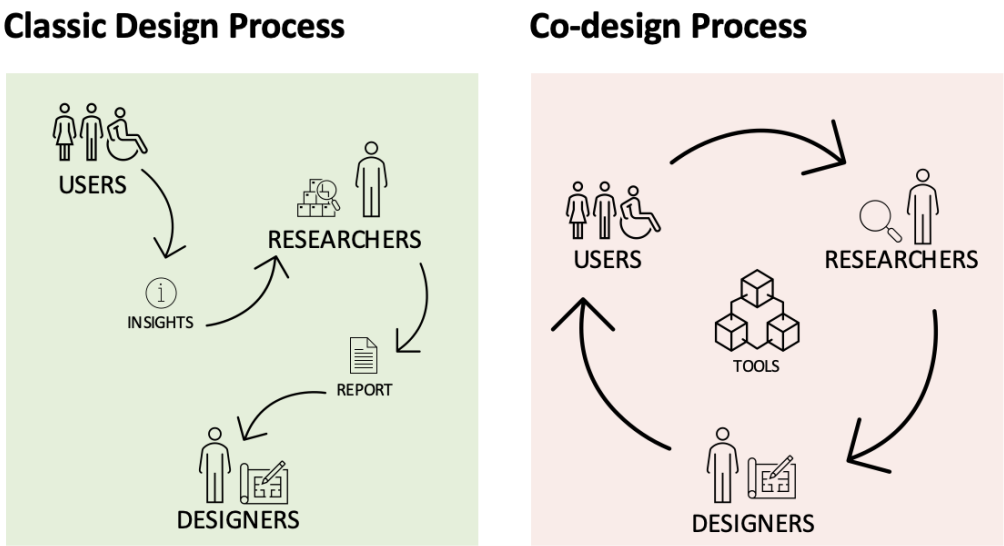

FIGURE 6 COMPARISON BETWEEN CLASSIC DESIGN PROCESS AND CO-DESIGN PROCESS. (ADAPTED FROM SANDERS & STAPPERS, 2008)

Design-led social innovation has grown from a budding profession to a thriving ecosystem of advocates worldwide (Amatullo et al., 2019). Traditionally, attempting to address problems has entailed outlining management issues, enlisting specialists to do study and analysis, and then presenting viable recommendations and strategies, also known as top-down innovation (Manzini, 2014). On the other hand, design thinking is a systematic process that involves a wide range of stakeholders, including leadership, all relevant staff, and consumers or end-users (Brown, 2009; Manzini, 2015). The design thinking process prioritizes and incorporates varied important stakeholders equitably from the beginning, rather than using a top-down approach to pointing out problems and

obtaining expert opinions for solutions. This allows a multi-dimensional approach to address a complex issue and an open, noncritical ideation process to uncover multiple potential answers that might otherwise go unnoticed with a more linear approach.

Design thinking can be described as an established set of attitudes that use innovative, integrated, and continuous approaches (Brown, 2009; Lockwood, 2010; Martin, 2009). The structure of this thinking consists of critical methods for learning, collective collaboration, observation, prototyping, testing, and analysis. Design thinking or designers thinking is a purposeful, solution-oriented process based on the active participation of stakeholders. Further to the previous explanation, design thinking experts emphasize that the human perspective is included in all stages of the problem-solving process (Brown, 2009). As Sanders (2008) explained, the future of design has been accompanied by changes in definition, methods, and tools. Design at its heart is design thinking, serving as a valuable medium through which stakeholders can interact during the project.

Design thinking focuses on finding solutions and helps the process progress by constantly examining the problem, topic, and resolution (Brown, 2009; Liedtka, 2017). According to IDEO (*Design Thinking Define by IDEO*, n.d.), a leading global design and consulting firm, there are three core activities involved: ideation, inspiration, and implementation (Figure 7). This shows the importance of creativity and execution in the design thinking process, which are also the primary pillars of innovation (do Adro & Fernandes, 2020; Mulgan et al., 2007). Furthermore, design thinking combines what people want with what is technologically feasible and economically viable (Figure 7). The experts believe that design thinking also enables non-designers who aren't

professionally trained to utilize creative techniques to solve various problems (*Design Thinking Defined by IDEO*, n.d.).

Design thinking has been used widely to solve issues that are becoming more complex. Designers constantly refine their methods and principles to improve products, services, and systems (Forsythe, 2021). The designer's fundamental goal is to establish a shared vision that gives significance to everyday living. If social innovation is to alter the world and solve complex problems, it requires a culture, strategy, and understood process to have an effect (Murray et al., 2010).

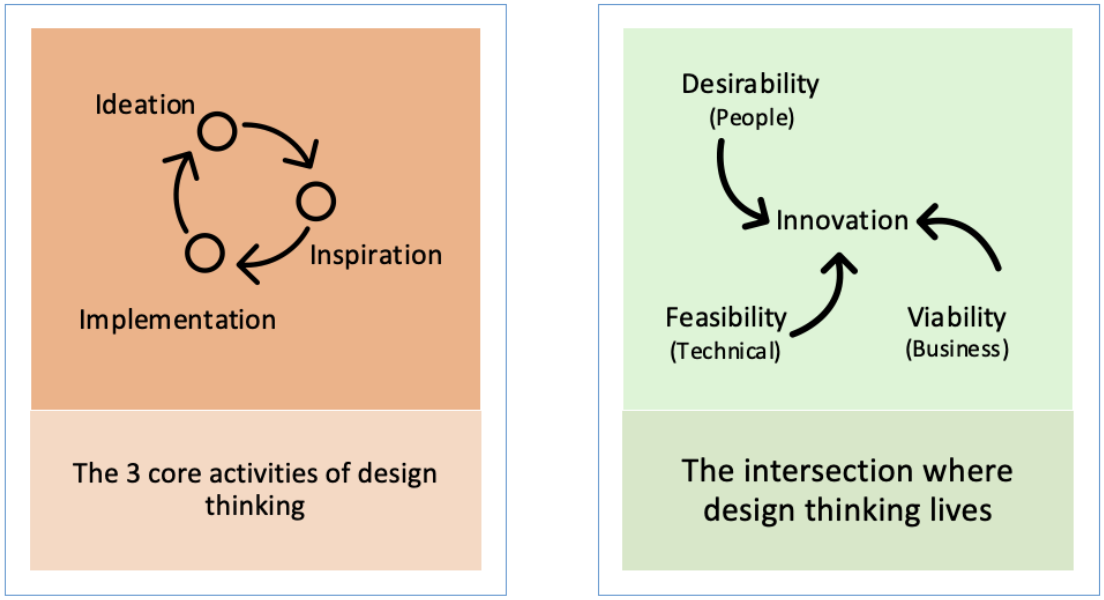

FIGURE 7 DESIGN THINKING DEFINED BY IDEO (ADAPTED FROM DESIGN THINKING DEFINE BY IDEO, N.D.)

Design thinking is described by Liedtka et al. (2017) as consisting of five main parts; namely empathy, definition, ideation, prototyping and testing. This concept can also be defined as a nonlinear systemic approach whose main purpose is to find effective

answers to real world needs. It is commonly regarded as a technique for tackling "wicked problems" and exploring possible futures, and it may be thought of as both a process and a mentality (Docherty, 2017). This definition emphasizes the need to focus on human beings. That is why empathy is the beginning of the design process and all design thinking. Tim Brown's perspective on the design process, which has also entered the business world, consists of five phases: empathy, definition, ideation, prototyping and testing. Brown (2009) believes that this non-linear process can pave the way for innovation in the face of wicked problems. Overall, these stages should be viewed as distinct modes that contribute to the overall design process rather than sequential procedures.

Empathy, as the first step in starting the design thinking process (Brown, 2009; Liedtka, 2017), means to fully and correctly understand the requirements of the stakeholders involved with a problem in a project. The main purpose of this step is to discover the ignored angles of the subject and the factors affecting the subject under study. As the core of design thinking, empathy helps us be aware of people's tacit needs (Liedtka, 2017). It also allows us to gain a deeper understanding of the problem by getting to know different categories of users.

Following the empathy phase, designers use the definition mode to analyze and combine empathetic results to meet persuasive needs and insights, as well as to design specific and relevant topics. This is important in that it is the beginning of the problem definition and project infrastructure. Proper analysis and definition of a need leads to the correct definition of the problem form and, finally, the definition of the path ahead for the

project. The most important point that can be considered in this part is to be asking the right question.

Ideation is the next part of the design process in which creative solutions are presented with a divergent view (Brown, 2009; Liedtka, 2017). In this step, the idea generation for an answer is carried out in the form of separate pieces away from the constraints of construction and execution. The second part of this phase combines ideas with a convergent perspective. Unsuccessful ideas are eliminated, and successful ideas are developed. Ideation is the first step in the birth of a solution.

After ideation comes prototyping. This is the part of the design process in which the final solutions take on a more realistic form (Brown, 2009; Liedtka, 2017). In this phase, the final ideas for development in the real world are transformed. The main challenge at this stage is to implement the main ideas accurately while considering the limitations of the real world.

Finally, the test phase is the last step of the design process, and, at the same time, it is a new beginning to review sample solutions and start a new design process. This phase, like the empathy phase, tries to understand the real opinions of users; although this time, the subject is the possible world of the future instead of the current real world. Testing solutions is important for giving users a perspective on the future and giving the designers' user feedback on that possible future.

Design thinking that emerges in social innovation is described by Manzini (2015) as a dynamic and sustainable process in which different groups of stakeholders, with or without the help of designers, innovate and implement ideas. The majority of the community should be given the opportunity to express its voice, share its experiences,

and present its views on collective ideas by evaluating new insights. In the process of social innovation, whereas different actors participate in diverse and sometimes even contradictory ways, they are however all participating and contributing to the creative process.

There are several reasons why participatory design/co-designing concepts and techniques have taken so long to make an influence on the man-made world. To begin with, one must think that everyone is creative in order to accept co-creativity (Sanders & Stappers, 2008). Designers are no longer only creating items for people to utilize. People, groups, and cultures are increasingly linked and informed in ways that were inconceivable even a decade ago, and design specialists are creating for their future experiences (Sanders & Stappers, 2008). This is not a widely held concept, particularly among individuals in the corporate world.

By empowering individuals and providing social value, social innovation provides new ways of addressing social issues and forging new partnerships. As a result, design thinking appears to be a good fit for facilitating creative solutions to the complex and hard social concerns that our communities and society as a whole confront (Docherty, 2017). Manzini (2015) states that in designing for social innovation, a combination of different components is formed: "original ideas and visions (from design culture), useful design tools (from different design disciplines), and creativity (which is a personal gift), within the framework of a design approach (deriving from previous reflexive design experience)" (p. 63).

2.5 Summary

A closer look at the definitions and literature reveals that the design thinking approach today is directly related to the process of innovation, especially social innovation. Although both concepts are parallel and exemplify similarities, the differences are apparent. The innovation process is a more comprehensive stage for ideation and problem-solving. Manzini (2015) points out that innovation may not only lead to novel solutions but may also impact the foundations of a new civilization. On the other hand, design thinking is a purposeful and methodological way of thinking to provide creative solutions. So, by providing various toolkits as well as being recognized as a creative approach, design thinking can lead to societal transformation in line with the goals of innovation processes (Amatullo et al., 2019).

Concluding this literature review, it was found that design thinking is pervasive in social innovation processes. Design thinking is one of the primary approaches in the field of innovation and social innovation. However, the data available usually refers to the process of innovation in organizations, businesses, and enterprises. In other words, these organizations use the design thinking approach to change their innovation process from Innovation I to Innovation II. Relative to this organizational literature, studies of community-based social innovation are limited.

The researcher has therefore resolved to take this opportunity to explore the project based on community-based social innovations, provided by innovation centres and hubs. These spaces, as defined, appear in various forms. However, their main purpose is purportedly to provide support and resources for individual innovators and small- to medium-sized start-up companies.

Based on the results of this literature review, innovation centres and hubs take different approaches to the innovation process. However, all approaches have a participatory identity and emphasize collective participation. The approaches used in innovation centres and hubs, in addition to being collective, should emphasize creativity and provide new solutions to innovative issues. This issue plays a more prominent role in the field of social innovation because collective and participatory creativity is one of the main pillars of this field.

Indeed, there are not a lot of innovation centres and hubs in any one local setting, so it was essential to expand across Canada to get perspective. In addition, and given the special circumstances of the COVID-19 pandemic, the researcher decided to take the research out of the local dimension and use virtual communication tools to connect with innovation centres and hubs across Canada. This allowed the researcher to explore different nodes in the Canadian innovation centres and hubs ecosystem and incorporate them into the research findings. Also, access to a vast network of innovation centres and hubs helps to enrich the findings from local and national perspectives to obtain a comprehensive analysis of the role of design thinking within these organizations at the national level.

The researcher intends to examine the design thinking approach in innovation centres and hubs as a support for social innovation. Design thinking is known as the way of thinking used by design experts for innovation issues; but in this research, an attempt has been made to address it from the perspective of innovators and innovation centres and hubs. As a result of this research, it tries to define why and how people participating in these organizations use design thinking, without necessarily being design experts

themselves. Therefore, the research question of this thesis that will aid the understanding of design thinking in this context is:

What is the role of design thinking in innovation centres and hubs?

Chapter 3: Research Methodology

3.1 Research Overview

As explained in the literature review, there is no specific documentation on how innovation centres and hubs use design thinking. Innovation centres and hubs play an essential role as organizations that strive to promote innovation (Berger & Brem, 2016). They can take many forms, but the primary purpose is to assist people in the innovation sector by gathering the various resources needed to bring goods and services from researchers to market.

Whereas these centres use diverse approaches and methods to advance the process of innovation, the researcher could not determine how design thinking is used in these centres and hubs from the literature review. There are many articles on the purpose for establishing innovation centres and hubs and their initial goals; but still, none of them have an in-depth investigation of the work process and approaches used in these organizations. Therefore, the researcher concluded that the role of design thinking in innovation centres and hubs has the potential for study as a research project.

To guide the primary research, the following research question was developed: ***What is the role of design thinking in innovation centres and hubs?***

Based on this research question, the researcher took a two stepped approach. The first being an exploration of innovation centres and hubs to gain an overview. The main data gathering came from expert interviews (Dworkin, 2012; Goodman et al., 2012; Palmquist & Connor, 2012). This included interviews with executives and senior members of various innovation centres and hubs across Canada. The expert is someone

who represents the whole group and can speak for all of them; arranging an interview with an expert in the field of inquiry helps the researcher investigate a particular group of people (Dworkin, 2012). The primary purpose of this interview method is to obtain qualitative information from senior innovation centre and hub team members who are familiar with the organization's strategic direction and that are in direct association with other members of the centre or hub.

The results of these expert interviews were thus expected to provide information on the strategies of innovation centres and hubs and the role design thinking plays. Other data the researcher expected from this process included obtaining data and insights on how design thinking is used among members and representatives of these centres and hubs.

3.2 Online Research of Innovation Centres and Hubs and Contact List

The first step in finding potential participants was to identify innovation centres and hubs across Canada. The researcher began a Google search to better identify these organizations. Through this search, the researcher identified local innovation centres and hubs in Ottawa and Toronto as a starting point. The researcher became acquainted with each and became a member of one of them. After joining and participating in the local innovation centres' orientation, the researcher gathered more information about the centre's activities and cooperation with other centres and hubs in an informal meeting with one of their membership officials. As one of the oldest innovation centres and being

around for almost twenty years, this local innovation centre was helpful to start the research project.

Through an expanded search for more innovation centres and hubs, the researcher became familiar with Social Innovation Canada (SI Canada), a society of innovation centres and hubs that connects and build networks of nodes across the nation (Figure 8). The purpose of such partnerships is to create a collaborative environment and integrate the infrastructure of Canada's social innovation ecosystem (*Social Innovation Canada*, n.d.). Familiarity with SI Canada helped the researcher find more centres and hubs across Canada in different provinces. In this way, the researcher created more connections and channels to start the project.

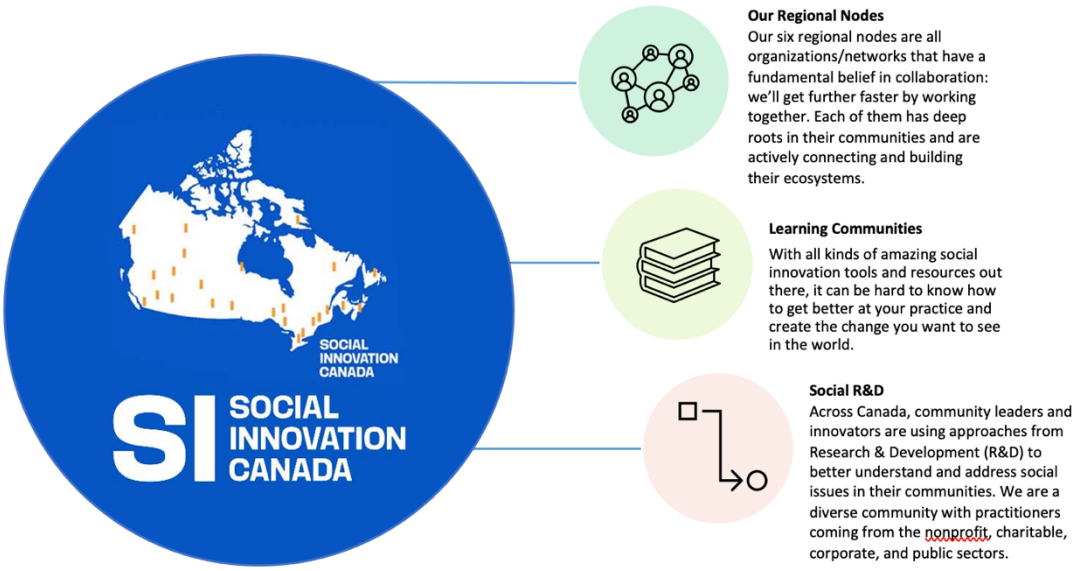

FIGURE 8 CANADA'S SOCIAL INNOVATION ECOSYSTEM COLLABORATION: SOCIAL INNOVATION CANADA (SI CANADA) (ADAPTED FROM SOCIAL INNOVATION CANADA, N.D.)

The researcher also reviewed the information available on the website of these centres and hubs and found each of their formation stories to be unique. The purpose of the establishment and the primary values of the innovation centres and hubs were also considered by the researcher in this study.

After an internet search of websites of centres and hubs across Canada, the researcher began reviewing the leadership team members of each organization to create an initial list of potential participants, for an in-depth expert interview. However, like all data collection methods, the researcher first addressed ethical considerations. The researcher paid special attention to ethical concerns such as the privacy of the participants, data storage, consent forms and the tone and structure of the questions and the interview sessions during the design process.

3.3 Ethical Considerations

The researcher completed the Tri-Council Policy Statement 2 Course on Research Ethics (TCPS2: CORE) training which is a guidance on research ethics in Canada. One important conclusion from that training was that interviewing professionals working in innovation centres and hubs should not expose them to physical, emotional, social, privacy or legal risks that outweigh the risks they face in everyday life, although privacy and anonymity would help safeguard the ability to share more personal opinions.

The observance of safety and well-being restrictions to prevent the spread of COVID-19, required the researcher to run the interviews virtually. This also allowed the

researcher to interview more people from other innovation centres and hubs in other parts of Canada and had the benefit of a broader reach.

Another consideration was the privacy and anonymity of the participants. The researcher stated in the primary request for ethics clearance that the identifiable information of the participants is kept along with the data in this study; but the results are not published with any of this identifying information. Participants' contact information is stored with the data in Citrix Sharefile, which only the research team has access to. However, the researcher also noted that the participants' personal information would be considered confidential, although absolute privacy is not guaranteed, since certain comments made in the interview may make them, or the innovation centre or hub they are associated with, indirectly identifiable.

The next step in designing the expert interview sessions was to ensure how the collected data would be stored. In this research, data were collected through interview sessions using Zoom. These sessions were video-recorded, and after the interview sessions, the researcher reviewed the video files to conduct transcripts. After the videos were reviewed and transcribed manually, the video files were stored in Citrix Sharefile. The service is hosted at Carleton University, and all research data is securely stored in Carleton data centres.

As part of the ethics approval process, the researcher developed a consent form to be sent via email to the participants (Appendix G). If participants could not proceed with the digital consent form, participants would give oral consent just before the interview (Appendix H). The researcher first reviewed the key sections of the consent form for the participants and reminded them that the interview session would be videorecorded.

Participants were also reminded by the consent form and the researcher that this project was reviewed and cleared by the Carleton University Research Ethics Board B (CUREB-B) (Appendix A).

3.4 Recruitment of Participants

The primary purpose of this research is to understand how design thinking is used in innovation centres and hubs, including how it may be used by the members of these organizations or by the organization teams themselves.

Senior or executive level representatives and team members of innovation centres and hubs usually have a detailed and more comprehensive view of the organization's activities. Compared to the members who join the centre or hub to take part in its offerings, the representatives have extensive information about how and to what extent design thinking may be used among the members or by the centre or hub itself. Representatives' professional expertise and their experience in interacting with the members of the innovation centre or hub may have strengthened their insights. Thus, the researcher decided to conduct interviews to obtain the required data from these individuals.

Using the initial list of 30 potential participants from the online research activities that met these criteria (including directors, membership managers, and programming managers), the researcher utilized two methods to get in touch with them. In the first method, the researcher sent the invitation (Appendix B) directly to the professional email of the people in the list of participants. The researcher also tried to contact the

administrators of the innovation centres and hubs to send out invitations to potential participants. Although many invitation emails were sent by the researcher, as expected, the percentage of respondents was deficient. The researcher tried to increase the number of accepted invitations by sending follow-up emails (Appendix C, and Appendix D).

After two weeks of attempting to communicate and a few rejections, people finally started sending positive responses. During the first two weeks, the researcher conducted four interviews and sent out more invitation emails to other potential participants and other innovation centres and hubs. In addition to re-researching to find more innovation centres and new participants, the researcher was able to identify several new centres and hubs during the interviews. With increasing invitations by inviting more new people, the number of positive responses to the invitation rose.

Finally, the researcher decided to ask the former participants to get help from their professional network and send the research invitation to their colleagues and other innovation centres and hubs (Appendix E). This method, called snowball sampling, is one of the most effective ways to find more participants for research (L. A. Goodman, 1961; Heckathorn & Cameron, 2017). Snowball sampling is a strategy in which current research participants solicit new participants from their circle of acquaintances (L. A. Goodman, 1961). As a result, the sample group is said to expand like a snowball. After the previous participants sent the invitation, the researcher was able to conduct four more interviews.

In the end, the researcher interviewed ten experts in total, from nine different innovation centres and hubs around Canada. Five innovation centres and hubs' representatives participated in this study were in the province of Ontario, and the other

four participated from Quebec, British Colombia, Alberta and lastly from Nova Scotia (Figure 9). The sample size was pragmatic, because that is all the people the researcher could enroll in the study in the limited time available. On one hand, a larger sample size would yield more results and data, recruitment however took a lot of time as people do not necessarily respond without several follow-ups and because it can be hard to gain their interest as they have demanding jobs. Furthermore, the transcriptions of the video recordings were done manually, and with 10 people included more than six hours of verbal data that had to be listened to iteratively and carefully. Finally, the in-depth analysis of this qualitative data had to be done carefully and iteratively as well which also took a lot of time and effort.

FIGURE 9 LOCATION OF INNOVATION CENTRES AND HUBS THAT PARTICIPATE IN THIS STUDY BY PROVINCE

Due to the qualitative nature of the research, this poses the question if the sample size would be sufficient to answer the research question. The most important features that determine the quality of the sample size in such studies are data saturation, homogeneity of participants, and the scope of questions (Baker & Edwards, 2012). Saturation is the number of people the researcher talks to before hearing the same thing repeatedly, and this can be considered an overlap of homogeneity of participants and the scope of questions. The homogeneity of the participants will make results more similar as well and because the study deals entirely with experts in the same area of work, this can be assumed to be high. Finally, the range of questions meant the scope and subject matter of each question is limited, although all questions are open-ended, this helps to provide answers in a specific area.

3.5 Expert Interviews

The semi-structured expert interviews were all conducted virtually using the Zoom video-conferencing platform. Each lasted about 30 to 40 minutes. During these interviews, the researcher asked participants to share their views on the role of design thinking in innovation centres and hubs. The interview structure consisted of four general sections, each of which pursued a specific goal. All questions were designed to be open-ended to avoid directing participants' responses (Appendix I). The questioning method was designed to encourage participants to provide honest feedback and experiences. In a qualitative study such as this one, the researcher and the interview process must have a minimal impact on participants' responses to reduce bias (Goodman et al., 2012).

The first part of the interview discussed the role of the participants in the innovation centres and hubs and what they do to accomplish this role. This section consisted of two fundamental questions. In the first question, the researcher asked the participants to talk more about their job titles and duties within the organization. The primary purpose of this question was to better understand the participant's role and tasks and the extent to which they fit into real-world activities. The second question in this section asked participants to explain the innovation centre or hub team and other roles within the organization. The purpose of asking this question was to become more familiar with the active roles in the innovation centres and hubs, especially the roles in interaction with their members.

The second part of the interview focused on the innovation centre or hub and its core competencies. This part of the interview also consisted of two basic questions. The first question asked participants to provide a complete description of the values and objectives of the innovation centre or hub. In addition to helping form a better understanding of why the centre or hub exists, this question helped to obtain an appropriate measure for the centre or hub’s achievements. In the second question, the researcher asked what support and resources the innovation centre or hub provides to its members. By asking this question and obtaining complete information about the financial and non-financial support provided, the researcher can better understand the centre's efforts to achieve the goal. At the end of this section, it was expected that the researcher would obtain comprehensive information on the work process of the centre or hub and its main objectives. Another goal of this section was to obtain information about the involvement of innovation centres and hubs in social innovation projects. These centres

and hubs support a variety of innovations, although the purpose of establishing themselves, especially physical shared workspace, shows the importance of collaborative activities.

The third part of the interview began with a question about the extent to which participants are familiar with the concept of design thinking. In this section, the researcher tried to better understand the level of familiarity of the participants and the nature of the innovation centre or hub with design thinking. This section continued with whether the centre or hub, or its members use this way of thinking in their projects. This raised direct questions about familiarity with the concept of design thinking and its use within their organizations. Sub-questions in this section were designed according to the participants' answers to achieve more elaborate and deep answers.

The final part of the interview sought to explore participants' perspectives as high-ranking representatives in innovation centres and hubs on the future of innovation and design thinking. This section also consisted of two central questions. First, participants were asked to share their views on the future of innovation and social innovation through the lens of design thinking, so as to visualize a picture of how design thinking and the field of social innovation relate. Secondly, the researcher asked what the future of innovation centres and hubs is from the point of view of design thinking, in order to understand the high-level positions of innovation centres and hubs on the role of design thinking in the future of these organizations. While answering these two questions helps to better understand the future of innovation from a design thinking perspective, it can also reflect the role of innovation centres and the future of the innovation ecosystem. This set of questions tries to give an overview of the role of innovation centres and hubs in the

innovation ecosystem and then the role of design thinking in these centres and its nature in innovation.

At the end of the interviews, the researcher asked them to add any content they thought was needed, to allow them to pose questions that were outside the scope of the prepared question but related to the topic.

In terms of the subsequent analysis, the researcher transcribed the interview sessions by reviewing the video recordings and using the automatic transcription feature of the Zoom software. The researcher tried to write a transcription with the greatest detail and as close to the actual conversation as possible; however, the participants' speech styles and responses made the transcription process challenging and it did take more time to do it properly. After completing the transcriptions, the researcher rewrote and edited them again, and with the help of Grammarly editor software, corrected the wording and spelling mistakes to a reliable extent.

3.6 Data Analysis

This study utilized a deductive and inductive thematic approach to analyze interview transcripts from interview responses (Figure 10). Deductive coding is a top-down technique in which the researcher starts with a series of predetermined codes and then extracts matching information from the transcript (Robson & McCartan, 2016; Saldaña, 2021). The deductive coding was used to pre-define codes based on the specific purpose behind the researcher's questions. Whereas the interview questions were open-

ended and gave participants the freedom to answer, each question had a particular purpose as stated above.

As the experts provided open ended answers to the specific questions, there is the expectation that one should seek to find unexpected insights. This approach is called inductive coding, in which the researcher thoroughly examines the text to discover themes that are hidden in the data. The use of this technique is because not all codes and themes may reach the minds of researchers, and some of them may remain. Although inductive data coding takes more time than deductive coding, it was used in this research to complete the data analysis process and to provide more insight and depth (Robson & McCartan, 2016; Saldaña, 2021).

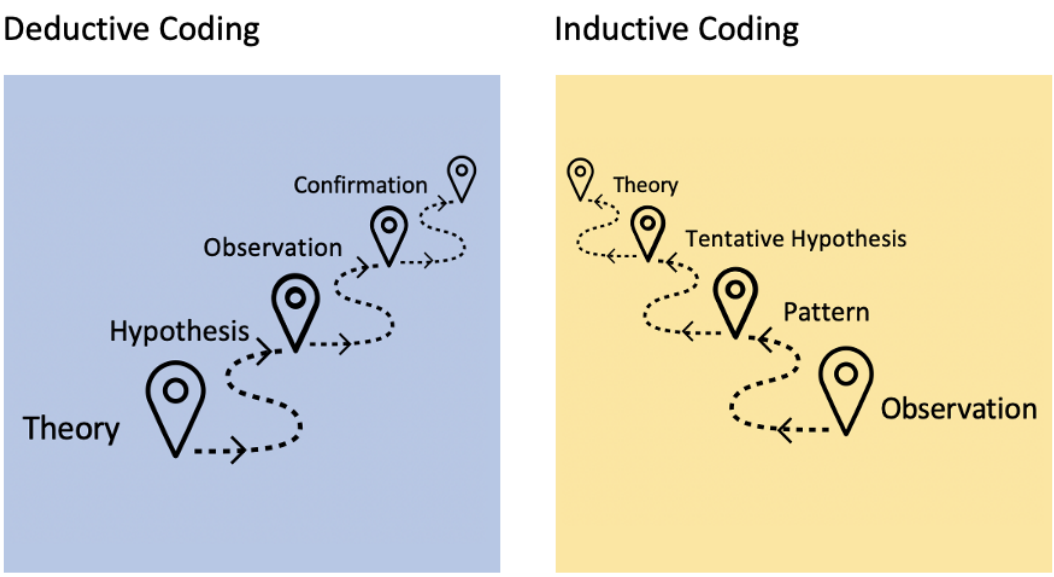

FIGURE 10 COMPARISON BETWEEN DEDUCTIVE AND INDUCTIVE RESEARCH APPROACH (ADAPTED FROM TROCHIM & DONNELLY, 2006)

Preliminary themes for the deductive coding came from the research question and objectives and were first manually coded by the researcher utilizing a spreadsheet in Microsoft Excel. Responses were coded, and specific quotes from the interviewees particular to the study were also highlighted for the elaboration in the Findings and Discussion chapter. The researcher compared responses from the participants and wrote down his own interpretations and insights from the responses. This was done in an iterative and reflective manner.

Through reading the responses iteratively, the researcher started to take note of hidden themes and developed new codes for these through the inductive method. Doing this technique was aided by simple methods such as searching for a keyword in the transcribed text. However, after creating a new code, the researcher needed to reflect on the insights and opinions of the participants and make sense of this data through interpretation and comparison between responses by various participants.

The researcher analyzed the expert interview data through a deductive thematic approach, which identified six separate themes for data analysis in the first step, and the data coding process began (Figure 11). The researcher then used the inductive approach to examine the data obtained from the interview sessions to add four more codes to the project analysis (Figure 11).

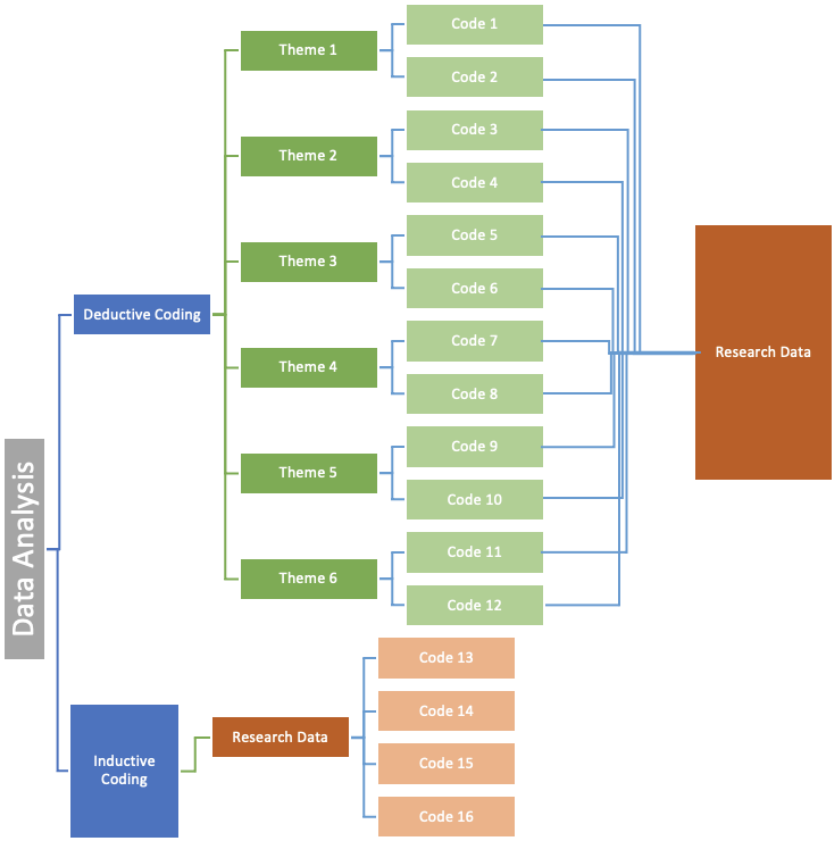

FIGURE 11 RESEARCH DEDUCTIVE AND INDUCTIVE CODING CHART

Chapter 4: Findings and Discussion

The online research on innovation centres and hubs was explorative in nature. It was useful as a general starting point in order to examine the centre and hubs stated mission, values and membership. The research served more than the purpose of gaining an overall impression as it helped the researcher uncover the lack of specific information or reference to the term design thinking on 30 sites investigated. It also allowed the recruitment of experts and helped the researcher to become familiar with how the centres and hubs present themselves via their online presence. Based on this, it was found that most innovation centres and hubs started their operations by providing a shared workspace for their members who could benefit from such shared access. Many of these centres and hubs have various services and resources to offer their members: including consulting, training, networking, and innovation, as well as office services. According to this explorative online study, the members of these innovation centres and hubs consist of innovative people, small and medium-sized companies, and non-profit organizations that use the services and resources provided. Membership in these centres and hubs is usually accompanied by a request and payment of a monthly fee, giving them access to shared physical workspace and even workspace in partner centres or hubs. Finally the online information was used for the purpose of designing the interview questions for the primary data gathering as well as formed the basis for the deductive coding themes.

In this chapter, all the exploratory results of the experts' interviews, which are specified in the methodology chapter, are presented, and examined in detail. The data encoding, and classification is explained, and various concepts and comparisons of views are discussed. As explained in the methodology section, the researcher defined specific themes for data analysis based on questions using the deductive coding method. These themes include (Figure 12):

- Title and description of the participants' role;
- Team and other roles at the innovation centre/hub;
- The mission and vision of the innovation centre/hub and their values;
- Resources and services that the centre/hub provides;
- Familiarity with design thinking and its use in the innovation centre/hub;
- The future of innovation and innovation centres/hubs on design thinking.

FIGURE 12 RESEARCHERS DEDUCTIVE AND INDUCTIVE CODING THEMES

The researcher sought to achieve a coherent process when designing interview sessions and constructing questions. Information, findings, and analyses were presented in the same way. First, the researcher examined the role of participants in innovation centres and hubs, and then other roles and teams in these organizations were analyzed in detail. The primary purpose and values of the innovation centres and hubs were then interpreted, from which the resources and support that these provide were carefully examined. In the third part, the researcher introduced the participants to design thinking and tried to gain a comprehensive understanding of the role of this thinking in innovation centres and hubs. In this section, the researcher tried to narrate the definition of design thinking from the perspective of participants and their organizations.

Finally, a comprehensive analysis of the future of innovation and innovation centres was carried out through the lens of design thinking from participants' perspectives. After coding and analysis with a deductive approach, the researcher encoded the data using the inductive method and explored the meaning in the data. Therefore, in the final part of the findings and data analysis, the researcher discusses all unrecognizable content in detail. Throughout the inductive coding, four new codes emerged (Figure 12).

4.1 Title and description of the participants' roles

The question of the expert about their title and description of their role (Figure 13), aimed to better understand the position and the extent of participants' knowledge of

innovation centres and hubs and their members. Among ten participants in this study, five managers, three directors and co-founders, and two coaches and trainers participated. The primary value of interviewing people who have a high-level role and position in innovation centres and hubs is that they are in explicit contact with members and are aware of the centre or hub's strategic decisions.

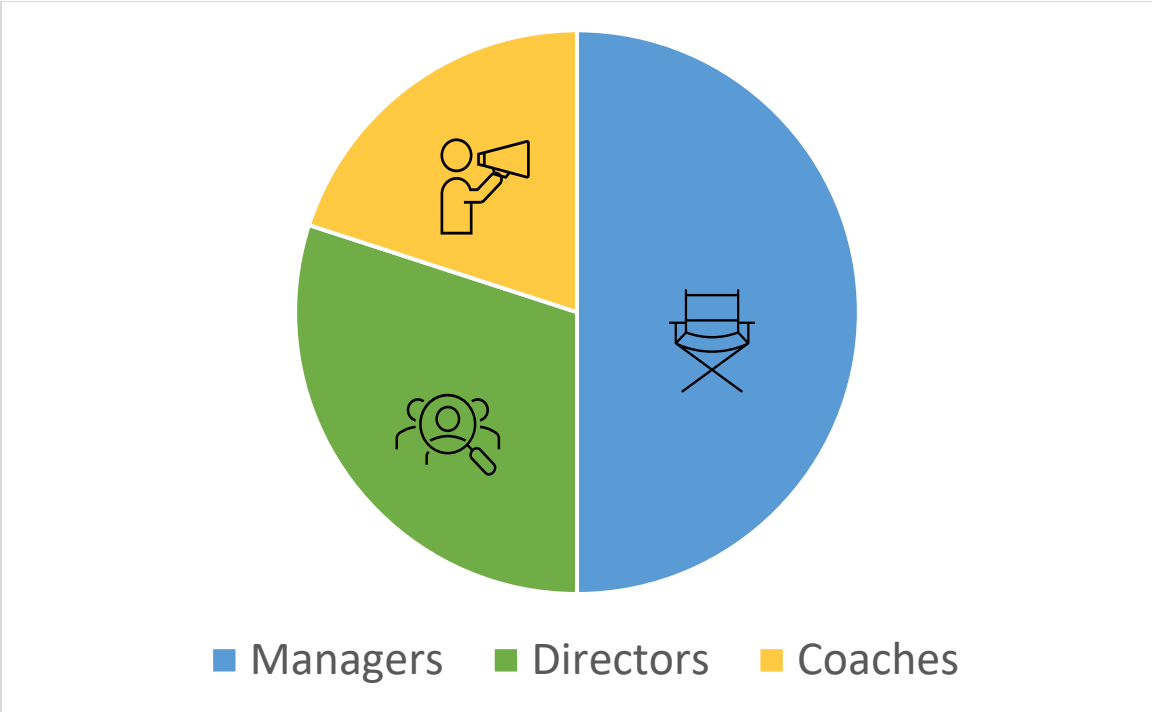

FIGURE 13 THE PROPORTION PIE-CHART OF THE PARTICIPANTS ROLES IN THIS STUDY

As the researcher examined the data, he noticed a pattern about their job background. According to the three participants, they work specifically in the field of social innovation. One participant stated that the work that the centre undertakes is mostly focused on identifying researchers who are conducting social innovation studies or research that has the potential to have a significant influence on the community. Another participant also stated that she works as an innovator at the innovation centre. A

total of seven participants pointed out that social innovation activities are taking place in their centres and hubs, where humans and environmental sustainability are a priority.

Innovation centres and hubs' teams are structured individually for their various goals and values. However, there are similar roles and job descriptions in each centre, including Directors and Lead Managers, Community and Centre Managers, Innovation Leaders, Coaches and Trainers, and Program Managers. The researcher found similarities not only in terms of participants' job titles but also in terms of their responsibilities and routine tasks such as managing the space, managing the members' community, designing programs, networking, and building partnerships. Multitasking and collaborative skills seem to be a common feature among this group. Individuals work collectively and enter different departments if necessary. Although this does not represent a formal definition of their job title, a participant emphasized that team spirit is one of the main elements of the process on innovation projects. For instance, one of the participants mentioned during the interview that "I feel like I am doing a little bit of everything, which is the best."

Although multitasking and collaboration in a structured organization can be controversial, according to one participant, these are multi-dimensional roles, and all involve the overall success of the innovation centre or hub. Another reason for the concept of multitasking was the small size of their teams. Most of these centres and hubs operate locally and with limited capacity, and small teams and limited staff seem reasonable, in addition to the fact that most of these centres and hubs state that they are non-profit which causes the expansion of teams to be very slow. In brief, the researcher deduced that the role of individuals in this context, no matter how specific and defined, still leads to multitasking, which is the main pillar in the innovation centres and hub's

culture, leading to cooperation between team members and all people within the organization.

4.2 Team and other roles at the innovation centre/hub

According to almost all participants, a participatory and collaborative atmosphere can clearly be seen in the structure of innovation centres and hubs. A cohesive atmosphere allows employees and members to share their views, which helps coordinate and integrate the system. Although in many situations the number of staff is fewer than ten and people usually work while multitasking; learning and working with different skills have still formed a collaborative work culture.

The core of innovation centres and hubs is usually composed of two to three teams, including the leadership team, the consulting team, and the coaching team (Figure 14). The leadership team usually consists of the board of directors and decision-makers for the organization's macro strategies. For example, one of the participants said: "In that regard, the board of directors effectively controls the centre and decides many of the team's strategic choices." By comparing participants' responses, the researcher noted that, as mentioned earlier, based on the teamwork culture, the leadership team usually has a horizontal structure and strives for consensus-based and non-hierarchical frameworks.

When all these teams work together, they work in the interdisciplinary realm (Figure 14). As previously mentioned, many staff and even high-level representatives of these centres often perform activities beyond their tasks. Although in a deliberate

collaboration, each team has a specific role, according to the participants, it is widespread to perform the tasks of other teams and apply interdisciplinary skills in innovation centres and hubs.

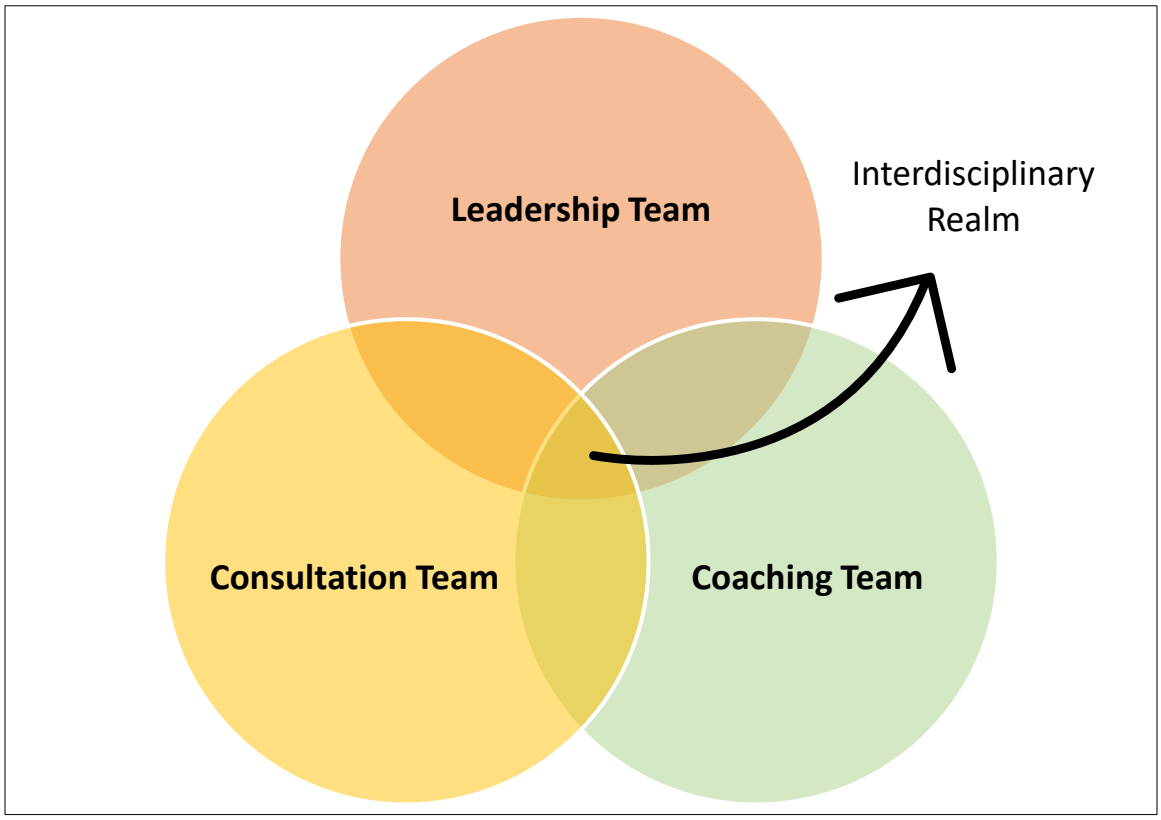

FIGURE 14 INNOVATION CENTRES AND HUBS DIFFERENT TEAMS AND THE INTERDISCIPLINARY REALM

The consulting team is generally composed of experts in various fields and active in communication networks that support members of the community in the stages of the innovation process. These people directly connect with the innovators by providing rich insights, valuable tools, and one-on-one meetings, accompanying them on their journeys.

Based on participants' definitions, consulting team members can be permanent members of the centre or hub team or enter the system on a contractual and cross-sectional basis to help projects.

The last to be seen at innovation centres and hubs are usually the coaching teams; usually in direct contact with the members, as they practically become part of the innovation centre or hub's community themselves. The primary purpose of this team is to coach and transfer experience to innovators. They are also constantly involved in running the programs and events.

In addition to all these formally active teams, informal groups play an essential role in the innovation process and, according to the participants in this study, have enhanced the centre or hub's activities (Figure 15). Volunteer groups are usually found in the academic-based innovation centres and hubs and are formed from a student community eager to work in such associations. According to one of the participants in the research, the number of part-time volunteers who work on the team is greater than their full-time staff. The second group is the community leaders who actively work for the community's objectives and enter the innovation centres and hubs to participate in innovation projects beneficial to their community. Although this group is limitedly active in business-oriented innovation centres and hubs, their expertise in their own experience and eagerness to fulfill social goals makes their presence extremely valuable.

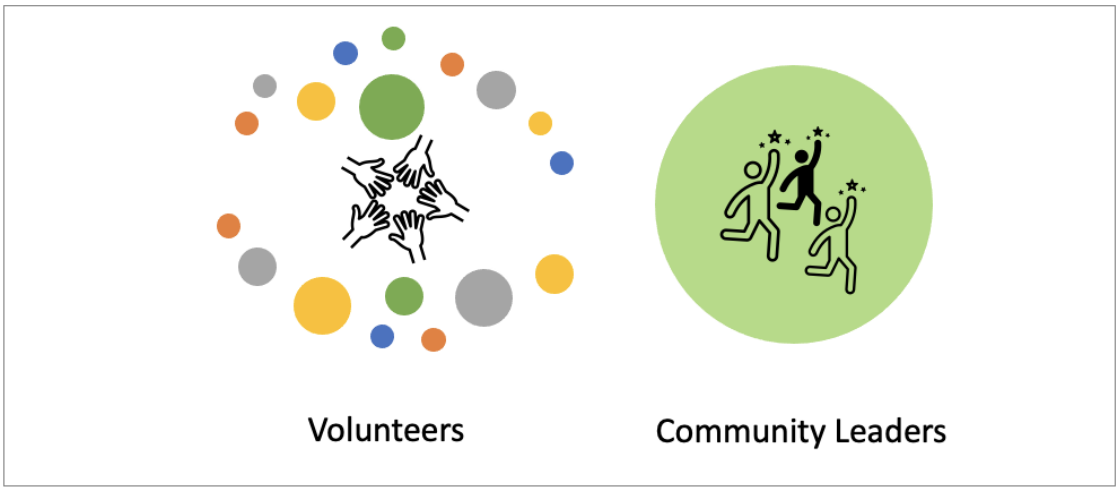

FIGURE 15 THE INNOVATION CENTRES AND HUBS VOLUNTEERS, AND COMMUNITY LEADERS

Berger and Brem (2016) note that in the end, the fate of an innovation hub is all about people: the people who decide that they want to set up an innovative environment, the people who are attracted by these environments, and the people who lead teams and work in such environments. The interaction of the centre and hub's staff with these groups is vital for the organization's purposes. This creates the local community, which is a small part of the innovation ecosystem. Any misstep in enticing and directing these people reduces the probability of their success.

4.3 Mission, vision, and value of innovation centres/hubs

In order to discuss the success of an innovation centre or hub, the researcher examined the goals and values of that organization to gain a better understanding of the criteria for measuring success. The third stage of data analysis is related to the mission, vision, and values of innovation centres and hubs (Figure 16). Among the essential data the researcher strived for was a better understanding of an innovation centre or hub's goals, which directly impact its strategic approaches. For example, half of participants were from innovation centres or hubs that collaborated with or are established in a university, but their policies and values differed from their academic backgrounds. University-based innovation centres and hubs as knowledge brokers can support advanced research, education, and innovation. An academic-innovation institution might integrate activities with various aims in various ways to link the organization's internal networks with external sources of information.

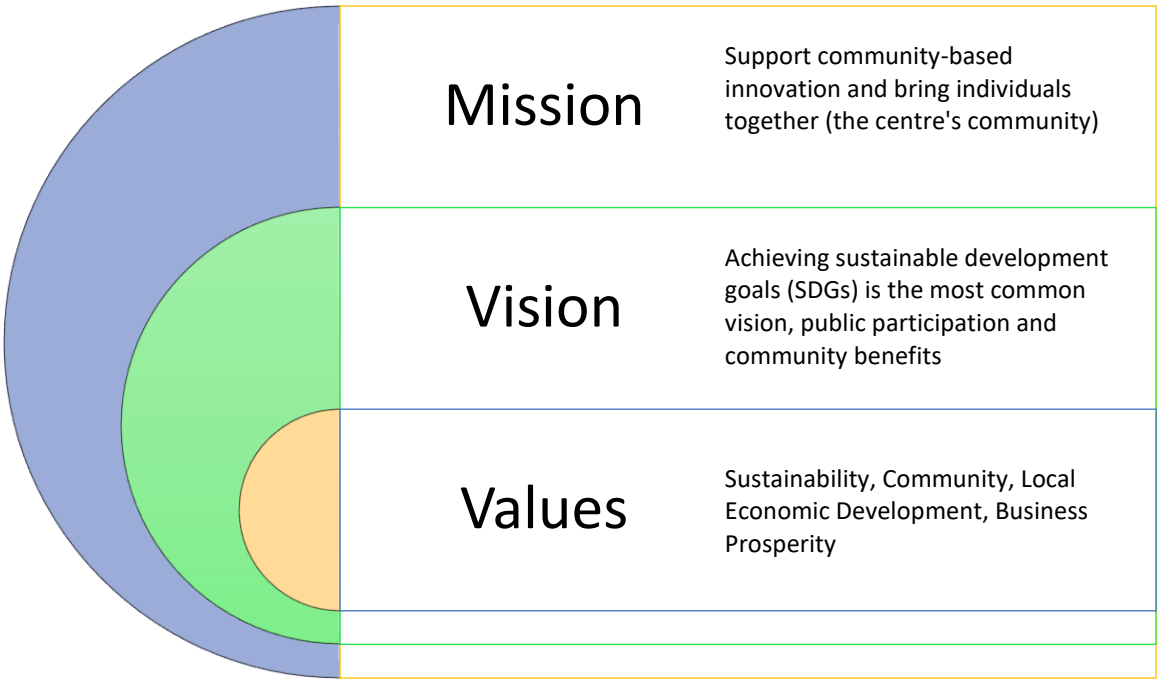

FIGURE 16 INNOVATION CENTRES AND HUBS' VALUES, VISION, AND MISSION

In terms of the values of innovation centres and hubs; more than half of the participants, six to be exact, consider the existence of the community as one of the main pillars of their organization. They emphasize the value of bringing people together to develop and generate new ideas in innovation processes. One of the participants, believes that public participation at the grassroots level is the most vital element of the centre. Another participant in the interview told the researcher that the core value of their centre is to support community-based companies to build their capacity to deliver more robust programming for their communities and to develop their business in a way that supports the community.

The other core value of innovation centres and hubs is to create a solid and sustainable network of individuals and businesses. One of the first participants in the

study stated that they have “folks from the environmental sector, folks from the business sector, and folks from aerospace and chemical engineering”. So, the idea is really to have as broad a network as possible so that regardless of what members' true passions and desired impacts are, they can benefit from the network's connections. Another participant mentioned that their network is one of the biggest things they offer. They noted: “We have a truly strong, I think, network locally and in Ontario that we help people build bridges to and among.”

Each innovation centre and hub set a unique mission and long-term vision for its strategic plan to address these values. Achieving sustainable development goals (SDGs) is the most common vision that innovation centres and hubs define for their organizational strategy. As one participant puts it, the "impact continuum" creates the culture and mindset they promote in their innovation centre that seeks to offer innovative solutions on a global scale through a local lens.

All United Nations (UN) members endorsed the sustainable development agenda in 2015, which provides a shared roadmap for peace and prosperity for people and the planet today and in the future by 2030 (*Sustainable Development Goals*, n.d.). The 17 Sustainable Development Goals (SDGs) \ represent an imperative call to action for all nations developed and developing to work together in a world community. They understand that eradicating poverty and other forms of deprivation must be combined with efforts to enhance health and education, decrease inequality, and boost economic growth – all while combating environmental issues and protecting our seas and forests.

Many other innovation centres and hubs identified public participation and community benefits as their organization’s most important vision. These centres and hubs

are the ones that introduced their values to the community and interaction networks. "Transformed economy" is a concept of these goals and visions, which is defined by one of the participants as follows: "the future requires a transformed economy that is dynamic, just, sustainable and resilient". Another participant introduced the "theory of change," which is a belief that serendipity occurs when the appropriate people, values, and environment are brought together. This combination results in the creation of a social innovation process. This innovation centre believes that innovation begins with creating physical space. They believe that the functional, inviting, and energetic space attracts more people to the centre, ultimately leading to the formation of a community. A community that starts as a group of people looking for a workplace becomes a community for innovation through conscious and careful planning and monitoring.

The community is one of the most valuable assets of an innovation centre or hub, and all participants in this study emphasized that having a large and active community is valuable for any such organization. The community of innovation centres and hubs is the result of the efforts of these organizations to create connections and networks of specialized and experienced people together. One of the experts who participated in the interviews stated that to achieve strategic goals, their innovation centre strives to train members to make an impact in the community. The community of innovation centres and hubs sometimes includes the employees themselves, with another participant stating that sometimes the employees' relations with members take on a form such that the employees become practically part of the community of the innovation centres themselves. The formation of these communities and the connections within this network are the main goals that the centres and hubs strive to accomplish. Academic-based innovation centres

and hubs, despite having communities that are usually student-centred with a primary purpose to support and empower students meaningfully after graduation, have a similar purpose in shaping society.

Apart from all this, one of the primary missions, which is one of the reasons for the formation of innovation centres and hubs in the first place, is the physical space. The researcher became aware of the particular importance of physical space when, in data analysis, it was found that almost all participants cited physical and shared workspace as a primary resource. For example, three interviewees stated that the main sources their centres and hubs provide are shared workspace and facilities such as office space, conference rooms, Wi-Fi, coffee, and even cooking utensils. The importance of physical space was clear when one participant stated, "We had to close the in-person centre because of the COVID-19 pandemic, so I do not think our centre is officially an innovation centre right now." From the researcher's point of view, physical space is a central part of the identity and body of innovation centres and hubs, which will be discussed more in the following sections.

Innovation centres and hubs need to set long-term visions and values to achieve correspondingly defined goals. They strive to achieve these values through various missions tailored to their visions, using multiple resources to accomplish their goals. In the next section, the researcher examines the help and support that innovation centres and hubs provide to their members and how helpful they are. In addition to trying to understand how impactful the services and programs provided by these organizations are, the researcher describes what approaches they offer in their use.

4.4 Resources and services that the centre/hub provides

A variety of resources are needed to support and implement innovation. Specialized organizations themselves can provide each service and resource, but there is a differing view regarding whether innovation centres and hubs provide this support together. Representatives in this study pointed out that providing all the resources and support creates a strong communication network that is a key element of their community. Many offers similar programs, although they all modify them based on their needs and goals to make them more useful to members. One of the sources most often cited by innovation centres and hubs is the connections between each other, which has led to work and project collaborations, and participation in the Canadian Innovation Ecosystem.

As mentioned earlier, the formation of the community and the network of members is one of the main goals of such organizations, created by their efforts to attract members and generate communication channels among members. Innovation centres and hubs work through organizational strategies down to the smallest detail; for example, one participant noted that they have only one microwave in the centre's physical space to make sure that everyone must come to the same area to heat their food and wait in the same place to talk in the process. Another participant considers this issue as a kind of knowledge sharing and presentation of some of the leading methods and approaches to influence. At the end of the day, the community, and the network of members, is one of the main pillars of an innovation centre or hub at any level.

A shared workspace is not only one of the most important resources, but also an essential one (Figure 17). Many described their organization's start as a shared workspace. In one of the first interview sessions, the participant said that they think this is one of the biggest things they offer: a meeting space, collaboration spaces, work desks, and offices with Wi-Fi and coffee and people.

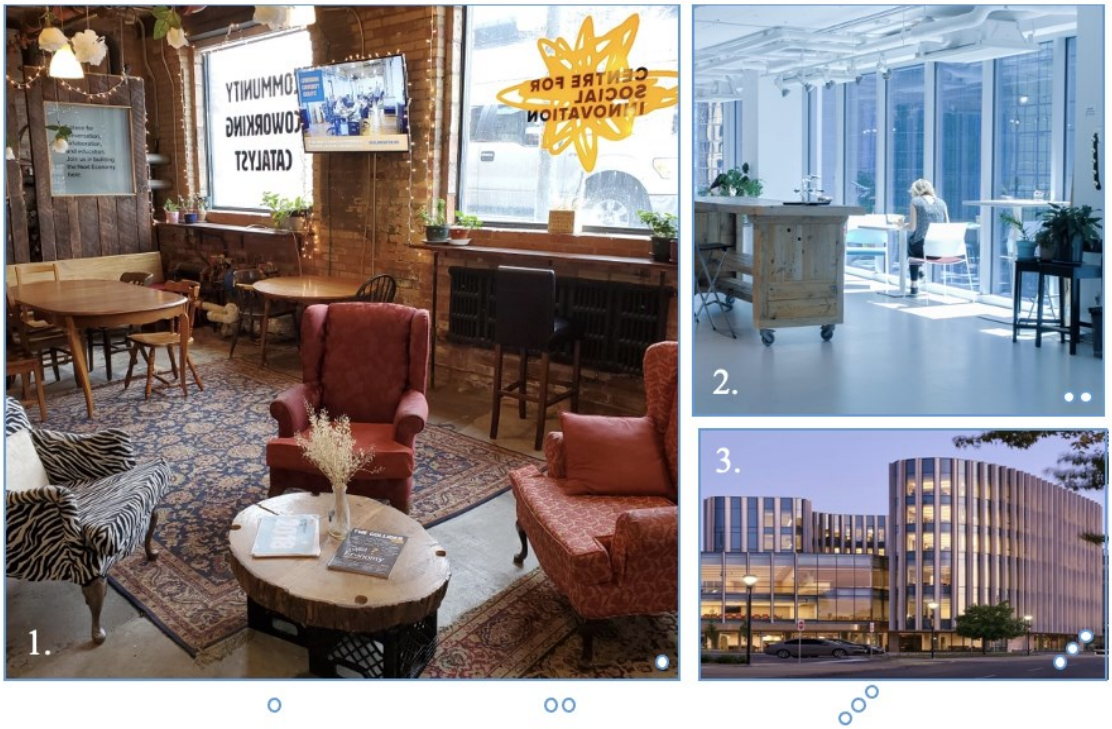

FIGURE 17 INNOVATION HUB PHYSICAL SPACE: 1. CSI ANNEX (*CENTRE FOR SOCIAL INNOVATION ANNEX BUILDING*, N.D.), 2. IMPACT HUB OTTAWA (IMPACT HUB OTTAWA CO-WORKING SPACE, N.D.), 3. CARLETON UNIVERSITY NICOL BUILDING (*CARLETON UNIVERSITY NICOL BUILDING*, N.D.)

Many offer not just one space but several physical spaces in different locations; this can be seen in academically driven innovation centres, for example. In addition, the

Innovation Centres and Innovation Ecosystem of Canada network allow members to obtain a passport and permission to enter and use the shared workspace of another centre. The researcher believes that the physical space is more important than a mere physical workspace. The importance of this physical space as an environment for gathering innovators to work together to achieve common goals instead of just confronting each other is a key element of success. Working toward common goals does not mean abandoning members' individual demands, but rather prioritizing important issues for more people and involving more stakeholders. Physical space allows members to come together in an environment and connect with each other to form a creative community.

Member networks, counselling sessions, and training events are some of the resources that innovation centres and hubs are expected to provide Training sessions and workshops, are often designed to be useful and accessible to all members. One interviewee said: "Currently, many of the programs we have are extracurricular. So, we do not want to make it very difficult for them to participate in these programs. We are light on their commitment, yet at the same time, as impactful as we can be."

At the same time such events can be specially designed for a specific organization or role. One participant stated that the organization wanted to train a business development officer on how to better support the entrepreneurs they work with, so the centre designed special sessions for them.

Financial issues have always been of particular importance for an innovative person or start-up business. Financial resources are available in the form of loans, prizes, grants, and even investments, but not all innovation centres or hubs agree on the effectiveness of these for members. One of the interviewees noted that their innovation

centre once had a micro-loan for members, but they no longer offer it. "We found it honest to say that it was not as helpful as we thought it would be, and so it is stopping right now because we are kind of re-imagining it,". The participant continued: "Although this helped some people, the fact that it was a micro-loan foundation was not very helpful, as they had to repay it. We often deal with organizations that are probably in the process of development, and they are earlier than the stage where they have to go into debt. If they want to go into debt, they have to have a very special space in a certain area."

The researcher did consider the capability of each centre and hub and how they offer these resources. For example, academic-based centres and hubs in conjunction with academia and industry can take advantage of a wide variety of capacities in which a business-based centre or hub is limited. For example, they have access to advisors from the faculty members, the physical space of the university, and even the possibility of participating in university programs and events. "It is a multi-pronged strategy," stated one of the participants, "and the aim for us is to be able to give different kinds of support to innovators based on where they are on their path."

All participants of this study agreed that the experience and knowledge sharing could be more effective than other sources. Therefore, providing counselling sessions with innovation leaders and training sessions with experienced trainers is one of the leading programs that is generally offered. "The coaches have something that I think is a precious piece of what we do," one study participant told the researcher. But it is not only formal programs that are available at such centres and hubs; as one expert interviewee pointed out, it is like finding something you are not looking for. There are also informal

programs and meetings organized by members. The researcher considers the experience and knowledge sharing essential for innovation processes and notes that the community of innovators in innovation centres and hubs even have innovative methods for sharing expertise. From in-line food conversations to member workshops, transfer of knowledge requires building a network of creative people. The organization may not provide these resources in a tangible and planned way; still, such results are undoubtedly one of the consequences. Finally, it can be concluded that resources are predominantly presented in the following four categories: innovation centre or hub community, co-working space, coaches and consulting resources, and financial resources (Figure 18).

After understanding the innovation centres and hubs' main values, visions, and missions and having a better look at what resources they offer, it is time to investigate their initial understanding of design thinking. In the next stage of analysis, the main researcher reviews and critiques the participants' responses about their familiarity with design thinking and the use of it in their organizations.

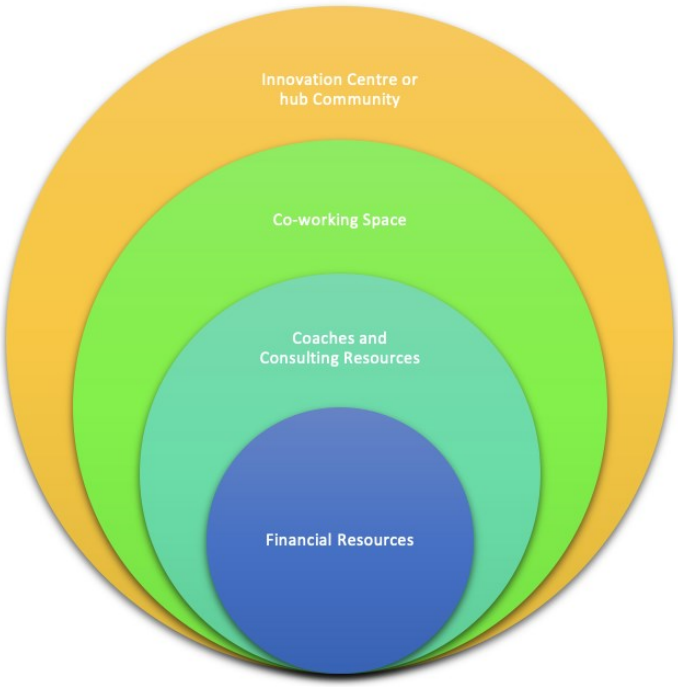

FIGURE 18 INNOVATION CENTRES AND HUBS' RESOURCES AND SERVICES

4.5 Familiarity with design thinking and its use in the innovation centre/hub

Design thinking and endeavouring to describe its role in innovation centres and hubs, was the basis of this research. The participants responded as to how knowledgeable the staff and members are with design thinking and how much they use it in their innovation processes. Except for one participant, all nine others were aware of design thinking at different levels. However, the researcher's analysis of the participants' responses raises a new debate about the similarity of the design thinking definition from the perspective of members and representatives of innovation centres and hubs. Different interpretations of this concept seem to have been used, which seems to be an expected

debate due to the expansion of design definition in recent years (Amatullo et al., 2019; Manzini, 2015; Sanders & Stappers, 2008).

Many participants do not come from a design background, so their familiarity with design thinking goes back to their experiences in innovation centres and hubs confronting this concept. For example, one participant stated: "When I first started working at the Hub, I was introduced to the concept of design thinking, which I first heard about at one of our programs." The participant continued: "As the instructor of a course on design thinking and human-centred design, a designer introduced it as a means of understanding the problems you want to solve and the people you want to collaborate with." In this definition, the participant seems to be familiar with Brown's (2009; Sanders & Stappers, 2008) definition of design thinking as an approach and process.

This indicates that the participants in this study are familiar with design thinking through second-hand knowledge. Although many of them have participated in projects that use the design thinking approach or have been introduced to the concept by those around them (other members), no one had been professionally trained in this approach or at least not substantially so. One interviewee stated that "although I have not had formal training in design thinking, I am certain that I have been exposed to it and am familiar with the principles." This participant noted that she has used some design tools and methods in different projects, which reflects their attitude towards design thinking as a set of tools as per Sanders (2008). However, another co-expert told the researcher that "I will be a candidate, and I have a basic understanding. I used design thinking through IDEO, a design and consulting firm, in a bit of coursework before working at the centre."

As mentioned, participants with a background in social innovation participated in this study, so seven participants had an evident familiarity with the social innovation process. These participants stated that their field of activity and their experiences in innovation centre projects made them familiar with the concept of designed thinking. For example, one participant said, "I have not been formally trained in design thinking, but I definitely, I definitely know I've been around people talking about it and understand the concepts well enough." As mentioned, in the process of social innovation and co-design, there are generative tools to help participants actively communicate in the process (Sanders & Stappers, 2014; Sanders & Stappers, 2008). Another participant told the researcher that their centre is trying to introduce design thinking, social innovation and human-centred design to members under one umbrella because they all have overlapping ideas.

In re-examining the transcripts of the interviews, the researcher found that two participants stated that they were fully acquainted with the design thinking approach. In contrast, there were differences between their definitions of design thinking. The first participant stated, "We are very familiar, we do it, we use it, and we use it more on the business model validation program." The participant seems to look at design thinking more from a business perspective, which is only one part of the design thinking approach. Again, the participant seems to see design thinking as more of an approach to the innovation process than anything else. Another participant stated that they knew enough about design thinking, saying that because of their background and that they are primarily an artist, they believe that they are familiar with all design thinking, presenting it as though it were the main language in design. In this study, this is the first time that one

participant mentions design thinking as a set of attitudes, as defined by Manzini (2015) and Amalto (2019).

After eight interviews in a row, one participant said they were not familiar with the concept of design thinking. "I am not familiar with design thinking, got to be honest with you." This was one of the most exciting moments for the researcher, as he tried to reflect and critique data that differed from the common familiar responses of the other participants. The researcher in this instance was able to give a brief definition of design thinking and how to use it. The participant replied: “I would like to learn more because I believe that's something we're really trying to exemplify here. I do not have much experience with design thinking, but like I mentioned, I believe there are many symbionts and parallels between everything we're attempting to achieve.” The researcher believes that the reason for this participant's different answer from the other participants was only because he was not familiar with the term ‘design thinking’. The researcher found that this participant however used other terms and titles commonly found in design thinking throughout the interview. The researcher suggests that this participant is one of the silent designers – those who are non-designers and design, without calling it design or even knowing that they design (Gorb & Dumas, 1987) – who do the design and is familiar with the process but does not know that this is the design process they are participating in. This indicates that the participant was more familiar with the concept of design thinking as a set of tools for the innovation process. However, in the further explanations of this participant, it was evident that design thinking and its tools are used in their innovation centre. For example, the participant went on to say that they use methods such

as "Persona" to identify and gain a deep understanding of various stakeholders and “Card sorting” as a tool to explore complex ideas and help participants to disclose their insights.

In general, it can be declared that knowledge about design thinking among high-level innovation centre and hub experts exists to the extent that they are familiar with the process of design thinking and a solution-oriented approach. They are also familiar with the tools and methods used in the design thinking. Although their interpretations vary, almost all were familiar with the design thinking process and the usage of various tools in the design field. In interviews, they stated that their familiarity with design thinking usually stemmed from their encounters with designers or design events within the organization.

The result of this research shows that the role of design thinking in innovation centres and hubs is prominent and tangible. Its effect is visible not only in ongoing projects and developments at the centres and hubs, but also in the organizational strategies of the organizations. One expert explained to the researcher that they had allocated funds to redesign part of their physical space and wanted to ask their community what they wanted from the space instead of making assumptions. Involving members and stakeholders in decisions and brainstorming is one of the basic procedures of design thinking as well as social innovation. The participant, who is at the executive level also stated that they have set aside funds for workshops and trainings related to design thinking and social innovation projects have gone to the community to find out what they think.

Another participant said, regarding the use of design thinking at their innovation centre: "I think our learners and participants enjoy design thinking or value-based design

thinking as a methodology and tool for understanding and exploring possible solutions, just different thinking patterns." These tools and methods, as stated by Saunders (2014), seem to be the same probes and generative tools that are used in the co-design process. Saunders and Stappers (2014) states that the tools and techniques of design thinking in the processes in which many stakeholders participate in the future can act as a means of dialogue between participants. As mentioned earlier, design for social innovation seeks to use these tools to provide a creative and participatory approach to innovation processes for community goals (Manzini, 2015). However, it is no secret, according to six participants, that the full process of design thinking may not take place in the centre's projects. These participants explained that innovators are more familiar with different tools and methods to develop and understand growth of a business.

It was a common complaint among study participants that design thinking is time-consuming and costly, so the process in its entirety is not used in many innovation centre or hub projects. Interviewees stated that they do not use the whole design thinking process but use stages such as "idea generation" and "final testing." In addition, one of the participants explicitly stated that he is familiar with the IDEO working process through design thinking. This indicates that they descriptively know the design thinking process by Tim Brown (2009). However, given the explanation of the different stages of design thinking from the perspective of Brown (2009) in the literature review chapter, it seems that innovation centres do not use design thinking and its primary stages such as "empathy" and "problem definition." Also, three of the two participants stated that they use business techniques in the "prototyping" and testing of their ideas. It can be concluded that the representatives of the innovation centres and hubs, when mentioning

that they do not use the whole process, referred to the design process developed by IDEO.

Participants emphasized that in their view, the tools and methods mattered, and it was how they were used that determined the outcome. However, from the literature review's outcome, design thinking is a structured process, and its primary importance is in its approach, including a purposeful, solution-oriented process based on the active participation of stakeholders in all stages of the problem-solving process in design thinking (Brown, 2009). Therefore, the question arises: if the process is not fully formed, can it be called design thinking? As stated in the literature review, design thinking in this study can be described as an established set of attitudes that use innovative, integrated, and continuous approaches (Manzini, 2015). This study showed that different definitions of design thinking, which were explained in the literature review section, have caused differences in understanding the concept of design thinking in innovation centres and hubs. In addition, second-hand familiarity with the concept has led intermediaries to influence the definition of design thinking. The results of literature research show that innovation centres need to be familiar with the definitions of design thinking from the perspective of designers to be able to use it more effectively in the innovation process.

In the interviews, one participant explained more about a significant project working on their innovation centre's strategy. The interviewee stated that the centre was currently implementing design thinking for the first time in full because it is usually based on the financial funding deadlines and schedule. In this case, design thinking is used as an approach and process to design the system strategy of this centre. This points out that since innovation centres and hubs are generally not for profit and their budgets

are usually funded by investors, they cannot always take full advantage of design thinking. By not fully investing in the design thinking process, they often do not have the time to do the necessary research to ensure that they are entirely human-centred when it comes to design or co-design.

The fact that design thinking is not fully applied in the context of projects is possibly another reason why participants in this study have different definitions of this concept. Hence, at innovation centres and hubs, the design thinking approach does not follow all the possible steps outlined, and instead, individual methods and tools are popular. Another participant, active at an academic-based centre, stated that they do not always apply the design thinking whole process and tools, as previously declared design thinking can be seen as a process (Brown, 2009) or a set of tools (Sanders & Stappers, 2008). They indicated instead that they use only what they consider the most appropriate design thinking steps, depending on the different project stages disclosed by members. The participant continued that design methods and tools are commonly used for social innovations that prioritize society and the planet. It seems that the human-centreed nature of design thinking makes this approach and its techniques suitable for social innovation processes. Surprisingly, however, design thinking has not been able to establish itself as a more critical aspect of running projects in innovation centres and hubs.

It seems that the experts believe that the concept of design thinking has been introduced through their organizations but are biased in presenting and applying it in whole. The desired and different selection of tools changes the process and application of design thinking. Although the tools and methods of design thinking work properly and are helpful for a project, in the end, the process is incomplete and may not deliver the

required results. "We're not really in favour of any particular tools, and we use whatever we have available in some way, “this is where we are in terms of specific design thinking tools," the participant from the academic-based centre concluded.

On the other hand, design thinking as an attitude can have a more profound and fundamental impact on social innovation projects as they always tackle complex social issues. Different approaches are used in the innovation process and the term design thinking has become known as one such approach that addresses everyday problems and complex social issues (Docherty, 2017; Sanders & Stappers, 2008). There is a disconnect in terms of what design thinking aims to accomplish and what senior members of the innovation hubs and centres believe is feasible. They believe that the economic and financial dimension prevents them from utilizing a more extensive involvement of stakeholders in the process as it is seen as taking time and efforst and it is costly. Lack of full use of the design thinking process however makes it impossible to disseminate this thinking between innovators and members of the innovation centres and hubs.

More than five participants claim that design thinking is the process of using a set of design tools and methods that are highly efficient for innovation. Eventually, only one participant was familiar with the concept of design thinking as a set of attitudes because of the participant's design background. This shows that the perspective of design thinking as a set of attitudes (Sanders & Stappers, 2014; Chick, 2012) has not yet entered these interviewed innovation centres and hubs and is not yet seen as the designers' mindset.

It should be noted that, as mentioned earlier, design thinking as a set of attitudes involves a comprehensive understanding of the design approach and the tools used in it (Manzini, 2015; Chick, 2012). According to the participants responses, the researcher

believes that innovation centres do not adequately understand the benefits and consequences of using design thinking as a broader and more complete process and way of thinking. This is probably one of the reasons why design thinking is not fully, from the perspective of design thinking as an approach, used in innovation projects in these centres and hubs. My findings from this study show that innovation centres and hubs seem to use design thinking from a process perspective and as a set of tools and methods in shorter events such as workshops or short projects. One participant stated that they had workshops and talk-shows about design thinking last year. Based on the literature review findings, the researcher identified many things that did not happen in the real world in innovation centres. For example, because innovation centres and hubs are community-based organizations that want to drive innovation processes with community participation, there is an opportunity for design thinking to be more visible in these centres. As Manzini (2015) points out, design can become a way of living. Thus, it seems that innovation centres and hubs do not use what design thinking potentially can be, a set of designer attitudes.

4.6 The future of innovation and innovation centres/hubs through design thinking

The last part of the data analysis discusses the future of innovation and, more specifically, the future of innovation centres and hubs by looking at design thinking from the participants' perspectives. In interviews, the researcher asked participants about their views on the future of innovation and innovation centres and hubs through the lens of

design thinking. Many participants, such as one of the managers, answered this question: "I am optimistic about the design thinking future. With the right resources and support, I believe that it tends to contribute the social impact sector, even more influential and responsive to the welfare of the communities they are attempting to serve." However, the same participant continued in the interview that: “Unless we have the financial stability to do so, we will be unable to do things very differently”.

It seems that in theory, and conceptually, design thinking is known and increases the probability of success and effectiveness of an innovation and social innovation. However, obstacles such as sufficient budget, deadlines, time, and other resources required for change make it impossible to predict the near future positively. A participant from a local innovation centre provided a definition of the future of innovation that was very similar to the design thinking process and its purpose. The expert said that society must be understood by the innovators who want to serve it; otherwise, problems will never really be solved. They went on to say that without understanding the context of what society really needs, innovation will be unsustainable and inconclusive. Seven of the participants mentioned that design thinking is widespread in various areas, especially social innovation, and will be used as one of the main approaches in the future. Although it seems unlikely that innovation centre or hub members will use the entire design thinking process soon, knowledge and awareness of the concept will undoubtedly increase. “I see it as expanding. In all honesty, I think students are a great example. There is growing research on the next generation of students who are coming into universities.”

Participants' views on the future of design thinking and innovation are very promising. One of the participants expressed his opinion that "the process and the

difference in the process of really centring it around the end-user and their needs, really thinking thoroughly about the design. I think that is starting to kind of shake up our sector in a good way." The fact that innovation professionals are aware of fundamental changes in the strategies and activities of their centres and hubs, and consider this the result of design thinking, shows that design thinking is on the way to becoming a default approach in innovation processes. A group of participants think that design thinking is a priority for society in this approach. This shows the importance and impact of using design thinking in social innovation as a type of innovation that involves stakeholder participation. Design thinking and co-design approach at its core emphasize the presence of non-designers, which is fully consistent with the participation of stakeholders and society in social innovation.

Despite the positive comments about the use and role of design thinking in the future of innovation, experts from various innovation centres and hubs do not agree on the future of their organizations and design thinking. Some believe that the investment system in these centres and hubs prevents them from advancing in a direction where design thinking can really be used. "I would like to say that more organizations will think about design, but I think as long as we do not have the necessary financial security, we may really stop doing things differently," one participant told the researcher. They go on to say that many innovation centres may have project-based design thinking, which is not always innovative. Another group believes that an approach such as design thinking that prioritizes community needs is more likely to be seen in community-based innovations. One interviewee states: "We want to help people whose business is inherently socially

innovative, because of the ways in which they help their community, or build community support, or support those things."

In conclusion, the experts who participated in this research believe that design thinking will find a public place in the field of innovation centres and hubs. They speak of the support of experts and individuals for the design approach and see it as the most viable option for innovation from a community perspective. However, there are obstacles to entirely using this approach that need to be addressed. At the end of the day, if there is a need to change sustainable systems and solutions, the principles must be followed to satisfy investors, the community, and all stakeholders of the innovation centres and hubs. For example, one participant stated that the future is thinking about reaching more people regarding innovation, how this work can be done, and its value to them.

Chapter 5: Final Considerations and Conclusion

Broadly, this thesis provided an opportunity to better understand the values, purposes and approaches used in innovation centres and hubs to attain their vision. Specifically, this research aimed to further study the role of design thinking in these organizations and how that might relate to social innovation in community-based projects. In this concluding chapter, the researcher will summarize the findings and primary insights from this investigation.

One key point raised in the results of this study is the importance of participatory and multitasking work in these centres and hubs. The study participants confirmed that multitasking is one of the main traits that employees and members have. In general, it can be said that participation and collaborative activities are part of the culture of these innovation centres, which relates to the spirit of co-design and participatory approaches that are more bottom-up or hybrid in nature, as previously shown in Chapter 2 (refer to figure 5). This points to the importance of collaboration and using one's own resources to boot strap innovation.

This study revealed that innovation centres and hubs are generally familiar with the concept of design thinking, but their interpretations of the concept vary. This relates back to the literature review, which indicates that these organizations are not primarily design driven organizations, but rather business driven with design and design thinking influence that varies in depth and scope. As such, they do try to use their own understanding of the design thinking approach, methods, and tools to advance the

innovation process. Most of the representatives interviewed gave similar feedback, although their individual experiences were somewhat different in terms of specific exposure that they had with design thinking principles and methods.

Many of the participants stated that it is impossible to implement the design thinking process in their centres and hubs fully; instead, they use it more in the ideation and creativity phases. As noted in Chapter 4, the participants describe the process of design thinking as a resource-intensive process. They point out that deadlines and directives defined by investors often prevent them from taking advantage of the design thinking process throughout the entirety of their projects. Many participants described the use of certain design methods or tools in the innovation process as more common than the whole process.

Another insight gained was the importance of physical space in innovation centres and hubs. What all participants agreed on was the real significance of physical space, even at the time of the COVID-19 pandemic. Several interviewees highlighted that the loss of physical space due to the COVID-19 pandemic made them reconsider their own value, as this level of experience does not at least yet seem to be duplicable online. This topic is very important now that online communities and working from home are more common, posing interesting questions for the future. As mentioned earlier, this research was conducted during the COVID-19 pandemic, at which time many physical workspaces, including innovation centres and hubs, were faced with challenges such as closures or physical distancing restrictions. Therefore, working from home and virtual working has been one of the significant points during the research.

The results of this study show that the role of design thinking in each innovation centre and hub can be different based on the needs and perceptions of the representatives and stakeholders. This can be seen in two different ways. Accordingly, the first role of design thinking is to use it as a systematic approach to advance the innovation process. During interviews, three participants in the study mentioned that they use design thinking as a process in their innovation centres and hubs. However, they all point out that design thinking is costly and time-consuming, so they might only use it as an innovative approach in some programs. Although experts in this study believe that, in the future, innovation centres and hubs will benefit more from design thinking, they indicate that this requires systemic change. The process of attracting capital and planning to use design thinking more comprehensively requires designing and redefining the strategy of these organizations.

The second role of design thinking is to use it as a set of tools or a toolkit in innovation projects. Two participants mentioned they use design thinking from this perspective. They noted that the set of methods and tools of design thinking is the way they use this concept in their innovation centres and hubs. Participants stated that these tools and methods are standard in many innovation projects in their organization and amongst their members. This shows that design thinking from this perspective is common in innovation centres and hubs. Using these methods and tools in different stages of the innovation process is what authors mentioned that design thinking can be used for (Sanders & Stappers, 2014; Sanders & Stappers, 2008). Five other participants also stated that they use design thinking both as an approach and as a toolkit.

According to the reviewed literature, another role of design thinking in innovation centres and hubs was expected to be a set of attitudes (Manzini, 2015; Chick, 2012). However, in the results of this study, none of the participants mentioned the role of design thinking in their organizations from this point of view. One of the interviewees mentioned that they acknowledge design thinking as a set of attitudes, but none of the other centres or hubs look at it from this point of view. Design thinking is well known as a mindset in innovation and social innovation processes (Manzini, 2015; Chick, 2012); however, this perspective has received less attention within these organizations. The reason for this may be related to the innovation centres and hubs' business driven workflow. According to the explanations in the literature review, innovation in business environments forms a competitive atmosphere (Brown, 2009; Mulgan et al., 2007). While innovation in design occurs with the empathy and cooperation of project participants, it is very close to the process we see in the social sector (see Figure 3 in Chapter 2). Although Manzini (2015) points out that design thinking can be the mindset of people who participate in social innovation processes, the reason why it is not used in terms of mindset in innovation centres and hubs should be further examined. The researcher did not dive into this subject more deeply during the research and did not ask follow-up questions in the interview process for clarification; so this is an opportunity for future studies.

An overview of these findings shows that additional research is possible. Although there were limitations in the formation and implementation of this study, the results can form the body of new research initiatives. Therefore, the researcher tries to explain the necessary requirements for future research by explaining these limitations.

5.1 Limitations of Thesis

During this thesis journey, several limitations were identified. First, the study was performed during the COVID-19 pandemic which prevented the researcher from conducting the research in person. This factor prevented the researcher from visiting the physical spaces of the participating innovation centres and hubs. According to the findings from this study, the physical space is one of the most critical resources these organizations provide. However, despite this being a limiting factor, the online nature and workflow of these centres and hubs provided the opportunity for this research to expand across Canada, beyond the local context. This was beneficial because the researcher was able to explore a wider geographical area of the Canadian innovation ecosystem. The study of innovation centres and hubs from different provinces provided diverse points of view from different economic backgrounds. Although all of these organizations are part of the Canadian innovation ecosystem network, there are differences in their values, visions, and missions.

Another limitation of this research was that not all innovation centres and hubs across Canada were included in this research due to the time constraints with this project and the availability of appropriate representatives. At the time of sending the invitations to participate, many of the centres and hubs were unable to take part due to organizational reasons.

Lastly, this study did not include the presence of all members and stakeholders of innovation centres and hubs. Only the insights from high-level experts in these organizations were collected because they had a comprehensive view of their respective centres and hubs. As explained earlier, obtaining comprehensive feedback from high-level experts was an effective starting point for conducting this exploratory study; however, the inclusion of perspectives from members, staff, community leaders, and all other stakeholders can undoubtedly provide more accurate and supportive information.

5.2 Contributions

The findings and insights from this research contribute to the limited knowledge around how design thinking is used within innovation centres and hubs. It helps researchers, designers, and innovation experts in understanding how these organizations view the design thinking approach. One of the most significant achievements of this research has been determining the extent of how it is used and opportunities for growth, based on the interview responses and the correlation to how literature shows the importance of using design thinking also in the latter stages of prototyping and more as an iterative approach. The researcher tried to paint a picture of the innovation centres and hubs' approaches by showing the subtle differences in the experience levels, but also uncovering that the process is mostly used up-front in the ideation stage and for shorter periods of time, such as in a workshop setting. As a preliminary investigation around this topic, this research provides a baseline for the academic community and opens opportunities for deeper investigation through future studies.

5.3 Further Research

Based on the results of this study, an investigation could be conducted on the different definitions of design thinking in innovation centres and hubs. This can help to understand better the knowledge and how to use other methods and tools in these organizations. It can also create an integrated definition of design thinking from the perspective of innovation centres and hubs.

It is suggested that a co-design workshop be formed to identify the potentials and challenges facing design thinking in innovation centres and hubs. According to the findings of this study, these organizations do not use the complete design thinking process because they describe it as time-consuming and costly. In the following research, the goal can be to better understand the obstacles and challenges of using the complete design thinking process within these organizations.

It is also proposed that a similar study be conducted with the broader membership of the innovation centres and hubs. Different views of members compared to experts in these centres and hubs can have beneficial results. It is also recommended that focus group meetings be held with both stakeholders, as the exchange of ideas and opinions can be constructive.

There are many challenges and opportunities in this research that have created a positive perspective on the development and improvement of how to use design thinking as a core approach. In future research, the role of innovation centres and hubs, and the

community of these organizations in the development of design thinking, can also be examined.

One of the future projects that the researcher intends to do is to design a customized version of design thinking for these centres and hubs in comprehensive research with these organizations and professional designers. This research can be formed by conducting group design and co-design workshops with the presence of innovation centre and hub representatives, members, and professional designers. This research can be essential in helping innovation processes by providing a clear and effective design thinking approach suited for these organizations. Design researchers will also play a key role in developing this concept.

In this study, six participants pointed out that one of the reasons design thinking was not fully implemented in their innovation centre or hub is that it is costly and time-consuming. They noted that despite being aware of the benefits of design thinking for innovation processes, they still could not fully use it. Although, many design processes are not necessarily pricey and time consuming, representatives of innovation centres and hubs are familiar with more complex design thinking processes. Therefore, the researcher recommends a cost-benefit analysis of design thinking and innovation centres and hubs. This could show innovation centre or hub managers and representatives what an accurate picture is of the cost-benefit ratio when fully implementing design thinking. This is an excellent opportunity to measure the true nature of design thinking in the projects of these organizations. However, it should not be forgotten that a detailed interpretation of the design thinking definition is needed for this to be effective. Therefore, the researcher

believes that measuring all three perspectives about design thinking can be studied in cost-benefit research to compare all three interpretations.

Another future research opportunity could be to examine the impact of the physical environment of innovation centres and hubs on the use of design thinking. As mentioned in Chapter 4, the physical spaces are critical to the participants and representatives of these centres and hubs. In addition, the participatory nature of the co-design and social innovation processes makes this research a good opportunity to discover the differences between in-person and virtual participation in such a process. Investigating the impacts of physical space and virtual space on the use of design thinking in innovation centres and hubs can be valuable research for the innovation and design communities.

Determining the role of design thinking in innovation centres and hubs was the primary goal of this thesis. However, a lot of information was obtained about the innovation process, and design thinking along the way. This research showed that design thinking could be a comprehensive and complete approach for innovation centres and hubs, although this approach is not fully used currently. Very similar features of design thinking and the innovation process make the two intertwined, although different backgrounds and perspectives can change both processes.

Although the data and results of this research were beyond expectations, additional and future research can be formed in the future. Innovation centres and hubs play an essential role in the innovation and social innovation ecosystem, so addressing these organizations' systems, approaches and strategies is particularly important. Design thinking and innovation centres and hubs can be the topic of numerous research studies

that will take more time and resources but can support the innovation ecosystem of Canada for the benefit of the broader community.

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Appendices

Appendix A Ethics Approval

Carleton University

Office of Research Ethics
4500 ARISE Building | 1125 Colonel By Drive
Ottawa, Ontario K1S 5B6
613-520-2600 Ext: 4085
ethics@carleton.ca

CERTIFICATION OF INSTITUTIONAL ETHICS CLEARANCE

The following research has been granted clearance by the Carleton University Research Ethics Board-B (CUREB-B). CUREB-B is constituted and operates in compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2).

Ethics Clearance ID: Project # 116291

Project Team Members: Nima Sharifi (Primary Investigator)
Prof. Bjarki Hallgrimsson (Research Supervisor)
Prof. Tim Haats (Research Supervisor)

Study Title: Role of Design Thinking in Innovation Centres and Hubs

Funding Source: (If applicable):

Effective: October 05, 2021 **Expires:** October 31, 2022

This certification is subject to the following conditions:

1. Clearance is granted only for the research and purposes described in the application.
2. Any modification to the approved research must be submitted to CUREB-B via a Change to Protocol Form. All changes must be cleared prior to the continuance of the research.
3. An Annual Status Report for the renewal or closure of ethics clearance must be submitted and cleared by the renewal date listed above. Failure to submit the Annual Status Report will result in the closure of the file. If funding is associated, funds will be frozen.
4. During the course of the study, if you encounter an adverse event, material incidental finding, protocol deviation or other unanticipated problem, you must complete and submit a Report of Adverse Events and Unanticipated Problems Form.
5. It is the responsibility of the student to notify their supervisor of any adverse events, changes to their application, or requests to renew/close the protocol.
6. Failure to conduct the research in accordance with the principles of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans 2nd edition* and the *Carleton University Policies and Procedures for the Ethical Conduct of Research* may result in the suspension or termination of the research project.

IMPORTANT: Special requirements for COVID-19:

If this study involves **in-person research interactions with human participants**, whether on- or off-campus, the following rules apply:

1. Upon receiving clearance from CUREB, please seek the approval of the relevant Dean for your research. Provide a copy of your CUREB clearance to the Dean for their records. See Principles and Procedures for On-campus Research at Carleton University and note that this document applies both to on- and off-campus research that involves human participants. Please contact your Dean's Office for more information about obtaining their approval.
2. Provide a copy of the Dean's approval to the Office of Research Ethics prior to starting any in-person research activities.
3. If the Dean's approval requires any significant change(s) to any element of the study, you must notify the Office of Research Ethics of such change(s).

Upon reasonable request, it is the policy of CUREB, for cleared protocols, to release the name of the PI, the title of the project, and the date of clearance and any renewal(s).

Please email the Research Compliance Coordinators at ethics@carleton.ca if you have any questions.

CLEARED BY: **Date: October 05, 2021**

[redacted]

Bernadette Campbell, PhD, Chair, CUREB-B

[redacted]

Kathryne Dupre, PhD, Co-Chair, CUREB-B

Appendix B Letter of Invitation

Carleton UNIVERSITY
Canada's Capital University

Letter of Invitation

Title: Role of Design Thinking in Innovation Centers and Hubs

11/10/2021

Hello,

My name is **Nima Sharifi**, and I am a Master of Design student in the School of Industrial Design at Carleton University. I am working on a research project under the supervision of Prof. **Tim Haats** and Prof. **Bjarki Hallgrimsson**.

I am writing to you today to invite you to participate in a study on understanding the role of Design Thinking in innovation centers and hubs. This study aims to help identify whether members and representatives of innovation centers and hubs benefit from this approach.

This study involves an individual interview that will take place online through a Zoom call and will last approximately 30 minutes. With your consent, this interview will be video-recorded. Once the interview has been done, the lead researcher will review the video file to perform the transcript manually.

While this project may expose operational aspects and your own opinions or expertise, care will be taken to protect your identity. This will be done by keeping all responses without mentioning your name, your job title or your workplace, and allowing you to request that certain responses not be included in the final project. As a result of this research, identifiable information will not be presented in the thesis and will not be published or shared anywhere. However, identifiable information might make participants and innovation centres and hubs indirectly identifiable.

You will have the right to end your participation in the study at any time, for any reason, up until 2 weeks after completion of the interview. If you choose to withdraw, all the information you have provided will be destroyed.

No compensation will be provided.

All research data, including video-recordings and any notes will be stored password-

protected. Research data will only be accessible by the researcher and the research supervisors listed above.

This research has been cleared by Carleton University Research Ethics Board B Clearance **#116291**

Should you have any ethical concerns with the study, please contact the REB Chair, Carleton University Research Ethics Board-B (by phone: **613-520-2600 ext. 4085** or by email: **ethics@carleton.ca**). For all other questions about the study, please contact the researcher.

If you would like to participate in this research project, or have any questions about the research, please contact me at [redacted] or **nimasharifi@cmail.carleton.ca**

Sincerely,
Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca

Appendix C First Response Email

Carleton UNIVERSITY
Canada's Capital University

First Response Email

Title: Role of Design Thinking in Innovation Centers and Hubs

Dear ...,

Thank you for your email and reply to my invitation.
I appreciate you for expressing your interest in participating in this study. Below you can find the availability schedule for an interview for next week. Please pick a time that is more convenient for you. In case none of this work, please let me know, and I'll provide more availability for the following weeks.

Availability schedule:
Thursday, November --th: 10:00 am - 2:00 pm
Friday, November --th: 8:am - 1:00 pm
Saturday, November --th: 8:00 am - 5:00 pm
Sunday, November --th: 8:am - 5:00 pm
Monday, November --th: 8:00 am - 9:00 pm
Wednesday, November --th: 2:00 pm - 9:00 pm

In the meantime, if you need any more information, please reach me by email at nimasharifi@cmail.carleton.ca or phone at [redacted]

Best regards,
Nima

Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca

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Appendix D Second Response Email

Carleton UNIVERSITY
Canada's Capital University

Second Response Email

Title: Research Interview Session - Role of Design Thinking in Innovation Centres and Hubs

Dear...,

Thank you again for accepting my invitation to discuss the role of design thinking in centres and hubs. I look forward to discussing it further with you.

The study involves an individual virtual interview that takes place online via a Zoom call and lasts approximately 30 minutes. The link to the interview session follows this email.

You need to read the consent form before the interview and express your consent digitally by signing it. If this is not possible for you, please print out the consent form and send it to me after signing it manually. If this is not convenient for you, we can arrange to go through the oral consent form before starting the meeting. With your consent, this interview will be videotaped. After the interview, I'll review the video file to do the transcription manually.

Here you can find the scheduled Zoom call meeting information.
Nima Sharifi is inviting you to a scheduled Zoom meeting.

Topic: Research Interview Session - Role of Design Thinking in Innovation Centres and Hubs
Time: Nov --, 2021 09:00 AM America/Toronto

Join Zoom Meeting
https://carleton-ca.zoom.us/j/7646870928

Meeting ID: 764 687 0928
Passcode: 0m5UFY
One tap mobile
+12532158782,,7646870928#,,,,*825981# US (Tacoma)
+13017158592,,7646870928#,,,,*825981# US (Washington DC)

Dial by your location
+1 253 215 8782 US (Tacoma)

Page **1** of **2**

+1 301 715 8592 US (Washington DC)
+1 312 626 6799 US (Chicago)
+1 346 248 7799 US (Houston)
+1 646 558 8656 US (New York)
+1 669 900 9128 US (San Jose)
Meeting ID: 764 687 0928
Passcode: 825981
Find your local number: https://carleton-ca.zoom.us/u/aJjud0G

I look forward to meet you.

Best regards,
Nima

Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca

Appendix E Snowball Sampling Email

Carleton UNIVERSITY
Canada's Capital University

Snowball Sampling

Title: Need Your Help Reaching Out More Participants on Role of Design Thinking in Innovation Centres and Hubs.

Hi ...,

I hope you're having a great week.

I know you are so busy, so I'm keeping it short. I'm reaching out to you because I was hoping you could do me a favour.
As you know, I do interview team members of innovation centres and hubs for my research project. So far, I have done some; however, I need more participants to progress my project. I'm sure you know many people in that regard, so I want to kindly ask you to introduce me to your colleagues in your innovation centre or other centres. You can find my research project's invitation letter attached to this email.

I truly appreciate your time and any help you can provide.

All the best,
Nima

Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca

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Appendix F Expert Interview Followup Email

Carleton UNIVERSITY
Canada's Capital University

Follow-up Interview Email

Title: Thank You for Your Participation in My Thesis Research.

Dear X,

I hope you are having a wonderful evening.

Thank you so much for taking the time to meet with me and talk about the role of design thinking in innovation centres and hubs. It was a pleasure to talk with you, your comments were insightful and gave me lots of ideas for my ongoing thesis research.

It was truly inspiring to have such a meaningful conversation with someone who is experienced expert in this area and to learn about your innovation hub.

I am looking forward to discussing it about more about it in the future, hopefully in person.

Warm regards,
Nima

Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca

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Appendix G Consent Form

Carleton UNIVERSITY
Canada's Capital University

Informed Consent Form

Name and Contact Information of Researchers:

Nima Sharifi, Carleton University, School of Industrial Design
Tel.: [redacted]
Email: nimasharifi@cmail.carleton.ca

Supervisor and Contact Information:

Prof. **Tim Haats**, Carleton University, School of Industrial Design

tim.haats@carleton.ca

Prof. **Bjarki Hallgrimsson**, Carleton University, School of Industrial Design

bjarki.hallgrimsson@carleton.ca

Project Title

Role of Design Thinking in Innovation Centers and Hubs

Carleton University Project Clearance

Clearance #: 116291 Date of Clearance: October 05, 2021

Invitation

You are invited to take part in a research project because you are representative of an innovation center or hub who is experienced in programming and holding events and known as an expert in your position. The information in this form is intended to help you understand what we are asking of you so that you can decide whether you agree to participate in this study. Your participation in this study is voluntary, and a decision not to participate will not be used against you in any way. As you read this form, and decide whether to participate, please ask all the questions you might have, take whatever time you need, and consult with others as you wish.

What is the purpose of the study?

Innovation can be defined as providing new solutions to problems that have not been encountered before. However, in broader comparisons, such as a community that includes a group of people with a common goal, the problems are more complex and affect everyone.

The primary purpose of this study is to examine how design thinking is practiced in innovation centers and hubs as an approach to address the mission of your innovation center or hub. Design thinking is often known and promoted as an effective approach towards innovation, especially when various stakeholders are involved during the process. Therefore, understanding how design thinking is used in innovation centers and hubs can help develop a better understanding of effective innovation approaches that can also help the community and members alike.

What will I be asked to do?

If you agree to take part in the study, I will ask you to:

Participate in an individual Zoom call which will last approximately 30 minutes where I will ask you questions about your experiences and insights regarding innovation centers and hubs events, workshops, and meetings within the context of social innovation with various stakeholders. During this semi-structured interview, I will ask you to share your perspective about the role of design thinking in innovation centers and hubs. I am interested in developing a better picture of people's experiences related to these settings to help innovation centers and hubs, and social innovation leaders.

Risks and Inconveniences

We do not anticipate any risks to participating in this study.

Possible Benefits

This research investigates possible benefits of the design thinking approach in social innovation projects. Understanding the role of design thinking in innovation centers and hubs can help improve and advance knowledge and innovation approaches which may be useful for you and your particular innovation center or hub.

Compensation/Incentives

You will not be paid or compensated for participating in this study.

No waiver of your rights

By signing this form, you are not waiving any rights or releasing the researchers from any liability.

Withdrawing from the study

If you withdraw your consent during the course of the study, all information collected from you before your withdrawal will still be used, unless you request that it be removed from the study data.

After the study, you may request that your data be removed from the study and deleted by notice given to the Principal Investigator (named above) 2 weeks after completion of the study.

Confidentiality

Your name, professional information and title, and the name of innovation centre or hub that you represent will be known to the researcher and the supervisors, but this information will be kept confidential and will not be revealed in any dissemination of the research results; however, your identity and association with the innovation center or hub might make you indirectly identifiable.

"In-session" data, such as the audio, video and chat transcript from the interview, will be stored locally on the researcher's computer. Operation data, such as meeting and performance data, will be stored and protected by Zoom on servers located in Canada and United States, but may be disclosed via a court order or data breach.

After the interview session, the lead researcher will review the recorded video file to perform the transcript. Following the verification of the transcription, Citrix Sharefile will be used to secure the information. Carleton University hosts this service, and all research data is safely kept in Carleton's data centres. This folder is password-protected, and only the study team has access to the data. The data is encrypted while in transit with this technique. In the system, it is not encrypted at rest. A password and two-factor authentication are used to safeguard the information. Because this study will be used to guide the development of future studies, the data will be stored on Citrix for a period of ten years. After a ten-year term, it will be removed from Citrix.

We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. No information that discloses your identity or the innovation centre or hub will be released or published without your specific consent. Research records may be accessed by the Carleton University Research Ethics Board in order to ensure continuing ethics compliance.

Data Retention

After the study is completed, the data will be retained for future research use.

New information during the study

In the event that any changes could affect your decision to continue participating in this study, you will be promptly informed.

Ethics review

This project was reviewed and cleared by the Carleton University Research Ethics Board **B (CUREB-B Clearance #: 116291)**. If you have any ethical concerns with the study, please contact Carleton University Research Ethics Board by phone at **613-520-2600 ext. 4085** or by email at ethics@carleton.ca.

Statement of consent – print and sign name

I voluntarily agree to participate in this study.	___Yes	___No
I agree to be video recorded.	___Yes	___No
I agree to be audio recorded.	___Yes	___No

_____ _____

Signature of participant Date

Research team member who interacted with the participant

I have explained the study to the participant and answered any and all of their questions. The participant appeared to understand and agree. I provided a copy of the consent form to the participant for their reference.

_____ _____

Signature of researcher Date

Appendix H Oral Consent Form

Carleton UNIVERSITY
Canada's Capital University

Research Consent Form Script for Oral Consent

Hello, my name is **Nima Sharifi**, and I am a Master of Design student in the School of Industrial Design at Carleton University. I am working under the supervision of Prof. **Tim Haats** and Prof. **Bjarki Hallgrimsson**.

I would like to invite you to participate in a study titled Role of Design Thinking in innovation centers and hubs. This study aims to help identify whether members and representatives of innovation centers and hubs benefit from this approach.

The study involves a virtual individual interview that will take place online through a Zoom call. This interview is about understanding the role of Design Thinking in innovation centers and hubs. With your consent the interview will be video-recorded, and once transcribed and verified, the recording will be destroyed.

We estimate that the interview will take about 30 minutes to complete. Your participation in this interview is voluntary, and you may choose not to take part, or not to answer any of the questions. If you decide to withdraw after the interview, your responses will be removed if you notify the researcher up until 2 weeks after completion of the study.

Your name, professional information, and title and the name of innovation centre or hub that you represent will be known to the researcher and the supervisors, but this information will be kept confidential and will not be revealed in any dissemination of the research results; however, your identity and your association with the innovation center or hub might make you indirectly identifiable.

"In-session" data, such as the audio, video and chat transcript from the interview, will be stored locally on the researcher's computer. Operation data, such as meeting and performance data, will be stored and protected by Zoom on servers located in Canada and United States, but may be disclosed via a court order or data breach.

After the interview session, the lead researcher will review the recorded video file to perform the transcript. Following the verification of the transcription, Citrix Sharefile will be used to secure the information. Carleton University hosts this service, and all research data is safely kept in Carleton's data centres. This folder is password-protected, and only the study team has access to the data. The data is encrypted while in transit with this technique. In the system, it is not encrypted at rest. A password and two-factor authentication are used to safeguard the information. Because this study will be used to guide the development of future studies, the data will be stored on Citrix for a period of ten years. After a ten-year term, it will be removed from Citrix.

We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. No information that discloses your identity will be released or published without your specific consent. However, research records identifying you may be inspected by Carleton University Research Ethics Board for the purpose of monitoring the research.

After the study is completed, your de-identified data will be retained for future research use.

This project was reviewed and cleared by the Carleton University Research Ethics Board **B (CUREB-B Clearance #: 116291)**. If you have any ethical concerns with the study, please contact the Carleton University Research Ethics Board by phone at **613-520-2600 ext. 4085** or by email at ethics@carleton.ca.

You can also reach me at [redacted] or email me at nimasharifi@cmail.carleton.ca. You may contact my supervisors at tim.haats@carleton.ca or bjarki.hallgrimsson@carleton.ca.

Statement of consent

Do you have any questions about this study or need any clarification?

Do you voluntarily agree to participate in the study? Yes_____ No_____

Do you agree to be video recorded? Yes_____ No_____

Do you agree to be audio recorded? Yes_____ No_____

Date: _____

Participant's Name/Pseudonym/Initials (as appropriate): _____

Research team member who interacted with the subject

I have explained the study to the participant and answered any and all of their questions. The participant appeared to understand and agree. I provided a copy of the consent information to the participant for their reference.

_____ _____

Signature of researcher Date

Appendix I Experts Interview Research Questions

Carleton UNIVERSITY
Canada's Capital University

Research Interview Questions

Title: Expert interview Questions.

Stage 1: Participant's Role Description
Please explain your role in this Social Innovation center or hub?
(What are the most important features of this role? What are your tasks in this role? What is your experience as a person working in this role? Why does the Innovation Center or hub assign this role?)
What are other similar roles that help participants and members of the center in the process of social innovation projects?
(What are the differences and reasons for these roles? Why does the Innovation Center or hub assign these roles?)

Stage 2: Centers and Hubs Values
What are social innovation projects done in this center or hub?
(What are the projects field of the participants and members of the center? Does the center have any specific goals or regulations for the content of social innovation projects?)
What services and support does this social innovation center or hub provide for social innovation projects?
(What services and support does the center provide? In what setting are these services provided (workshops, lectures, teamwork or other)? Which projects use these services the most (in which fields are these projects?)

Stage 3: Design Thinking
Are you familiar with the concept of design thinking?
(What is your definition and perception of the concept of design thinking? How and by whom did you become familiarized with this concept? Do you know how design thinking can contribute to social innovation?)
Is design thinking used in the Innovation Center?
(Who uses it? In which projects is it used? How and in what format is it used (workshops, lectures, workshops, etc.)? In which format does it use? (As an approach, toolkit (tool) Or problem-solving method)?)

Stage 4: Future of Social Innovation and Design (thinking)

Page **1** of **2**

Which parts of a social innovation does design thinking affect?
(On the whole process of social innovation, on the final output of social innovation, on the experience of participating in social innovation, etc.)
Based on your experience in innovation centers and hubs and your expertise in the field of social innovation, can you please comment on the future of social innovation? (What will be the future of social innovation?
(Social innovation process, social innovation outcome, the experience of participating in social innovation, etc.) What is the role of innovation centers in this future? What is the role of design thinking in this future?)

Nima Sharifi
nimasharifi@cmail.carleton.ca

Supervisors contact information:
Professor Tim Haats
tim.haats@carleton.ca

Professor Bjarki Hallgrimsson
bjarki.hallgrimsson@carleton.ca