POLICY RATIONALE FOR INNOVATION PARKS IN CANADA

POLICY RATIONALE FOR INNOVATION PARKS IN CANADA: INSTITUTIONS, INTERESTS AND IDEAS

By ATA-UL MUNIM B.A., M.P.P.

A Thesis Submitted to the School of Graduate Studies in Partial Fulfillment of the Requirements for the Doctor of Philosophy

McMaster University DOCTOR OF PHILOSOPHY (2018)

McMaster University

Political Science Hamilton, Ontario

TITLE: Policy Rationale for Innovation Parks in Canada: Institutions, Interests and Ideas

AUTHOR: Ata-ul Munim B.A. (McMaster University), M.P.P. (University of Saskatchewan)

SUPERVISOR: Dr. Stephen McBride

NUMBER OF PAGES: i to 311

Abstract

Innovation Parks became an innovation and economic development policy instrument in the Western world more than two decades ago. While Canada was slow to catch up to this phenomenon, it did eventually join the trend. This study analyzes the policy rationales for innovation parks in Canada through a national and sub-national lens. For this purpose, Ontario and Saskatchewan are chosen as comparative points. It compares the Saskatchewan Innovation Place (SIP), McMaster Innovation Park (MIP), and David Johnston Research and Technology Park (DJRTP). The study develops a three-pronged analysis of institutions, interests and ideas to explain why governments support innovation parks as a policy instrument. It is argued that the continued support of these initiatives is largely a function of institutional path-dependence and policy lock-ins manifest through sunk infrastructure investments, desire to balance different interest groups – mainly the commercial real estate sector and the organizations representing the research parks. These institutional and structural struggles are underpinned by the ideational frames of economic development and knowledge-based economic growth.

Acknowledgements

I wish to extend my sincere gratitude to my supervisor, Dr. Stephen McBride, and my committee members – Dr. Michelle Lynn Dion and Dr. Ahmad Shafiqul Huque – for their guidance, support and encouragement throughout my course of studies. I am also grateful to my examiners, Dr. Bruce Smardon and Dr. Peter Graefe, for their insightful comments.

I also wish to thank all the individuals who provided me valuable insights on the Innovation Parks. Thank you to McMaster University for the financial support.

A special thank you to my PhD colleagues, in particular, Dr. Stephanie Tombari and Dr. Andrea Rowe for providing invaluable support and advice. It has been a pleasure and a great learning experience working with you.

I am a better person for my interactions with several members of the Political Science Department at McMaster University: Dr. Katherine Boothe, Dr. Alina Sajed, Dr. Todd Alway, Dr. James Ingram and Dr. Henry Jacek. I also wish to thank Manuela Dozzi for the administrative support and advice.

I would like to dedicate this dissertation to my family: my grandparents - Nasir Ahmed Khan, Sughran Begum, Abdul Mannan Khan, and Shifat un Nissa Begum; my parents – Sadiqa Nasir and Abdul Shakoor; my wife – Munazza Tahir; and lastly, but most importantly, my little bundle of joy and my inspiration, my son – Aydin Zayyan. This dissertation would not have been possible without your love, support and encouragement. I am because of all of you!

Contents

List of Tables & Figures

List of Abbreviations

AAFC	Agriculture and Agri-Food Canada
ASD	Alternative Service Delivery
AUCC	Association of Universities and Colleges Canada
AURP	Association of University Research Parks
BAP	Business Advisor Program
BDC	Business Development Bank of Canada
BEAM	Biomedical Engineering and Advanced Manufacturing
BOD	Board of Directors
CAMC	Centre for Automotive Materials and Corrosion
CBC	Canadian Broadcasting Corporation
CCF	Co-operative Commonwealth Federation
CENGN	Center of Excellence for Next Generation Network
CEO	Chief Executive Officer
CERC	Canadian Excellence Research Chair in Advance Powertrain and Electric Vehicles
CFI	Canada Foundation for Innovation
CIC	Crown Investment Corporation
CLS	Canadian Light Source
CMA	Census Metropolitan Area
CMHT	Centre for Mechatronics and Hybrid Technologies
CTT	Canada's Technology Triangle
CUFTA	Canada-U.S. Free Trade Agreement
DFAITD	Department of Foreign Affairs, International Trade and Development
DJRTP	David Johnston Research and Technology Park
EDC	Economic Development Canada
FDI	Foreign Direct Investment
FTE	Full-Time Employee
GAC	Global Affairs Canada
GATT	General Agreements on Tariffs and Trade
GCR	Global City-Region
GDP	Gross Domestic Product
HEI	Higher Education Institutions
HHS	Hamilton Health Sciences
HQP	High Quality Personnel
IASP	International Association of Science Parks
ICAST	International Centre for Agricultural Science & Technology

ICT	Information Communication Technology
IF	Innovation Factory
ILO	Industry Liaison Office
IP (R)	Intellectual Property Regime
ISED	Innovation, Science and Economic Development Canada
ISRN	Innovations Systems Research Network
ITA	Industry Technology Advisor
KBE	Knowledge-Based Economy
LEED	Leadership in Energy and Environmental Design
MARC	McMaster Automotive Resource Center
MILO	McMaster Industry Liaison Office
MIP	McMaster Innovation Park
MOSST	Ministry of Science and Technology
MOU	Memorandum of Understanding
MREB	McMaster Research Ethics Board
NABST	National Advisory Board on Science and Technology
NAFTA	North American Free Trade Agreement
NCE	Networks of Centres of Excellence
NCR	National Capital Region
NECSIS	Network on Engineering Complex Software Intensive Systems
NPM	New Public Management
NRCan	Natural Resources Canada
NRC-IRAP	National Research Council – Industrial Research Assistance Program
NRC-PBI	National Research Council's Plant Biotechnology Institute
NSERC	Natural Sciences and Engineering Research Council of Canada
NSI	National System of Innovation
NTBF	New Technology Based Firm
OCE	Ontario Centres of Excellence
OECD	Organisation for Economic Co-operation and Development
OEMS	Original Equipment Manufacturer
ONE	Ontario Network of Entrepreneurs
REDA	Regina Economic Development Authority
RIC	Regional Innovation Centers
SEDA	Saskatoon Economic Development Authority
SIP	Saskatchewan Innovation Place
SME	Small-Medium Enterprises
SOCO	Saskatchewan Opportunities Corporation

SR&ED	Scientific Research and Experimental Development Tax Credit
SRC	Saskatchewan Research Council
SRTC	Scientific Research Tax Credit
STI	Science, Technology, Innovation
TTO	Technology Transfer Office
UKSPA	United Kingdom Science Parks Association
UNESCO	United Nations Educational, Scientific and Cultural Organization
VIDO	Veterinary Infectious Disease Organization
WTO	World Trade Organization

1. Introduction

Innovation – and the underlying research and development (R&D) systems that drive it – are the key to national and regional prosperity. R&D and Innovation have come to be regarded as the drivers of countries' economic growth and competitiveness. This is true for Canada as much as it is for other countries around the globe. We have seen a dramatic rise in the attention given to innovation policy, theory and discourse over the past twenty-five years. Subsequently, a number of concepts such as national innovation systems, local-city or regional systems, and clusters have emerged internationally and diffused across most countries including Canada (Doern, Castle, & Phillips, 2016, p. 22). Innovation is viewed as a process that comprises of non-linear, collaborative and networked interactions, where research leads to technological change in diverse and unpredictable ways. Given the importance of networks and collaboration, innovation strategies, rather than wholesome policies, seek to foster individual and firm performance through various instruments including co-funding applied science conducted in collaborative physical spaces (Doern et al., 2016, p. 220).

New theoretical paradigms such as the New Public Management have also given greater prominence to concepts such as "partnerships" and "collaboration" (Wettenhall, 2003; Yescombe, 2011; Zussman, 2002). New models of service delivery, also known as Alternative Service Delivery Models (ASD), are viewed by governments as tools to "deinstitutionalize traditional public administration" and promote innovative program delivery through partnerships with the private and non-government sectors (Zussman, 2002). The academic sector is increasingly looked upon to fill the gaps in governments' innovation programming at various levels. Academia plays an important role in service delivery and more importantly community development aspects that are outside the purview of governments and the private sector (McPhee-Knowles & Boland, 2016).

Academia serves the dual purposes of undertaking research – pure and applied – and training highly qualified personnel (HQP) for the industry and government (AUCC, 2008; Munim, 2011). The universities now perform a large share of public and private R&D to compensate for the retreating public science and the poor performance of the private sector (Munim, 2011). The increasing complexity and pace of R&D has also meant that any one sector – government, industry or academia – is incapable of carrying out the entire research enterprise alone. Canadian capacity is particularly limited in this regard given it is a “relatively small player in the global economy” (Munim, 2011). Neither sector has the capacity to independently undertake all the functions necessary to advance a knowledge-based economy (Phillips, 2007; Phillips, Boland, & Ryan, 2013; Phillips & Castle, 2010; Smardon, 2014).

The private sector particularly appears incapable, and mostly unwilling to drive the innovation alone. It relies heavily on government and academia, along with large multinationals headquartered in the United States or Europe, to lead the basic as well as applied R&D leading to innovation. The latter has been a function of Canada’s “dependent technological development” whereby private sector has invested limited resources in developing R&D networks in Canada and relied more heavily on the R&D wings attached to their headquarters in the United States or Europe (Smardon, 2014). As a result, Canada’s innovation system has become increasingly reliant on university-based

R&D which has grown consistently in the context of declining private sector R&D commitments (Smardon, 2014).

Governments and private sector has become increasingly reliant on collaborations with the private sector to translate knowledge generation in the universities to economic growth and competitive advantage. Similarly, academia also looks to leverage industry funding in the wake of ever-reducing government grants (Munim, 2011). Thus, facilitating partnerships between industry and academia has become a central plank in innovation policies of many OECD governments. The increased focus on collaborative research spaces and partnerships to foster innovation and knowledge transfer has also led to significantly greater expectations from the academic sector. Apart from the ideological forces, the growing complexity and costs of the research enterprise have also facilitated this move toward greater collaborations between governments, academia and private sector. The rapid speed of technological advances has further increased the expectation that researchers can address the large societal challenges in "a more holistic fashion and at an accelerated pace" (AUCC, 2008). These collaborative activities are often carried out in physical collaborative spaces that are specially designed to facilitate such activity. Innovation/Research Parks are one of the examples of such initiatives in many OECD as well as developing countries.

1.1. Innovation Parks

Innovation Parks, or University Research and Technology Parks – as they are alternatively known - are the infrastructure-based developments that facilitate the advancement of knowledge-based components of the economy, globally and in Canada.

Innovation Parks provide collaborative co-working locations where individuals from academia, industry and government often come together to promote applied R&D and commercialization of technology in the pursuit of knowledge-based technological innovations (AURP, 2013, p. 5).

Innovation Parks have also been used by governments as policy instruments to facilitate cluster formation that can spur economic growth and improve the international competitiveness of the regions in which they are located. They are also seen as sources of important spill-over effects on the geographical distribution of industry and employment (AURP, 2013, p. 1). However, despite the ascribed importance of these parks, it is not clear whether these parks provide benefits in a global manner. Studies conducted thus far point to limited success of innovation parks in achieving the desired outcomes. This author's earlier work (see Munim, 2011) and interviews conducted for this research enterprise pointed to sub-par performance of collaborative activities and innovation parks in Canada (see 2.4 for a detailed discussion on the performance and impacts of innovation parks).

1.1. Objectives of the Study and Research Questions

There is very limited theoretical understanding of the functions and performance of innovation parks, especially in a comparative context. Much less attention has been given to the policy rationales for governments to support these innovation parks and the underlying tensions and driving forces that eventually shape the outcomes of interactions between different organizations. The academic literature on innovation parks is in formative stages, focusing mostly on innovation parks and industry-university linkages in the United States (Hobbs, Link, & Scott, 2016, p. 1). In Canada, in particular, there has been only one empirical study conducted almost 20 years ago (see Shearmur & Doloreux, 2000). Since then, the innovation policy domain has changed with the establishment of many new innovation parks around the country and dismantling of some of the existing ones. The Financial Crisis and the resulting Great Recession of 2008-09 has also had important implications for the operating conditions of the innovation parks.

This research project serves to fulfill two key objectives. First, it develops an explanatory theoretical model to understand why governments support innovation parks. In the process, I attempt to resolve a number of conceptual and methodological issues facing the innovation park community. Second, the research project presents a detailed narrative of three innovation parks in Canada, namely Saskatchewan Innovation Park (SIP), McMaster Innovation Park (MIP) and David Johnston Research and Technology Park (DJRTP). It is my expectation that the narrative – developed through in-depth key informant interviews – will contribute to enriching the literature on innovation parks and the application of the model will fill the empirical void in this space.

The aim of this research project is to build on the existing theoretical work in the transdisciplinary field of innovation policy while bringing in insights from the political science and public policy literatures. The intent, however, is not to disprove or discard the existing theoretical accounts of innovation systems. It also provides an opportunity for stakeholders to develop an in-depth understanding of their motivations and incentives for participating in such partnerships. The underlying theoretical goal is to move beyond the purely descriptive models of innovation and develop an explanatory model that can help us understand why (or why not) governments support innovation parks.

The starting point of this research enterprise is the observation, which is supported by media reports (for example, see CBC News, 2014; Chiose, 2016) and more importantly the key informants interviewed for this study, that innovation parks in Canada have not been a great success story to justify their existence and government support for them. The question then becomes as to why governments support innovation parks, despite lack of clear evidence regarding positive, tangible outcomes. It is imperative to note that this study does not aim to undertake a quantitative verification of the outcomes and impacts of innovation parks in Canada. Rather, I take the existing studies and media reports as a starting point – confirmed by media reports and more importantly key informants interviewed for this research. Section 2.4 delves into this discussion in greater detail.

1.1.1. Research Question and Hypothesis

Why do governments support innovation parks?

To answer this question, I delve into a brief analysis of Canada's innovation policies and attempt to determine governments' rationale for supporting innovation parks as a policy tool. In order to understand this issue, it was imperative to conduct an in-depth analysis of innovation policy in Canada, as the innovation parks are an element of the broader policy. There has not been any academic study in Canadian innovation literature that delves into the interplay between federal, provincial and municipal governments in supporting the innovation parks through various stages of their development. To this end, this research project was driven in part by the following supplementary questions:

- Why are certain policy rationales preferred over others by the governments?
- Why do the governments choose (or not choose) to be directly or indirectly involved in the governance of innovation parks?
- Why is support from each level of government (federal, provincial, and municipal) important in the development and functioning of innovation parks?
- Why do certain levels of government play a more dominant role whereas others may play a more secondary role in supporting innovation parks?

Starting with the theoretical aspects, I attempt to delve into conceptual issues of what is meant by Innovation Parks and their different typologies. The conceptualization discussion will help us understand the theoretical underpinnings of innovation parks and their place within the innovation/industrial/economic development policy literature.

I offer a *three-I approach* to the theorization of innovation parks: <u>*Institutions*</u>*,* <u>*Ideas*</u> *and* <u>*Interests*</u> (for examples of literature, see Atkinson-Grosjean, 2006; Bleich, 2002; Hall, 1993; North, 1990; Pontusson, 1995; Simeon, 1976; Streeck & Thelen, 2005: these will be explored in greater detail in the following chapter). I argue that these three elements form the building blocks to understand the rationales of government support, or lack thereof, for these policy instruments. More specifically, I contend that institutions at the macro and meso levels provide the context for government support of innovation parks. Federalism and specific political institutional trajectories in specific Canadian provinces provide strong rationale for governments' support of innovation parks. The policy rationales are further strengthened by the involvement of certain interest groups such as the Association of University Research Parks, industry and civic associations, policy leaders and government bureaucrats. Furthermore, institutionalized norms of different organizations involved in the development and operations of innovation parks, namely universities, government departments and industry, create an interest-based environment whereby each stakeholder attempts to exert influence and use innovation parks as a tool to further their institutional interests. Finally, support for innovation parks is driven by the global and transnational transfer of ideas regarding knowledge-based economies that necessitate university-industry collaboration and a move toward applied research. The networks created by political and governance institutions and specific interest groups help in the convergence and emulation of ideas to support innovation parks.

Utilizing the 3-I framework, I develop a comparative analysis of three innovation parks in Canada, namely the *Saskatchewan Innovation Place (SIP)*, *McMaster Innovation Park (MIP)* and *David Johnston Research and Technology Park (DJRTP)* to apply these theoretical postulates.

1.2. Methodology – Research Design and Data Collection

In order to investigate the theoretical postulates, a Small-N comparative research design is employed, comprising of three Innovation Parks in Canada: **Saskatchewan Innovation Place** (Saskatoon-Regina /Saskatchewan); **McMaster Innovation Park** (Hamilton/Ontario); and **David Johnston Research Park** (Waterloo/Ontario). The unit of analysis is the sub-national regions (municipalities and provinces). The primary data collection method was in-depth, qualitative interviews administered to senior managers, principal tenant organizations and government officials involved in managing the innovation parks in a respective region.

Comparative Research Design

Comparative research design entails comparing the experiences of two or more country cases (or sub-national cases in this instance). Comparative studies often seek to identify the causal linkages between macro-level phenomena by situating the relevant variables in a comparative context. (Amenta, 2003, p. 93). In this study, comparisons across innovation parks in sub-national jurisdictions in Canada are used to test hypotheses about the interaction of institutions, ideas, and interests on the dependent variable, namely government support for innovation parks. These hypotheses have been formulated through the existing literature in the fields of political science and innovation policy.

Comparative studies can help us avoid "false uniqueness" and "false universalism" (Geddes, 2003). False uniqueness emphasizes the specificity of the case, entirely ignoring the general social forces at work and does not move beyond 'thick description.' False universalism arises based on the assumption that a relationship, or lack thereof, between variables within the selected set of cases reflects relationships in the entire population (Rose, 1991). Another advantage of small-N comparative case studies is that they give us the opportunity to trace the complex causal processes that lead to a certain phenomenon. One of the most significant advantages of comparative methods is that they allow us to merge different levels of analysis and link macro-, meso-, and micro-level factors in order to explain a particular phenomenon (Halperin and Heath 2012).

In the context of this study, comparative method allows examining the impact of regional factors (such as economic and political centralization) on the level of policy support and impacts on the innovation parks. Therefore, we can move from macro-level institutional factors to meso-level network structures to micro-level behavioural decision-making models using comparative design. Furthermore, by using the small-N comparative design, the complex relationship between institutions (including governance models), interests, infrastructure and ideas can be unravelled.

1.2.1. Case Selection and Justification

A few different approaches for case selection have been advocated by scholars within the field of political science and public policy. Quantitatively oriented scholars such as King, Keohane and Verba (1994) and Geddes (2003) strongly favour comparative analysis based on random selection of large-N cases. According to these scholars, selecting cases randomly can help avoid case-selection bias and lack of generalizability that is a characteristic of purposive sampling (Tarrow, 1995). However, qualitatively-oriented scholars such as Amenta (2003), Lijphart (1971), Skocpol (2003), and Ragin (1987), recognize the feasibility constraints and unpracticality of such case selection techniques. Moreover, these quantitative oriented methods are most suitable for deductive studies. In this research project, where the purpose is inductive theory building and testing, small N comparative case study analysis is more appropriate.

This study utilizes the **most different systems** for selection of innovation/research parks in different regions/provinces of Canada (see Seawright & Gerring (2008) for detailed discussion on case-selection techniques). In undertaking the case selection for this study, a number of aspects were considered in-line with the methodology literature (Geddes, 2003; Seawright & Gerring, 2008).

According to Shearmur and Doloreux (Shearmur & Doloreux, 2000, p. 1073), the Canadian innovation parks can be analyzed based on: "a) their relationship with universities, b) their sectoral specialisation, and c) their initiator." The key defining feature of the Innovation Parks is their active association with university, regardless of governance mechanisms in place. Sectorally, most innovation parks focus on two or more high-tech sectors (AURP, 2013). Sectoral specialisation is a function of both natural synergy with regional economic base and real estate considerations. Often, the park managers wish to diversify their tenancy base for management and financial reasons (Shearmur & Doloreux, 2000, p. 1073).

Innovation parks in Canada vary widely in their governance and ownership structures vis-à-vis universities. The university may own them wholly or partially and operate them on non-profit basis or as a university trust. On the other end of the spectrum, they may be owned by an external, non-university party but may have some form of contractual relationship with the university (Link & Scott, 2006). In few cases, they may be owned by private for-profit companies (Shearmur & Doloreux, 2000).

Another important element is government involvement in the ownership and support of Innovation Parks in Canada. Some parks have more active and direct government involvement, manifest through the operation of the park as a crown corporation – such as in Saskatchewan or in Laval, Quebec, where the park is owned by the municipal government. In these cases, the board of governors overseeing the strategic activities of the park normally include members of provincial legislature or municipal bodies. In other cases, all three levels of government – federal, provincial and municipal – provide significant financial support through injection of cash or by locating government facilities in and around the innovation park.

Based on this description, the three innovation parks – namely, the Saskatchewan Innovation Park (SIP), McMaster Innovation Park (MIP) and David Johnston Research and Technology Park (DJRT), are representative of the broader population of Innovation Parks in Canada – being physical infrastructure projects with similar goals. They all provide real-estate space for entrepreneurial start-ups, information and advisory services, and have some level of government involvement at all three levels (municipal, federal and provincial). These parks have been operational for at least ten years with SIP being the oldest and MIP being the youngest in the sample. Each of these parks is associated with a renowned university, namely, University of Saskatchewan (SIP), McMaster University (MIP) and Waterloo University (DJRTP).

These cases achieve variation in governance and institutional aspects including federal-provincial-municipal relations and government involvement (or lack thereof) in innovation park management. The three innovation parks are located in different municipal regions: SIP is located in Saskatoon and Regina; MIP is situated in Hamilton; and, DJRTP is in the Waterloo-Cambridge-Kitchener region. Each of these municipal regions have different financial and policy capacity to support innovation parks as well as different historical rationale to support broader economic development. Each of these municipalities and municipal regions have a different economic, political and civic cultural base and differ significantly in size. It is important to note that while differences in size would be an important consideration, the variance in economic, political and civic-cultural base is used as an explanatory variable in this study. The innovation parks also represent key economic sectors of Canada including natural resources and agriculture (SIP), manufacturing (MIP), and information technology (DJRTP).

Moreover, each of these parks has a different governance structure and a different relationship to the universities. SIP operates as a Crown corporation, with the land owned by the University of Saskatchewan and leased to the provincial government. MIP operates as a separate Trust of the McMaster University whereby University administrators provide advisory oversight through the Board of Directors. Finally, DJRTP is embedded completely in the University of Waterloo administrative structures whereby the University owns the land and all administrative and operational decisions concerning DJRTP are subject to the University by-laws. Differences in provincial economic and political bases (Ontario and Saskatchewan) will further allow me to analyze provincial innovation policies and differences in political and programmatic support at the provincial level for such public-private policy instruments. Table 1.1 provides a summary of characteristic comparison across these innovation parks.

The impact of ‘background noise’ or ‘external factors’ – particularly biases could play an important role in the analysis given the qualitative nature of this enterprise (Seawright & Gerring, 2008). This has been minimized to some extent by interviewing from an inclusive multi-frame sample of key informants and corroborating with relevant documents and with other key informants (see the following section on data collection). The case study of each of the innovation parks being analyzed presents a holistic picture of the ecosystem in question. Each case study has been thoroughly grounded in the local and regional innovation ecosystem and provides analysis of key processes and players involved. This allows for a system-level analysis to explain differences within and across the three parks being compared (G. King et al., 1994; Tarrow, 1995; Teune & Przeworski, 1970).

**Table 1.1.	Characteristics of Innovation Parks under Study**

Characteristics	**Saskatchewan Innovation Place**	**David Johnston R+T Park**	**McMaster Innovation Park**
Governance Structure	Crown Corporation	University	Trust
University Engagement	Landlord +Advisory Committee	Owner	Landlord + Board of Directors
Government Involvement	Manager	Funder	Funder
Years Operational	38	15	13
Sector Focus	Agriculture Biotechnology	Information Technology	Advanced Manufacturing

1.2.2. Data collection, sampling strategy and analysis techniques

Data for this study have been collected through document analysis, which included governance documents such as policies, guidelines, evaluations and annual reports, lease agreements, and Memoranda of Understanding (MOUs) for each of these centers. These documents provided an in-depth review of the governing circumstances and codified expectations.

In order to gain a more nuanced understanding of innovation parks, I conducted interviews with 40 key informants that allowed me to explore the research question in a nuanced manner. The sampling frame consisted of three groups of individuals:

i- Government officials and policy makers from ministries of industry and economic development at the provincial and federal level as well as policy makers and key decision makers in municipal regions where these centers are located;

ii- Members of Innovation Park Management teams as well as members of board of directors; and,

iii- Representatives of industry and intermediary organizations that are associated with each of these centers and innovation parks at large.

The interview method is variously characterized through terminologies such as (in-) depth interview (Legard, Keegan, & Ward, 2003), intensive interview (Sommer & Sommer, 1991), in-person interviewing and interview surveys (Babbie & Benaquisto, 2010). In essence, these terminologies each point to specific characteristics of the interview method. As a whole, what differentiates this method from qualitative survey questionnaire and quantitative survey is the two-way interaction and collaboration between the interviewer and the respondent. The interview method can serve different functions in a research enterprise including exploration and analysis of complex topics with limited observation opportunities as well as assessment and interpretation of beliefs and opinions (Sommer & Sommer, 1991, p. 108).

These interviews allowed me to capture the perspectives of individuals and gain in-depth knowledge about the organizational and sociological phenomena that could not be directly observed. The interviews were conducted with the interviewer following the "miner metaphor" (Kvale, 1996) or "Interviewer as a craftsperson" (Babie & Benaquisto, 2010) where knowledge is taken to be a given and the interviewer plays a passive role in mining the knowledge that is already possessed (Kvale 1996; Goode & Hatt, 1952; Legard et al., 2003).

The initial sample of respondents from each of sample frames was selected using publicly available lists of key individuals. It was then augmented using snowball sampling technique, whereby each respondent was asked to provide leads about other consequential informants on the topic. Interview requests were sent to 58 individuals in total belonging to one of the frames above – thus the response rate was 60%. Initial contact with each key respondent was made through email invitations that were subject to McMaster Research Ethics Board (MREB) approval (Appendices 4, 5 & 6). The email invitation also sought explicit consent from each participant, obtained in writing prior to the interview or recorded at the start of the interview, to publish participant's name and other identifiable information. In cases where written consent was not obtained prior to the interview, the interviewer sought verbal consent following the script approved by the McMaster Ethics Board (Appendix 6). In all cases, consent was sought before formally starting the interview. While most participants consented to publishing their name and identifiable information, some key participants declined to be identified in this report. To ensure consistency and also considering that the respondents in this study belong to a small innovation park community, it was considered optimal to anonymize all the qualitative data to avoid any potential conflicts. Consequently, the names of participants have anonymized by numbering the interviewees and direct quotations or ideas from a key informant interview are cited as 'key informant no.' along with the innovation park affiliation and date of the interview. Withholding the names minimizes the bias and does not negatively affect the study.

The interviews followed a semi-structured format, whereby separate interview guides were prepared in advance for the three segments of key informants (presented in Annexes 1 to 3). These questions were used as guides, often tailored and modified to seek specialized information from each respondent. As the interviews proceeded in a semi-structured style, respondents were often asked follow-up questions that are not captured by these guides. These interviews were conducted over-the-phone due to geographical constraints of the researcher.

The responses from the interviews were then analyzed using narrative themes that identified the institutional, interest (power) and ideational dynamics influencing the development and functioning of innovation parks and the rationales for government intervention. These thematic categories are listed in table 1.2. The interviews were particularly helpful in understanding the political, economic and policy rationale for these centers as well as barriers to effective performance. They helped develop a more detailed and nuanced picture of innovation parks that was otherwise not available through policy documents. Thus, the interviews contributed to the development of enriched narrative and a storyline of each innovation park and a critical perspective on institutional, interest-based, and ideational perspectives that is largely absent from the macro-level policy narrative and key governance documents and position papers. They also provided specific interpretations of various governance documents including lease agreements and evaluation reports. These interpretations contributed to the explanatory framework of this research enterprise in answering why governments support innovation parks, why different levels of government play more active roles in managing the innovation parks and how interactions between ideas, interests and institutions explain government support for innovation parks.

Table 1.2. Examples of Key Themes

Institutions	Policy Rationale
	Levels of government
	Evolution over time
	Institutional Cultural differences
Interests	Power Dynamics
	Imbalances in power structures
	Influence over policy decisions
	Leadership
	Role of industry and lobbying groups
Ideas	Collaboration
	Normative Assumptions regarding extent and level of government involvement
	Economic Growth
	Knowledge-based Economy
	Common understanding of the role of innovation parks
	Lessons learnt – policy learning/adoption

1.3. Chapter Outline

The second chapter presents a somewhat broad overview of literature – including concepts, methods and theoretical frameworks employed in innovation studies followed by a closer look at the theoretical underpinnings – conceptualizations, measurements and frameworks. I set up the 3-I theoretical framework in this chapter. Chapter three will situate Innovation Parks in the Canadian policy context, while presenting a brief history of S&T-innovation policy development in the country.

Each of the three innovation parks are then discussed in detail (chapters four to six). These chapters present key elements of each of these parks, discussion of infrastructural facilities, governance structures and key tenants. The discussions in these chapters also help situate the parks within the 3-I framework. Chapter seven presents an in-depth analysis of these parks, based on the three-I framework – Institutions, Ideas and Interests. Concluding remarks are presented in chapter eight.

2. Innovation Parks - Theoretical and Methodological Framework

I begin this chapter by reviewing and consolidating the various definitions of innovation parks in general, understanding their objectives and historical evolution, and providing an overview of their impacts. The following sections provide a brief overview and critique of the descriptive models and theories of innovation including the Systems of Innovation, Triple Helix and Clusters as they relate to Innovation Parks. In light of the evaluative evidence, I then focus on constructing the 3-I framework comprising of *Institutions*, *Interests* and *Ideas* that can explain why governments support innovation parks. In this process, I also provide a brief overview and critique.

2.1. Conceptual Typology of Innovation Parks

Given the relative dearth of literature on Innovation Parks, it is also not surprising that not much effort has been devoted to understanding the meaning of "Innovation Parks". Whatever barebones literature exists, it is marred by the usage of multiple terms such as business parks, Research Park, innovation hub, technology center, and industrial zone to describe seemingly similar concepts. Often different terms are used to define same entities or terms are used interchangeably (Bruhat, 1990; Goldstein & Luger, 1992; Joseph, 1994; Lacave, 1995; Longhi & Quéré, 1993; Malecki, 1997).

Definitions range from a broad-encompassing conceptualization as put forth by United Nations Educational, Scientific and Cultural Organization (UNESCO) to more specific ones used by park associations such as the International Association of Science Parks (IASP), United Kingdom Science Park (UKSPA) and the Association of University Research Parks (AURP).

Table 2.1. Definitions of Innovation Parks

Organization	Definition
UNESCO	"The term 'science and technology park' encompasses any kind of high-tech cluster such as: technopolis, science park, science city, cyber park, hi tech (industrial) park, innovation centre, R&D park, university research park, research and technology park, science and technology park, science city, science town, technology park, technology incubator, technology park, techno-park, techno-pole, and technology business incubator" (UNESCO, 2017).
IASP	"A science park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions" (IASP, 2012).
UKSPA	"A business support and technology transfer initiative that: encourages and supports the start-up and incubation of innovation-led, high-growth, knowledge-based businesses; provides an environment where larger and international businesses can develop specific and close interactions with a particular centre of knowledge creation for their mutual benefit; and has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations" (UKSPA, 2018).
AURP	"…a property-based venture, which: master plans property designed for research and commercialization; creates partnerships with universities and research institutions; encourages the growth of new companies; translates technology; and drives technology-led economic development" (AURP, 2018).

Source: Data for this table has been reproduced from Hobbs et al. (2016, p. 2) and also validated through UNESCO (2017), IASP (2012), UKSPA (2018) and (AURP, 2018)

According to Association of University Research Parks (AURP), an innovation park – or a university research and technology park – is primarily a "master planned property", with possible secondary and tertiary buildings built for private and public collaborative research and development activities (AURP, 2013, p. 5). It also features other development facilities and services to aid collaborative activities between government, industry and academia. Another defining feature of the innovation park is its formal relationship with the university, which is often governed through contractual lease or similar mechanisms (AURP, 2013, p. 5).

UNESCO defines the innovation park – or the science and technology park – as “a property-based initiative with an organizational entity, which is established to assist the growth of knowledge-based firms, normally resident on site and knowledge-intensive activities.” Based on a global survey of innovation parks, IASP and UNESCO (UNESCO, 2017) have identified eight defining characteristics of these parks. These include: physical infrastructure; education and research; location; research and development; business incubation; venture capital; incentives; and, environment.

Theoretically, innovation parks may be situated along a continuum, one extreme end of which can be understood as the ‘real estate model’ and the other end can be characterized as the ‘research or science and technology model’ (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). In the real estate model, property development is the primary mission which is undertaken by providing high quality accommodation for industries and businesses. Infrastructural developments which are closely aligned with this end of the continuum are also referred to as Business Parks, Technology Park or Enterprise Parks. These establishments do not have formal linkages with academia and are primarily used for revenue generation for the owners as well as economic development and job creation (Quintas, Wield, & Massey, 1992). They are essentially real estate space for companies that may in a number of cases belong to the same sector. These parks often do not have innovation as a goal and therefore “their contribution to the innovation agenda is limited” or non-existent (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

The science and technology end of the continuum comprises of parks that have formal linkages to the post-secondary institutions. These innovation parks are especially designed to advance and facilitate knowledge-based economic agenda. These parks often have built-in functions to actively provide technology transfer and business management services to their tenant firms. The management of these parks invests actively to develop and promote linkages between university and industry by encouraging applied R&D. Innovation parks that fall on this end of the continuum are thus more conducive to the promotion of the regional innovation agenda all the while providing valuable physical space and equipment. In addition, they provide strong spillover effects in terms of developing and promoting the R&D capabilities by encouraging the formation of new firms that aim to commercialize leading-edge technologies. Often, these innovation parks play a vital role in the regeneration of the local or municipal regions. These innovation parks also provide more flexible physical space that could be conducive to undertaking in-house R&D in laboratory settings (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

Situating innovation parks on a continuum often leads to blurred distinctions. The blurring of lines between the real-estate model and science and technology model also happens because real-estate is always a strong defining feature of innovation parks

(Shearmur & Doloreux, 2000, p. 1067). Such overlap often leads to innovation parks becoming, what Massey & Wield (Massey & Wield 1992a cited in Shearmur & Doloreux, 2000) refer to as, “glorified Business Parks” which end up attracting firms simply because they are considered “prestige real estate”. In other instances, the different levels of governments leverage the positive image to demonstrate the economic development of the region. The parks thus fuse the infrastructure with economic and political considerations (Shearmur & Doloreux, 2000, p. 1068).

While revenue generation and financial sustainability is a key objective for many of the innovation parks around the world, more ‘progressive’ parks have adopted functional models that lean towards the middle of the continuum (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). Such models provide a strong foundation for entrepreneurship, talent development and economic competitiveness of regions, provinces and countries. Successful parks that strike the right balance between these models and thus become integral to the advancement of innovation agenda (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). They are more conducive to the development of collaborative environment between industry and academia and promote innovation and the development, transfer and commercialization of technology (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

Although the different terms used to define Innovation Parks may appear simply semantic differences, it is sometimes worthwhile drawing the difference between research parks and innovation parks. Research parks often invoke images of laboratory, ‘whitecoat' research – or hard scientific research carried out in the academic environments. Innovation parks, on the other hand, provide a more holistic set of activities with a focus on commercialization of research. While there is often a significant research component, the research is conducted for applied purposes in the industry - for new technology companies, new technological applications or new economic markets. Innovation parks may thus be perceived as more outcome oriented – with a focus on the whole spectrum of applied research, business development and commercialization with the end goals being economic development and promotion of knowledge-based economy (Key Informant no. 4, Personal Communication on AURP, June 6, 2016). .

The distinguishing feature between innovation parks and business parks is the university-linkages that are more-or-less mandatory in the case of the former. These parks are often built on or have very close ties to university campuses. Many of the tenants of these parks also have direct or indirect linkages with the university – some are current or former university faculty or students; some hire graduate students to undertake research; others gain access to university-based research and technology through licensing and patent agreements with university's industry liaison offices (ILOs).

Moreover, given a wider usage of the term 'innovation' in the policy circles, organizations and individuals affiliated with the parks may prefer to use the term 'Innovation Park' to define the entity. It may provide them better leverage when lobbying the different levels of governments for funding. Interestingly, the preference for using one or the other term may also reflect the underlying tensions between park managers, university administrators, and government funders. These will be explored in the subsequent sections and chapters.

2.2. Objectives and Activities of Innovation Parks

Based on the discussion in the previous section, it becomes apparent that innovation parks are a multidimensional combination of hard and soft infrastructure put in place to promote knowledge-based economic development – particularly in the rapidly evolving high-technology or innovation sectors. These are the physical spaces where government, academia and industry – multinationals, small-medium enterprises (SMEs) and start-ups – can come together to advance common goals, namely applied research and development for the purposes of economic development. They provide the basis for an innovation ecosystem that is conducive to R&D, commercialization and business development.

Innovation parks often have multiple competing goals that differ along the institutional boundaries. The functional objectives may differ depending on which institutional domain – academia, government or industry – is dominant in the governance of the park. Each stakeholder has different interests in being associated with and promoting the innovation park. Economic development is an important consideration for the government whereas the private sector is driven by the bottom-line profits. For governments, Innovation Park is a tool to promote economic development; private sector may seek to minimize its labour and capital costs by leveraging readily available highly qualified personnel and researchers through the university and sharing physical and laboratory space. The innovation parks may also be an avenue for the university to leverage government and industry funding particularly in the wake of dwindling government grants over the last couple of decades. Finally, all stakeholders may be jointly interested in lower informational costs through close proximity with each other and strong social (formal and informal) networks that develop within innovation parks. (Shearmur & Doloreux, 2000, p. 1067).

According to Massey and Wield (1992a), however, most of the objectives are ascribed to innovation parks on normative basis. They tend to reflect the institutional expectations of each of the involved organization, rather than the real outcomes of the innovation parks. These normatively defined objectives therefore give rise to false tautologies and misplaced or over exaggerated evaluations of the innovation parks. In their seminal study of the innovation parks in the United Kingdom, Massey and Wield (Massey & Wield, 1992a, 1992b) have identified a wide range of such normatively defined aims of innovation parks that are ascribed by the park managers and sponsors. These wide-ranging aims can be refined into key processes that are "expected from science parks" (Massey & Wield, 1992a, p. 12). These include job creation, establishment of new firms - including those at the cutting edge of technological development – and facilitating linkages between the university and the tenant firms of the innovation park many of which are offshoots of university-based or university-led R&D activities (Massey & Wield, 1992a, p. 12).

Table 2.2. Summary of Science [Innovation]-Park Objectives

Stimulate the formation of start-up new-technology-based firms (NTBFs)
Encourage the growth of existing NTBFs
Encourage spin-off firms started by academics
Encourage and facilitate links between higher education institutions (HEI) and industry
Facilitate technology transfer from academic institutions to park firms
Commercialise academic research
Increase the 'relevance' to industry of HEI research
Give academic institution access to leading-edge R&D in park firms
Increase the appreciation by academics of industry's needs
Create employment and consultancy opportunities for academic staff and students
Foster the technologies of the future
Create synergy between firms
Create new jobs for the region
Improve the performance of the local economy
Improve the image of the local economy
Improve the image of the location, particularly for areas of industrial decline
Shift local/regional industrial base from declining to new industries
Counter the regional imbalance of R&D capability, investment and innovation
Stimulate the shift in perceptions
Build confidence
Engender an entrepreneurial culture by example
Reproduce Silicon Valley, Hewlett Packard
Attract inward investment, mobile R&D
Provide an adequate and safe return on capital
Generate income for the academic institution
Stimulate science-based technological innovation
Improve the image of the academic institution in the eyes of the central government

Source: Reprinted from Massey & Wield (1992a, p. 12)

While some of these objectives are complementary, the others often compete with institutional norms deeply embedded in each organization involved. For instance, the goal to commercialize academic research often finds significant resistance from faculty researchers who are more accustomed to public research. These differences in expected goals and outcomes often lead to misalignment and lack of common understanding by the institutional players involved in the management of the innovation parks. I provide a detailed account of these institutional tensions in later chapters.

2.3. Historical Evolution of Innovation Parks

Innovation and Research Parks emerged as a policy tool in North America in the 1950's – Silicon Valley (USA) was the first. It is considered a leader in the establishment of innovation parks with the development of Stanford University Science Park (Patthirasinsiri & Wiboonrat, 2017; UNESCO, 2017). After the establishment of these pioneer parks, more innovation parks were built across the United States, albeit slowly, in the 1960s. In the 1970s, the concept of innovation parks gained increasing traction among governments as a policy tool for "urban economic revitalization" (Kharabsheh, 2012, p. 58). Europe and Asia followed suit with the establishment of Sophia Antipolis in France in 1960s and Tsukuba Science City in Japan in the early 1970s (UNESCO, 2017). These three parks in the United States, France and Japan represent the oldest and most well-known innovation parks in the world (Patthirasinsiri & Wiboonrat, 2017; UNESCO, 2017) .

Both San Francisco (Silicon Valley) and Boston-Cambridge (Route 128) had the benefit of important academic institutions that led the development of advanced technologies. The establishment of these parks provided a causal story where "entrepreneurial professors" successfully established their companies to take their "bright ideas" to the market (Massey & Wield, 1992a). The passage of Bayh-Dole Act (also known as the *Patent and Trademark Law Amendment Act*) in 1980, which transferred the intellectual property rights to the individual inventor from the federal government, gave further institutional credence to the concept of innovation parks. It incentivized the individual inventors (and/or their organizations) to freely commercialize their inventions and keep the royalties. More of the “entrepreneurial professors” could set up their own firms in attempts to commercialize their products. It is worth noting that Canada, to-date, lacks such a legislative incentive for academic entrepreneurs to claim ownership of their IP; rather, the IP policies have been piecemeal and differ from one academic institution to other.

The passage of Bayh-Dole Act in the U.S. in 1980, and other targeted legislation and macro-level changes in the European Union including the European Union Framework, led to a rapid increase in the number of innovation parks in these regions (Link & Scott, 2007). However, legislative incentives provide only part of the explanation for the dramatic rise in innovation parks. These governments complemented legislative measures with other more concrete economic incentives such as the R&D tax credits. These measures drove the ideological paradigm shift towards an applied science and intellectual property regime. The enactment of these policies defined the global rise of neo-liberal economic agenda and were further entrenched by supra- and trans-national organizations such as the European Union and the OECD.

Since the development of the first innovation park in 1950, there has been a widespread international and domestic growth in the development of new innovation parks. UNESCO reports that there are currently more than 400 innovation parks worldwide – according to its definition – and the number is still growing. United States remains a leader with close to 150 innovation parks; Japan has 111 and China has 100 – all of which are state-owned (UNESCO, 2017).

Over the years, the meaning of the term "Science Park" and "Innovation Park" has broadened significantly. Earlier in their history, these parks were confined to merely providing real estate space with minimal support services. While the innovation parks continue to provide the basic infrastructural facilities, additional range of functions and services including, but not limited to, business incubation, venture capital and technology transfer services are now part of the innovation park milieu. Increasingly a number of more advanced innovation parks have started providing residential and hospitality services for their tenants as well that allows the tenants to host their guests visiting the park for conferences, workshops and tradeshows.

2.4. Impact of Innovation Parks – A story of sub-par performance

The impact and performance of innovation parks is probably the single most contentious issue in innovation park discourse. Consensus regarding innovation park performance and their impacts on the broader economic growth remains elusive. While the economic impacts could not be quantitatively determined – given the qualitative nature of this study – the key informants were asked to weigh in on the issue of performance and park impact. While some parks, such as the DJRTP and mARS (occasionally) are pointed to as success stories in Canada, other innovation parks boast large numbers of empty spaces, falling tenancy rates and few tangible outcomes related to innovation. Some of these were undoubtedly related to different institutional interpretations of what these parks are intended to do; others were more theoretically and empirically grounded linking to the underlying gaps in Canada's approach to innovation policy. In this section, I review some of the literature on performance evaluation of innovation parks and evidence collected through key informant interview regarding the performance of innovation parks – particularly the SIP, MIP and DJRTP.

As noted at the outset in Chapter 1, quantitative performance measurement of innovation parks is not a goal of this research enterprise; rather, I undertake this review as a theoretical exercise and provide qualitative evidence to support the claim that despite forecasts of grand positive results, these innovation parks have not been able to deliver on their promised outcomes. Moreover, this discussion will help to situate the research question in the appropriate context and push us to inquire into the rationale for government support beyond merely the tangible, economic impacts. A reading of the literature suggests that there is no consensus about the definition of successful innovation parks. One of the common problems highlighted by the studies is a lack of common set of goals against which to measure the performance of all innovation parks under study (Dabrowska, 2016, p. 3). Thus, evaluators are often left with evaluating the innovation parks at ‘their own terms,’ i.e., measuring against their own specific goals. This approach precludes any effective comparative analysis.

Goldstein & Luger (1992) identify three stages of innovation parks’ development that can be considered success thresholds and those characteristics that determine the success of Innovation Park in each stage. The three stages are: “incubation”, “consolidation”, and “maturation.” According to Goldstein & Luger (1992), regional economic development that is frequently expected from the innovation parks only materializes in the maturation stage. Prior to that, innovation parks need to demonstrate initial planning development and steady growth in the incubation and consolidation stages respectively to be considered on a successful path – which is defined by contribution to wider economic growth. (Goldstein & Luger, 1992).

As innovation parks gained increased importance in the regional economic growth discourse, a number of economic impact indicators and commercialization metrics have also been employed to measure their success. Tangible economic performance indicators at the firm level are often used as indirect measures of the individual innovation park's performance. Thus, the performance of the firms located in the innovation parks is considered an indicator of the success of the innovation park. Some of the commonly used indicators include : growth rate of the firm, intensity of R&D investment, employee turnover, revenue, rate of introduction of novel products and services into the mainstream market, patents – held and applied for – and proportion of HQP (Dabrowska, 2016). A more detailed, and somewhat complex, set of economic indicators is also developed by Monck (Monck, 2010).

A number of studies (for example, Lindelof & Lofsten, 2003; Massey, Wield, & Qunitas, 2003; C. S. P. Monck, Porter, Quintas, Storey, & Wynarczyk, 1988; D. S. Siegel, Westhead, & Wright, 2003; Squiccaiarini, 2009) attempt to measure the performance of on-park companies versus off-park companies, using a match sample approach. Most of these studies found weak or inconclusive evidence of differences between on-park and off-park firms. This approach is used as an indirect proxy for the overall performance of the innovation park and attempt to support the false tautologies often embedded in the objectives of the innovation parks (Massey & Wield, 1992b).

Economic indicators commonly employed in the public sector are also increasingly employed to measure the performance of publicly funded innovation parks. According to Dabrowska (2016, p. 6) some of the most important indicators are "displacement," "value added," or value-for-money and "multipliers." "Displacement" measures how much the innovation park crowds out investment opportunities for firms and individuals elsewhere; "value added" provides an estimate of how much of the impacts or benefits would have occurred without the innovation park's involvement; and, "multipliers" attempt to capture the secondary or indirect effects that arise from the innovation park and run through expenditure and supply chain (Dabrowska, 2016, p. 6).

Most evaluations of Canadian innovation parks, conducted independently or through AURP, adopt some variation of "multiplier effects" approach to quantify direct and indirect impacts of innovation parks. In this study, I use these multiplier effect analyses to facilitate comparative analysis. However, this is done with the recognition that often these multiplier effects approaches are exaggerated forecasts with poorly defined indicators of "indirect" impacts. Public and private sector socio-economic data do not corroborate these multiplier effects. For instance, the national economic impact study of the Canadian innovation parks conducted by the Association of University Research Parks (AURP) pegs the "facilitative" (indirect) impacts of innovation parks on GDP at $4,3 billion, with $3,209 million in wages and salaries, $596 million in tax revenues for the Government and 65,817 jobs created (Association of University Research Parks Canada, 2013). However, these data could not be verified through other statistical and qualitative sources.

SIP's Economic Impact Reports (Insightrix Research Services, 2006, 2008) as well as the Annual Reports (Skelton & Isman, 2013, 2014, 2016; Wiks & Tastad, 2009, 2010, 2011, 2012) suggest that the SIP contributed approximately $292 M - in direct impacts including net payroll and provincial purchases – and 4,299 in total employment. These impacts augmented to $647 M in indirect impacts as well as 8,528 in full-time employment. According to the 2013 Economic Impact Report of MIP, commissioned by the park management, the economic impact of all MIP tenants on the city of Hamilton was approximately $38 to $50 million in terms of generated revenue and GDP. For Ontario, the projected economic impact was approximately $39 to $52 million. In terms of employment, approximately 700 to 725 jobs were attributed to MIP in the City of Hamilton and Ontario. These impacts are based on the direct projected impact of salaries, purchases and employment information and are further augmented by 'multiplier effects" as a percentage of money spent in the local area is re-spent within the same region (for a detailed discussion of methodology, see McMaster Innovation Park, 2014a).

Similarly, PriceWaterhouse Cooper – in collaboration with Association of University Research Parks (AURP) – conducted an impact study in 2013 that provided estimates of direct (attributable) and indirect (facilitative) impacts of the DJRTP (Association of University of Research Parks, 2013). The attributable impact on cumulative firm output is estimated $150 million; GDP impact is $105 million; contribution to labour income is $79 million and tax base is $15 million. In 2013, park employment stood at 1,645. In addition to the direct impacts, the park also has indirect/facilitative impacts which are 4 times higher than the direct impacts. The impact study also anticipates the future direct impacts to be 1.5 times higher than the current levels through expansion of current and development of new facilities.

While these statistics present innovation parks as quite successful, this success story is not corroborated by qualitative evidence obtained through key informant interviews. Canada's experiment with innovation parks, according to most key informants interviewed for this study, has had limited success, if not outright failure. In some regions, after the government provided the initial investments and supported the development of innovation parks, these had to be turned over to the private sector developers as real-estate space (for example, London and Ottawa). While there were some initial successes, notably with SIP's Saskatoon campus and mARS in Toronto, the subsequent extensions of these parks proved to be less successful in regard to attracting private sector firms and start-ups as tenants. Consequently, the governments have had to relocate some of their own departmental functions – that were in most cases not even remotely related to promoting innovation – to these innovation parks. In other instances, governments have boosted the viability of innovation parks by moving their large-scale research facilities as in the case of SIP and MIP.

Highlighting the government's perspective as an outsider to the policy circle, one respondent noted that "there is not an overwhelming evidence that [the] faith [in innovation parks] is well placed [and] the government[s] still are not seeing the results that they probably would want" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). Another high-ranking university administrator affiliated with MIP suggested that while the Innovation Parks may have the potential, that has not been yet realized. Other respondents, mostly academic and government policy advisors, lamented the becoming of SIP and MIP as a ‘real estate play’ (Key Informant no. 27, Personal Communication on MIP, November 30, 2016) and the ‘drift away from their intended outcomes of supplementing academic research’(Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

One key informant with significant experience in the Saskatchewan innovation policy landscape strongly suggested that the forecasts of tangible outcomes and their anticipated impacts in terms of contribution to GDP and economic growth are ‘highly misplaced’. Rather, the benefits of these innovation parks reside in the strong networks and collaborative cross-learning (Key Informant no. 14, Personal Communication on SIP, November 9, 2016). This insight regarding the networking and cross-learning benefits was also echoed by other key informants.

Analyzing the evidence presented here, particularly the insights from key informants which tend to contradict the rosier pictures presented through statistics on direct and multiplier/indirect effects, we can see that the innovation parks in Canada have not been a rousing success. The question thus remains: what are the rationale for governments to continue to support innovation parks? I suggest that the answer to this question lies in the underlying interplay of institutions, interest and ideas. In the following sections, I develop the detailed 3-I framework as it relates to policy rationale for supporting innovation parks.

2.5. Theoretical Underpinnings of Innovation Parks

The existing literature in the broad realms of economics, public policy and political science – as well as that in the innovation domain - does not provide a comprehensive theory of the innovation parks. The literature – dealing with individual case studies of innovation parks – mostly documents the institutional history of a number of research parks (Link & Scott, 2007). Policy literature mostly comprises of five varied approaches, namely "environment, power, ideas, institutional frameworks, and process of decision-making" that attempt to "explain variations in the scope, means and distribution of program, policy areas and patterns of policy over time" (Simeon, 1976, p. 566). None of these approaches provides a full understanding on its own; they are both competing and complementary. Each of these approaches is useful in analyzing aspects of policy at different levels of granularity. For instance, the decision-making process explains more granular and detailed aspect of policy at micro levels, whereas macro and larger scale is better captured by ideological and environmental aspects (Simeon, 1976).

Innovation policy has been mostly studied either through a neo-classical economic or system lenses with Triple (and Quadruple) Helix Approach gaining traction in the early 21st century. These models are, however, descriptive – primarily trying to describe the nature of innovation processes and how innovation unfolds. Nonetheless, they can provide a useful framework to develop the institutional understanding of innovation parks. I present a brief outline of various theoretical approaches to the study of innovation and innovation parks – including those from the core public policy and political science literature – and draw linkages to the three I's, namely *Institutions, Interests,* and *Ideas*.

2.5.1. Linear Model

The earlier conceptualization of innovation parks followed the linear model of innovation (Massey & Wield, 1992b). In this conception, the pure scientific research was conducted in academic laboratories. This process led to invention and discovery which was handed off to government and industrial laboratories to be refined and transformed according to the needs of these sectors. The industry was responsible for the design and development of prototypes, which would be converted into commercial products, thus completing the linear chain (Massey & Wield, 1992b; Swann, 2009)

However, the process of innovation is now seen to be more complex and relies on a large number of inputs and actors that interact non-linearly. Moreover, the process "transcends multiple disciplinary boundaries" in a way that blurs traditionally defined roles for the actors involved (Phillips, 2007, p. 38). Further complicating this picture are the different levels of analysis that start with the national and collective levels and zoom down to individual entrepreneurs and researchers. The other models such as Systems of Innovation and Triple Helix attempt to capture the complex dynamics of multiple actors and inputs.

2.5.2. Systems of Innovation Approach

The Systems of Innovation (SI) approach has its roots in a compound of theoretical approaches such as the evolutionary theory (Nelson & Winter, 1982), as well as institutional approaches (North, 1990) and sociology. The SI approach has been developed to overcome the inadequacies in the neoclassical explanations of innovation processes discussed in the previous section (Chaminade & Edquist, 2010; Lundvall, 1992). The SI approach takes into account the interactions of the firm – which is taken as central to the innovation – with a broad range of actors including customers, suppliers, competitors and various other public and private organizations in the ‘system’ (Fagerberg, 2005). The SI approach also gives consideration to organizations at different levels including regional, sectoral, national and supranational levels. In this way, the approach provides for the possibility of ‘multi-causal’ explanations while delineating the role of various determinants (Fagerberg, 2005). Over the last two decades, the systems-of-innovation (SI) approach has become one of the most utilized approaches in understanding the underlying dynamics of innovation. Consequently, there has also been significant academic focus on systems approach, leading to seminal works in this area by Lundvall (1992, 1999, 2007), Nelson (1993), Edquist (1997, 2005), Porter (1990, 1998), Cooke (2001, 2007), and Malerba (2002, 2005).

2.5.3. Regional Systems of Innovation and Clusters Approaches

Closely related to the Systems of Innovation approach are the Regional Systems of Innovation (RSI) approach (see Asheim & Gertler, 2005; Cooke, 2001; Cooke & Morgan, 1998; Feldman, 2001; Morgan, 1997; Porter, 1990) and the cluster approach (for example see Porter, 1990, 1998; Wolfe & Gertler, 2003). Both these approaches, which gained prominence in policy circles over the last 20 years, emphasize the role of spatial concentration and agglomerations of high-technology firms located around research-intensive universities or public research centres. As noted earlier, Silicon Valley and Route 126 provided the impetus for successive efforts to foster the development of agglomerations in other areas. Often these efforts were focused on emulating the ‘Silicon Valley model’ to foster innovative capacity and in turn economic development in the region (Wolfe & Gertler, 2003). Clusters and regional agglomerations are thus seen as a recipe for regional economic development.

The benefits of the clusters are often described in terms of spillover impacts afforded by the agglomeration of the sectoral base in the region. The spillover effects arise when key suppliers co-locate with the leading companies in the region (Wolfe & Gertler, 2003). The potential for the development of a successful regional agglomeration and innovation system depends on several factors including taxation and spending power of the local region, availability of venture capital, infrastructure policy such as local building codes, and most importantly, the degree of university-industry linkages. (Cooke, 2001, p. 961).

The increased focus on spatial analysis of clusters has brought greater attention to the role of cities, city-regions and global city-regions (GCRs). Cities are considered to be globalization's crucial scale of economic and social interaction where the assets of density and diversity can be leveraged to enable firms to tap new ideas and individuals to forge new social bonds (Bradford & Bramwell, 2014; Courchene, 2004). Wolfe (2014) argues that although national institutions and global knowledge flows exert strong influence in shaping the creation and diffusion of new knowledge – a topic I deal with in greater detail in subsequent sections –innovation and creativity overwhelmingly occur in the geographic context of city-regions. Thus, cities have acquired the role of "principal sites for innovation, creativity and the production of knowledge-intensive goods and services" (Wolfe, 2014, p. 3). This trend – often referred to as "glocalization" – has been strengthened despite, and to some extent because of, increased globalization (Courchene, 1995, p. 10). As the international law and treaties governing international trade and economic distribution get stronger – constraining national governments' capacity to undertake traditional economic functions – lower levels have become critical for growth and prosperity (Wolfe, 2014).

While there is widespread agreement that the largest city-regions or global city regions (GCRs) (for example, New York, London, Toronto, Montreal) enjoy certain advantages as centres of innovation and creativity, there is less of a consensus on the prospects for mid-sized and small cities (Courchene, 2004; Wolfe, 2014). The big cities are increasingly regarded as "gateways to the world economy" and as the "engines essential for growth and competitiveness" (Sassen, 2000; Scott, 2001; Young & Leuprecht, 2004). Whereas GCRs enjoy high rankings on the Richard Florida's 3Ts (technology, talent and tolerance) and can reap the benefits of diversity that helps creativity and innovation flourish, these benefits are not experienced by the small and medium-sized cities, or alternatively non-GCRs (Wolfe, 2014). The non-GCRs often rely on a much smaller and specialized industrial base that is built around more traditional economic sectors (Wolfe, 2014). Thus when the traditional sector loses its economic value, the economic fate of non-GCRs is also significantly impacted because they are "locked-into obsolete technologies" (Wolfe, 2014, p. 5). The non-GCRs also have limited financial and policy capacity which may make them less agile in responding to rapid changes in technology in a timely manner. The ability of non-GCRs to become viable GCRs thus depends on a number of factors including their ability to "adapt and absorb rapid changes in technology" and the diversity and "competitiveness of their industrial mix (Wolfe, 2014, p. 5).

2.5.4. Triple Helix Approach

In addition to economic, evolutionary, and systems approaches, alternative approaches to study innovation processes have been offered by sociologists. The Triple Helix model deals with the knowledge production across three institutional domains, namely government, industry and university. Unlike other approaches, these models do not present innovation as a firm-centric phenomenon; rather, they consider it as a largely trans-disciplinary process, with an important role for universities in addition to firms and governments.

The core argument of the Triple Helix approach is that the university – which used to be the epicenter of basic R&D – no longer plays the traditional role. The new university-industry relationships now involve the responsibility for the university to provide physical capital (such as Innovation Parks) – in addition to their traditional role of providing highly qualified human capital – and to contribute to the formation of new firms (Etzkokwitz, 1998). The university has thus emerged as a leading participant in the regional economic development discourse. The Triple Helix Model – through its various stages (I, II, and III) of development and refinement by its authors, Henry Etzkowitz and Loet Leydesdorff – has come to present an evolving picture of industry-government-academia relations in innovation and science and technology policy (Etzkowitz & Leydesdorff, 2000). At least three main forms of the Triple Helix model have been identified since Etzkowitz and Leydesdorff first presented their theoretical conjectures. The earlier versions of Triple

Helix (I and II) encompass academia and industry as distinct institutional spheres that have their very specific roles in the innovation policy domain. Over time the model has come to envision a "a knowledge infrastructure in terms of overlapping institutional spheres, with each taking the role of the other and with hybrid organizations emerging at the interfaces" (Etzkowitz & Leydesdorff, 2000, pp. 111–112). The Triple helix approach thus extends an understanding of nested and non-linear dynamics and sub-dynamics of the innovation system (Etzkowitz & Leydesdorff, 2000).

2.5.5. Critique of Models of Innovation

The three broad models of innovation, namely the neoclassical economic approach, the systems approach including the regional system and the clusters approaches, and the Triple Helix approach provide valuable insights into the black box of innovation. Each of these approaches utilizes a unique lens that attempts to describe the innovation process. In doing so, these approaches emphasize certain structural elements over others as the driving force for innovation. While these models are useful heuristics to understand the innovation process in broad strokes, they remain descriptive in nature. That limits their ability to explain specific meso- and micro-level instruments within the innovation landscape, such as Innovation Parks. Nonetheless, we can extract useful elements from each of these to extend our understanding of the innovation parks – more specifically the rationale for governments to support innovation parks.

For neoclassical economic approaches, largely influenced by Austrian scholars, markets are the most suitable mechanism for coordinating and governing innovation processes. For these scholars, market failure, which may emerge from asymmetry of information as well as specific characteristics of knowledge associated with innovation such as uncertainty, inappropriability, and indivisibility, is the only justifiable rationale for government intervention (Chaminade & Edquist, 2010; Lundvall, 1992; Lundvall & Borras, 2005). Even in the case of market failures, neoclassical economists envision a very limited role for public sector. As such, the government's role may be limited to the provision of "public good" by extending financial support for basic research activity, regulatory activity to mitigate externalities and eliminating inefficiencies in the markets (Chaminade & Edquist, 2010).

Evolutionary, Systems and Triple-Helix approaches are not as antagonistic to the idea of public sector and government playing an active role in the entire innovation process, not limited to provision of basic research and knowledge production. Scholars working under the systems approach umbrella, and especially national systems approach, have most extensively analyzed the relationship between public sector and innovation. The systems approach allows for a broader set of functions and tools to be used by the governments to resolve systemic problems in the innovation milieu (for a detailed discussion on these systemic problems, see Chaminade & Edquist, 2010).

According to Edquist (2005), the holistic and interdisciplinary focus of the SI approach has made it almost equally popular among academic scholars and policy practitioners. Moreover, it studies innovation – and the underlying learning processes – from a historical and evolutionary perspective (Edquist, 2005, p. 186). The SI approach was among the first approaches to study the institutional aspects of innovation while emphasizing the non-linear and complex nature of institutions at different levels including national and regional levels. These characteristics of the approach led to the rapid diffusion and uptake of the approach by scholars and practitioners alike (Edquist, 2005).

One key characteristic of SI approach that makes it a good candidate to understand innovation processes is its integration of national, regional and local levels. Each of these levels have a significant role within the innovation system. The “national innovation system” is responsible for setting out the macro-level conditions that influence the micro-level behaviours. The national level establishes the rules and frameworks around the R&D, financial, industrial relations, employment and training systems that influence the outcomes of firms’ decisions (Wolfe & Gertler, 2003, p. 24). Similarly, a number of factors necessary for the effective performance of the innovation system are better handled at the regional level. The policies for research and physical infrastructure and specialized training systems are two examples of such regional factors (Wolfe & Gertler, 2003, p. 24). Finally, the local level is in-charge of policy implementation and the development of critical infrastructural facilities as well as providing the platforms for the civil society to come together to influence the outcomes of the innovation processes

Despite its analytical and theoretical strengths, the SI approach has its share of limitations and weaknesses as well. First, the SI approach suffers from a degree of conceptual diffuseness (Edquist, 2005). A number of concepts used in this approach, such as institutions and organizations, are poorly defined and consequently misused. Similarly, the approach does not specify which boundaries are most relevant for the study of an innovation system, which has led to much disagreement among scholars (for example see Cooke, 2001; Lundvall, 2007). The most important boundary blurring happens when the faculty researchers becomes an entrepreneur, in an attempt to commercialize the invention. Another limitation of the model is that it is primarily focused on institutions; it largely ignores or fails to explain the role of organized and individual interests as well ideational forces that often underpin the institutional and interest-based arraignments. The approach stays very close to the earlier neo-classical approaches in its treatment of innovation as a primarily market (firm)-driven process. Finally, and perhaps most importantly, the SI approach is not a formal theory. As a model, it remains constrained to ‘close’ systems and struggles to explain the dynamic changes that are common to innovation processes. It does not provide specific propositions regarding causal relationships among variables. Consequently, it relies to a large degree on empirical validation of its theoretical conjectures.

The Cluster approach also has its share of limitations as a theoretical and analytical model. For instance, the purely empirical approaches – such as those employed by Feser and Bergman (2000) – do not account for the trends in cluster life cycles (Wolfe & Gertler, 2003). Like the SI approach, the cluster approach also suffers from high degrees of conceptual fluidity. This fluidity manifests most negatively when the concept is applied at different spatial levels including state, province and local/municipal levels. Consequently, the approach loses its analytical and explanatory power to explain the innovation process. The broad usage of the term “cluster” to define different entities and settings at different geographical levels makes consensus on conceptualization challenging. The application of the cluster concept at both the state/province and the local or census metropolitan area level risks devaluing the analytical integrity of the concept (Wolfe & Gertler, 2003, p. 7).

Similarly, the Triple Helix also finds its critics (see Cooke, 2005; Sarpong, AbdRazaka, Alexandera, & Meissnerb, 2017; Shinn, 2002) for its complexity and lack of institutional specifics that define the activities and interconnections underpinning the triple helix in practice. Most importantly, the Triple Helix model does not allow for a detailed understanding of the impact of "social context" and "socio-cognitive micro-foundations" that affect the formation of the entrepreneurial university (Sarpong et al., 2017, p. 142). The model glaringly overlooks the social struggles between the actors from the different institutional spheres as well as those outside in the broader system. The model thus overemphasizes the role of meso-level sociological interactions between different institutional spheres without paying close attention to the broader struggles between actors at macro-levels as well as the cognitive processes that drive the entrepreneur within the entrepreneurial university paradigm (Etzkowitz & Leydesdorff, 1999).

As mentioned earlier, while these models provide valuable insights to the innovation process, they remain highly descriptive. They can offer the building blocks such as elements of institutional design and describe the black-box process of innovation. However, they are largely inadequate in answering the 'whys' – for example, why do governments play more or less active roles in innovation policy, why do certain policy instruments gain traction in policy circles and why do certain outcomes prevail over time. Similarly, for our purposes, we must look to other theoretical models to answer why governments support innovation parks. I do not intend to completely discard the systems, cluster and triple helix approaches; rather, I extract key elements from these to develop the 3-I framework which is discussed in greater detail in the following sections.

2.6. 3-I Framework – Institutions, Interests, Ideas

Having reviewed the diverse range of innovation policy approaches and the integral themes within it, we may turn our attention back to innovation parks and inquire about their place within the innovation policy space. Innovation parks are – for all intents and purposes – a subset of the broader innovation policy and deeply entrenched within various aspects of innovation policy discourse. The breadth and fluidity afforded by the theoretical models of innovation allows us to analyze innovation parks through a number of lenses. They can be seen as tools to implement innovation policy regardless of the theoretical lens adopted. This view would be correct if one were to consider innovation parks as mere infrastructure – bricks-and-mortar buildings. However, the presence of institutions, interests and ideas all point to the presence of more complex structures beyond the physical infrastructural components. Institutions such as governance structures, (supra) national institutions such as multinational trade regimes, intellectual property rights (IPR) and constitutional divisions of power among multiple levels of government can have significant influence – directly and indirectly - on the outcomes of innovation parks and the broader innovation policy. These national, regional and local institutions also impact the behaviour of individuals that act across different organizational spheres. Institutional rigidities embedded across different organizations that partake in innovation parks can also lead to path dependency, whereby certain actions by specific actors or organizations may be preferred despite their sub-optimality. Similarly, interests manifest in various business organizations, start-ups, individual entrepreneurs and a myriad of bureaucrats at different levels of government that design and manage innovation policies and programs. At times, these interest groups may work together to achieve same goals; at others, their "interests" could clash, leading to a sub-optimal outcome in the absence of government or third-party intermediary. These interest groups can also exert significant political and economic influence to alter the decision-makers' paths.

Innovation parks also create the "local buzz" that help generate new ideas (for instance, knowledge-based economy) or rally convergence towards existing ideational frames (such as regional economic development). Alternatively, they can be considered micro-systems embedded within the broader national-regional/local-sectoral systems of innovation, which are meant to facilitate interactions between government, industry and academia – as modeled through the triple helix approach – leading to emergent layers of institutions, interests and ideas. In the following sections, I develop these arguments further to develop the 3-I framework and understand the interplay between institutions, interests and Ideas as they apply to rationales for government support for innovation parks.

2.6.1. Institutions

Institutions feature prominently in both the systems and triple helix approaches reviewed above. The key difference in the two approaches is the point of influence of institutions: in the systems approach, institutions influence the outcomes; triple helix views institutional development as the result of sociological interaction between different organizational spheres. Institutions comprise a key explanatory element in our analysis of innovation parks. It is therefore imperative to understand the concept in greater detail.

What exactly do we mean by 'institutions'? The concept of 'institutions' has been defined in many ways. Most commonly, however, institutions are considered to comprise of "sets of common habits, norms, routines, established practices, rules, or laws that regulate the relations and interactions between individuals, groups, and organizations" (Edquist, 2005, p. 188). Institutions are thus related to both 'culture' and 'organizations' - terms that are often used interchangeably with institutions. Culture, which is a local phenomenon, describes the "collective control of individual action [through] behavioural regularities and habits" (Johnson, 1992, p. 25). Generalized habits and routines – solidified over time – give rise to formal and informal institutions such as norms and rules (Johnson, 1992). Organizations can be considered a derivative of institutions. As such, they may be referred to as 'formal institutions'. Organizations that play an important role in the innovation process such as firms, universities and public agencies are all based upon or governed by formal institutions. Each of these has a formal set of rules and laws that govern their interactions within and across the organizational domain.

While institutions, culture, and organizations all influence the outcomes of social processes by regulating and influencing behaviour at the cognitive level, there are important distinctions to be made. For example, organization are formal structures whereas culture is informal; organizations are created with an explicit purpose whereas culture is often unconsciously created without an explicit purpose (Edquist, 2001) Institutions lie in between these two ends: they can be formal or informal, created sub-consciously to achieve a particular purpose (Johnson, 1992). Institutions differ from both in that they can be formal and informal; created sub-consciously but with a purpose. According to North (1990, p. 5), institutions establish “the rules of the game” carried out by the organizations which act as “the players in the game.”

Public policy and political science literature has given significant attention to the role of institutions and institutional change (see Moe, 2005; Pontusson, 1995; Simeon, 1976; Streeck & Thelen, 2005; Watts, 1998). In the context of innovation process, institutions serve a number of important functions. According to Johnson (1992, p. 27), the primary function of institutions is “informational signposting.” In performing this function, “institutions reduce uncertainties, coordinate the use of knowledge, mediate conflicts and provide incentive systems.” Thus, institutions act as a stabilisation mechanism for policy (Johnson, 1992).

Two characteristics of institutions, namely stability and path dependence, are vital for innovation processes. That institutions provide stability and are path dependent may appear contradictory and oxymoronic to the concept of innovation, which embodies change and novelty. This is not necessarily the case, however. Institutions may serve as important signals and provide pathways to change. From neo-institutional perspective (North, 1990, 1991), institutions reduce transaction costs by providing the information and reducing uncertainty regarding rules that define the actors’ behaviour.

According to Johnson (1992, p. 27), institutions provide the stability necessary for change. While innovation is often defined by “creative destruction” and images of chaos, it nonetheless follows certain routines. Institutions provide the informational signposts that make rapid progress and technological change a realistic possibility (Johnson, 1992). Institutions also define the behaviours and "habits of thoughts" of actors undertaking the different steps of innovation including scientific community (Johnson, 1992, p. 27). The institutional frameworks can also be "regarded as time saving devices which set free resources for more creative activities aiming at radical innovations" (Johnson, 1992, p. 27). Institutional routines thus enable the actors to take decisions concerning major technological innovations in a timely manner.

Institutional set up at any given point of time determines the type and nature of innovation possible (Pierson, 2000). A number of outcomes may be possible for any action that is taken at a particular point in time; however, once taken, the action "can be virtually impossible to reverse" (Pierson, 2000, p. 251). Thus, time is of great essence in establishing and changing the institutions. Institutions are tenacious by nature – they tend to stick around long enough to outlive their designers, social coalitions and external conditions that contributed to their formation. This characteristic enables institutions to respond to very different challenges and meet "diametrically opposed goals and ends" (Streeck & Thelen, 2005, p. 28). Thus as more time passes, institutions can change because of the changes in actors and problems and the resulting gaps (Streeck & Thelen, 2005). As such institutional path-dependence manifests in the innovation process as well. There are often tensions between incremental innovation along established trajectories and radical innovations. Institutional incentives, which can be positive or negative, may determine the path chosen and the subsequent paths possible. Patent laws, tax regimes, and rules concerning revenue sharing from commercialization activities are all important institutional incentives that influence the innovation process at any given point of time.

On the other hand, younger institutions – established more recently - may be more amenable to change. The options for different paths are limited over time due to the increasing returns of existing actions, or alternatively increasing costs of new actions. (Pierson, 2000; Streeck & Thelen, 2005). The point of establishment and the strategic choices of decision-makers at that time strongly influence, and limit, future choices and the path to be taken in the future. The meaning of institutions can be more easily established in the early period after its establishment than once a number of possible meanings have discarded through deliberations or strategic action (Streeck & Thelen, 2005, p. 30).

Institutional change, extensively theorized by Streeck and Thelen (2005), is also evident in innovation-related institutions. Like other policy areas, institutional change may be brought upon by endogenous (internal) or exogenous (external) forces. The latter is often initiated internally and facilitated by external macro-level forces. (Streeck & Thelen, 2005, p. 22). Institutional change in an innovation system may be driven by several factors – four, as theorized by Streeck and Thelen – including displacement, layering, drift and conversion. Often these factors may work in tandem across several institutions leading to institutional co-evolution (Malerba, 2002).

Institutions can change when new – alternative or rediscovered - institutions replace the old ones. Change brought about in this fashion is referred to as "displacement" (Streeck & Thelen, 2005, p. 20). Such change requires the actors working within the institutional contexts to "operate simultaneously in different institutional contexts" while being governed by different, and at times competing "behavioural logics" of decision-making (Streeck & Thelen, 2005, p. 21). This form of institutional change is thus what is envisioned by the Triple Helix model, whereby new institutional forms, often hybrid ones, displace the existing institutional norms and rules of academia, government and industry. The new institutional forms are often dependent on "cultivation by enterprising actors" – who act from within and require facilitative push from the government or other stakeholders to achieve the goal. (Streeck & Thelen, 2005, pp. 21–22).

The second method– referred to as "layering" – leads to institutional change when new institutional layers are added to the existing institutions (Streeck & Thelen, 2005, p. 24). The new layer is often introduced as a refinement or correction to the existing institution. Over time, however, the two layers grow differentially and the new layer eventually "crowds out or supplant the old system" (Streeck & Thelen, 2005, p. 24). In the context of innovation parks, the informal addition of applied R&D to universities' mission of pure R&D can over time lead to change in the R&D orientation of these post-secondary institutions.

Third, institutional change, as relevant to innovation parks, may be brought upon through "drift", whereby existing institutions drift away from their original intention due to lack of maintenance and updating (Streeck & Thelen, 2005, p. 24). This form of change is largely a function of implementation or enforcement of formal institutions.

Change by drift can be induced through decisions but more importantly non-decisions of those in-charge. The institutions can "decay" if they are not actively maintained (Streeck & Thelen, 2005, p. 25). In the context of innovation parks, such change may be brought upon by the lack of enforcement of formal contractual obligations such as lease deeds or memoranda of understanding between the university and the innovation park management.

Finally, institutions can change when instead of the changing the institution, the goals or functions of the institutions are change. This method of change is referred to as "conversion" (Streeck & Thelen, 2005, p. 26). Changes in broader economic, political or sociological contexts can necessitate change in the direction of institutional outcomes. It may also happen due to a shift in power relations or change in guard, whereby the original institutional designers have been replaced by new ones who may push the institution to align with their interests. In this case, the struggle to change the direction or goals of the existing institution often becomes a function of "political contestation". In such situations, the contesting actors tend to leverage the "gaps that exist by design or emerge over time between institutionalized rules and their local enactment" (Streeck & Thelen, 2005, p. 26). A change in leadership, either in political arenas or other organizations operating in the innovation milieu, can allow once marginalized actors to take centre stage and re-interpret the rules in their own interest. Often actors rendered marginal at one point may emerge to re-interpret the rules in their own interest (Streeck & Thelen, 2005, p. 26).

In addition to changing through inter-institutional interactions, institutions within an innovation system may also change as a result of their interactions with technologies as well as through intra-institutional learning, whereby actors from within the organization learn through policy feedbacks (Lundvall, 1992). There is, therefore, a co-evolution of institutions and technologies (Martin, 2010). While the systems approach presents a more stable and incremental notion of institutional change more in line with drift and conversion, triple helix approach envisions a much more unstable, dynamic, and radical model of institutional-technological co-evolutions. In the Triple Helix model, institutional domains are considered to be in a constant flux, resembling displacement and layering (see Etzkowitz & Leydesdorff (2000) for detailed description of Triple Helix). Policy feedbacks and learning play an important role in inter- and intra-institutional learning.

From a systems perspective, there are important linkages between national, regional, and sectoral level institutions. Empirical works have shown that national institutions exert significant influence on the innovative potential of sectoral and regional systems (see Philip Cooke, 2001; Malerba, 2002). However, regional and sectoral differences may alter the impacts of nationally (or internationally) defined intellectual property laws and regulations. The cross-country differences in national institutions, or the different 'varieties of capitalism' may also lead to different institutional outcomes (Malerba, 2002).

Institutions also play the important role in the "production, dissemination, translation and utilisation of knowledge" (Johnson, 1992, p. 27). Institutions are central to the transformation of raw information – which is held culturally – into more productive forms of knowledge. This function is carried out by institutions through the process of 'learning'. Systems approach contends that institutional factors are critical for all kinds of learning, more so for interactive learning. Institutions influence communication and interactions among actors, which lie at the root of interactive learning, at the intra- and inter-firm and national levels. At the intra-firm level, organizational structure and job training regimes are identified as the most important institutional factors (Freeman, 1987). At the regional or inter-firm level, institutions that enhance multi-directional linkages and other types of out-of-firms communication and cooperation are considered vital. Two such institutions, namely universities and science parks, have been highlighted in the clusters and RSI literature (for example, see Philip Cooke, 2001; Porter, 1998).

Institutions at the national level shape the overall knowledge infrastructure that is critical to the innovation system. As such two broad elements, namely educational infrastructure and intellectual property right regimes, are at the helm of national systems of innovation. Educational infrastructure, by shaping the theoretical and vocational training regimes, determines the *supply* of skills in various knowledge domains (Lam, 2000; Lundvall, 2007). Intellectual property rights (IPR), on the other hand, set out a number of rules that determine the material beneficiaries of a given technological innovation. These rules – including those that define ownership and transfer of technology, enforcement criteria and dispute resolution mechanisms – serve as the primary material "incentives for technological innovation" (Johnson, 1992, p. 37).

Even though the concept of institutions has become widely used, it is still somewhat under-theorized. As such no list of the institutions which need to be considered to analyze an innovation system exist. However, based on the review of theoretical approaches, we can identify four broad types of institutions considered important for innovation processes. These include: **markets, state, academia, and hybrid institutions**. Neo-classical approaches focus solely on market institutions; Systems Approach, especially the National Systems of Innovation (NSI) approach, places a strong emphasis on state institutions in addition to markets; earlier versions of triple helix approach established the importance of academic institutions; and the later versions of triple helix introduce the idea of hybrid institutions that form as a result of interplay between different institutional spheres.

Innovation Parks – and the related governance mechanisms – belong to the last category of institutions. The institutional elements of innovation parks emerge through an interaction between the academic, government and private sectors and co-evolve to give rise to various interests, ideas and new institutional regimes. At the macro-level, innovation parks represent a process of institutional change through displacement and layering, whereby governments introduce these instruments to shift the research model at public universities from pure research to applied research and promote greater university-industry collaborations. The underlying property arrangements – leases, ownership and management contracts – form the institutional building blocks of these parks. As will be shown in subsequent chapters, these institutional blocks, while significantly resistant, do evolve over time through cultural cross-fertilization across various organizational domains and can be characterized through both drift and conversion mechanisms discussed above.

The underlying public-private divide acts as a significant institutional impediment to successful development and operations in innovation parks and within innovation systems in general. In a previous study on public-private partnerships, this author (Munim, 2011) conducted an in-depth analysis of the problems that arise as a result of institutional differences including the "two-cultures" problem and rigid IP structures of the universities. These problems are also experienced by the innovation park community, given the multi-institutional affiliation of stakeholders involved and therefore it would be useful to discuss these institutional issues here.

Cultural differences, captured in the "two-culture" problem, are frequently discussed as impediments to collaboration across institutional domains (see Declercq, 1981; Drucker, 1979; Lee, 1996; Snow, 1960). As noted previously, culture is often defined as the "raw information" about practices, norms and rules that is possessed by any given organization (Munim, 2011). In essence then, the two-culture argument suggests that "the normative and attitudinal differences separating universities from industry are inexorable as they stand today and present barriers to close cooperation between them" (Lee, 1996, p. 845). In the context of innovation parks, the behavioural logics as well as beliefs and motives of the actors belonging to each of the key institutional spheres, namely the university, government and industry, are significantly different (Munim, 2011). While the governments have increasingly pressured universities to be "involved in regional economic development" through industry-academia collaboration, the older generation faculty members find this incompatible with the 'pure' research mandate of the universities (Lee 1996; Munim, 2011).

Whereas the university is governed by the "public research" mindset – whereby academic freedom and contribution to the public knowledge pool through peer-reviewed publications is considered important for academics, the private sector in a capitalist economy is governed by diametrically opposed motives (Munim, 2011). Bottom-lines and profit generation for shareholders is the strongest driving force for the private sector. In contrast to academia, the private sector highly values secrecy and confidentiality regarding their R&D activities in order to safeguard its trade secrets.

While some of these issues are institutionally embedded, lack of information and trust between stakeholders often exacerbates the cultural beliefs about the other institutional domain. For instance, as discussed by Munim (2011, p. 39), faculty members fear that collaboration with the industry can jeopardize academic freedom and quality of academic research as a result of shift in focus from pure to applied research. Such belief systems are culturally informed by notions of 'intellectual hierarchy' whereby applied research conducted to advance financial interests is considered inferior to pure research conducted largely to satisfy intellectual curiosity (Massey & Wield, 1992; Lee, 1996; Munim 2011).

The government is often expected to mediate and bridge the cultural differences across the two sectors. The underlying motivation for the political arm of the government is to demonstrate positive economic results of their policies that can help them get re-elected. Often the election cycles are specific and have limited time horizons. In this sense, accountability to the electorate and responsible management of taxpayer money is an important principle for the government, which often makes elected governments quite risk averse.

Another role ascribed to (or taken upon by) the government is filling the voids left by universities or the private sector – in the spirit of providing public good and correcting market failures. For instance, the government may undertake scientific R&D in its research facilities – often in collaboration with universities but also on its own (Doern et al., 2016). Similarly, the government may become a provider of venture capital for start-ups, buyer of innovative technologies, and/or marketer of technologies at national and international levels. The undertaking of academic and market functions create bureaucracies, which often give rise to principal-agent problems vis-à-vis the political/executive function of the government. The bureaucratic arm – which is often driven by the self-interested motivation of managerial expansion by devising and implementing government-controlled programs (Blais & Dion, 1990). This creates an inherent intrinsic conflict within the government that plays out with the cultural incompatibility of academia and the private sector.

Another factor studied by Munim (2011) and others (for example see Siegel, Veugelers, & Wright, 2007) is the incentive structure for the university faculty members. These go hand-in-hand with the IPR policies of the university which often influence the extent of industry-university collaborations. The traditional university compensation model often does not incentivize participation in entrepreneurial and commercialization activities. Rather the focus is on publishing articles in peer-reviewed journals (Munim, 2011). Lack of incentive structures, including both “pecuniary and non-pecuniary rewards such as salary increases, tenure, and promotion diminish faculty interest in contributing towards building research partnerships with the private sector or to commercialize inventions” (Siegel, Veugelers, & Wright, 2007, p. 390). University IP policies, which often require ownership of patents and intellectual property rights of technology by the university in contrast to ownership by the individual – further dampen the potential for university-industry collaboration (Munim, 2011).

The discussion here has demonstrated that institutions are an important pillar in our understanding of the policy rationale for innovation parks. Institutions shape the behaviours of individuals and can either facilitate or impede certain actions. They provide the necessary stability to manage the underlying uncertainty of the innovation processes. Reconciliation across organizational domains is often challenging due to the inherent path-dependent nature of the institutions. Nonetheless, mechanisms for institutional change provide an opportunity for hybrid organizations such as innovation parks to develop and function effectively over time.

2.6.2. Interests

Institutional approaches discussed above provide the context in which various players act and how they are linked to each through distribution of power among them (Pontusson, 1995). However, structural power relations are not always constant; rather, they can evolve with “variable interests” thus leading to institutional change (Pontusson, 1995). The political struggle or social conflict among powerful actors to advance their interests can result in the policy content of institutions. The desirability of these outcomes is often a function of initial power distribution and asymmetries among actors and their impact on institutional evolution (Bleich, 2002, p. 1058).

The bi-directional relationship between institutions and interests is a question of debate among scholars of public policy and political economy (for example see, Pontusson 1995; Steinmo 1989; Steinmo, Thelen and Longstreth, 1992). While existing institutional arrangements can lead to disproportional economic benefits for certain individuals or groups, these very institutional arrangements can be altered and realigned over time through changing interests and coalitions across actors (Pontusson 1995). The changing interests and alliances reflect the economic interests of the actors which are in turn determined by "market conditions" or "long-term changes in production technology" (Pontusson 1995, p. 141).

According to Simeon (1976), the distribution of power across the different interest groups and the struggles to alter these power dynamics is reflected in the policy outcomes. The distribution of power depends on how many interests – individual or organized – are involved, the intensity of the conflict, and the resources each can expend to gain influence over the final policy outcomes (Simeon, 1976, p. 568). When the degree of conflict is low and the power is distributed more widely or evenly, policy implementation is often carried out through voluntaristic instruments; on the other hand, high degrees of conflict with highly concentrated power often necessitate coercive measures (Simeon, 1976).

At the theoretical level, the political science literature also struggles to make linkages and distinctions between meso-level interest groups and macro-level class structures (Pontusson, 1995). Often these two concepts are conflated and used interchangeably. However, it is important to note that whereas class structures focus on the power distribution and conflicts at the state or supra-state level, the interest-group perspective focuses on smaller, organized and competing faction of larger classes – also termed as "class segments" (Winders, 2005). These interest-groups use their "instrumental" power to "influence state policy" through lobbying, information dissemination, political contributions, as well as from within the government through the bureaucratic arm (Winders, 2005, pp. 389–390). They may also leverage their "structural power" over capital and economic activity to advance their interests. While the instrumental power is more generalized across different institutional settings, structural power is better understood in the context of macro-level political-economic relations (Winders, 2005).

Interest groups often exercise and extend their instrumental and structural power by forming coalitions with other interest groups or class segments within and across economic sectors such as finance, agriculture, or industry (Winders, 2005). By forming "center coalitions, or power-blocs", these interest-groups define policy problems and establish their supremacy over weaker segments such as labour (Winders, 2005, p. 390). While political imperatives may drive these coalitions, often the stronger and longer-lasting coalitions are formed to advance economic interests (Winders, 2005). As noted earlier, these economic interests can change with changes in market conditions or long-term technological changes which result in shifting the dynamics of such coalitions.

A number of interest-groups may be of relevance in the context of innovation parks and the broader innovation policy. The three institutional domains, namely academia, industry and government, set grounds for heterogeneous bases of power to emerge (Bonaccorsi and Piccaluga, 1994; Munim, 2011). The university holds power over intellectual capital; industry exerts its power through physical capital; and the government holds political as well as financial leverage over stakeholders (Munim, 2011). Thus, each sphere may appear to be dependent on others to advance their interests. However, it may also be over-simplistic to consider that each domain has only one interest; rather, they have multiple interests which, at any given time, may overlap with interests of some stakeholders and contradict others' interests. These "perceived mutual dependencies" mask the cultural conflicts inherent in the institutional structures, which give rise to overall asymmetric power bases which may impede effective collaboration (Bonaccorsi & Piccaluga, 1994, p. 237).

The increased complexity of R&D – along with a shift towards applied R&D – means that faculty researchers have diminished control over their means of production as the scale of scientific instrumentation has increased (Etzkowitz, 1998). Diminished funding for public sector research organizations further shifts the balance towards the private sector, which may exercise the direction of R&D along with its control on the instrumentation and physical capital. The narrative of entrepreneurial scientist emerges as an attempt to shift some of the balance towards the researcher. Nonetheless, the power base of the researcher – and by extension the research organization – remains largely subordinate to the power base of the private sector.

Massey and Wield (1992) have utilized the Marxist lens to develop a similar argument in greater detail, based on their study of innovation parks in the United Kingdom. They provide a conceptualisation of "difference in particular divisions of labour within the scientific investigation," which interact with sectoral and spatial divisions of labour in a "mutually constitutive" or reinforcing manner. (Massey & Wield, 1992a, p. 15). According to this view, innovation parks – by their social, scientific and spatial construction – are based on notions of unequal, mutually constitutive difference. The authors suggest that the original foundations for the idea of innovation parks – derived from the United States – was empirically juxtaposed to be causally linked with the growth of the global high-tech industry. The empirical 'story' then evolved and spread, built on key components including "tales of entrepreneurial professors, the spawning of new companies as bright ideas dreamt up in academe found favour in the market place, and were turned into commercial successes" (Massey & Wield, 1992b, p. 18). These bright entrepreneurial scholars had further support from risk-taking venture capitalists who provided them funds for "inventing gadgets in garages" (Massey & Wield, 1992b, p. 18).

This particular narrative – while originally built upon the prevalent capitalist foundations of the economy - exploited the lack of capacity of the local industry to adopt novel production technologies. The industry was thus heavily reliant on its workers, which highlighted the underlying class tensions between the owners of human and physical capital. It benefited from the perceived or real disconnect between the ivory tower intelligentsia and the general publics. Accordingly, the former made major scientific breakthroughs with significant potential for application and for commercial success. However, this potential remained largely unfulfilled and therefore, the general populace, which funded this research and development in public institutions through their taxes, did not benefit from the returns from these breakthroughs (Massey & Wield, 1992b). This disdain found a particular window of opportunity with the dawn of new technological era in the mid-1980s when the neoliberal forces found particular political allies in the west – namely, Reagan, Thatcher, and Mulroney (Harvey, 2007; King & Wood, 1999).

According to this interpretation, the division of labour between producers of different types of knowledge can be mapped onto the class framework. The class location of scientists and technologists has been the focus of long debate. While the exact placement of scientific intelligentsia on the bourgeoisie-proletariat dimensions has been difficult for Marxist scholars, with many ascribing them to more dynamic multidimensional space – it nonetheless follows a certain hierarchical structure. The distinction between scientists and apprentices has always been a hallmark of class division and therefore may not merit much discussion (Massey & Wield, 1992b). The hierarchical divisions within scientific scholarship – based on types of education (pure versus applied; natural sciences versus engineering), types of jobs (self-employed versus semi-autonomous versus employed by public or private research institutions) and educational achievement (distinctions, scholarships and grants) have been a key source of social structuralizing of academic scientific inquiry (Massey & Wield, 1992b). Over the years, these distinctions developed into ownership of skills/credential assets. The ownership of these knowledge-based assets – highly biased towards the academic intelligentsia, as the argument goes – gave rise to the class relations within scientific research milieu (Massey & Wield, 1992a).

Many of these class divisions within academia are institutionalized through incentive structures – as discussed in the previous section. At a more meso-level, these divisions play out through different class segments or interest groups that form coalitions across three institutional domains. The changing political-economy landscape which has led to a greater reliance on collaboratively conducted applied R&D and increased pressures on universities to contribute toward regional economic growth have led to changes in the institutional context. The new hybrid institutional forms have come to define a new set of interest groups which have shifted power away from the traditional class segments. These shifts in power balance have also given rise to formation of new interest-groups and coalitions as well as additional grounds of conflict across institutional domains. Most important of these are the individuals and groups that maintain hold on information and knowledge across multiple organizations. I will discuss these in greater detail in the following chapters.

2.6.3. Ideas

Ideational explanations are the third pillar of policy analysis literature that are frequently employed to explain policy development and change (for detailed discussion on ideas and related concepts see Bleich, 2002; Hall, 1993; Kahneman & Tversky, 1986; Sabatier, 1987). The concept of ideas often refers to the fundamental notions of "world views, cultures, societal scripts, norms, models, an causal beliefs" that form the building blocks of institutional arrangements (Bleich, 2002, p. 1063). Ideas in their raw shape do not necessarily impact policy formation; rather, when they are arranged as "multidimensional sets of cognitive and moral maps," also known as "frames", they can be more easily integrated into policy development (Bleich, 2002, p. 1063). These frames provide the interpretive capacity to individuals and allow them to define problems, identify their own interests, and align their interests with policy directions based on "causal and normative judgements" (Bleich, 2002, p. 1063). As normative concepts, "frames are used by elites to legitimize programs to the public through processes such as transposition" (Campbell, 1998, p. 385).

Frames provide the cognitive sign-posts or heuristics in the form of "definitions, analogies, metaphors and symbols" that allow individuals to identify and interpret their actions (Bleich, 2002, p. 1064). More importantly, they provide the normative assessments of what is legitimate and appropriate in different social situations (Bleich, 2002). Over time, the frames evolve which prompt changes in policy content. However, existing policy frames continue to influence policy direction as new policy directions are chosen based on the assessed implications of these existing frames (Bleich, 2002). The evolution of policy frames is largely dictated by changes in the "public sentiment" which may refer to collective values and opinions; however, in many cases, certain symbols and rhetoric may be mobilized by the policy-makers to align the frame with the "prevailing public mood" (Campbell, 1998, pp. 394–395). This was the case, as Hall (1993) noted, in Britain and elsewhere, where policy makers mobilized neo-liberal ideas to gain support for their retrenchment policies. The neo-liberal frame comprising of certain values and propositions aligned well with the changing public mood that was affected by the downturn in economic fortunes in the 1970s and 1980s. Thus, congruence of frames across the wide range of actors and stakeholders is important to the successful development and implementation of a policy.

When studying innovation parks – one realizes the importance of congruence in cognitive frames of individuals belonging to different institutional structures. The different cultures of universities, industry and government lead to diverging frames that are used to identify and interpret problems. As noted by Munim (2011), risk perceptions differ significantly across the three sectors. Therefore, individuals from university and government may be perceived to be slow in responding to social challenges. In these situations, there may be significant challenges in developing common understanding of goals and trust among potential collaborators. Yet there is an expectation that adoption of common frames can be developed – either through institutional imposition or through bottom-up integration of individuals, who work in close proximity and often have the benefit of face-to-face interactions with others within the confines of the physical space that is the innovation park. Cognitive and institutional processes of learning and knowledge transfer play an important role in ensuring such congruence in ideas.

2.6.3.1. Learning and Transfer

Learning and transfer are central to ideational convergence. Theories of policy learning and transfer (for example see Bennett, 1991; Bennett & Howlett, 1992; Stone, 1999) highlight the different structural and agency-based processes involved in voluntary as well as involuntary adoption or adaptation of policies, institutions, ideologies and ideas from other international or domestic jurisdictions. It is a dynamic whereby knowledge about policy goals, content, instruments and outcomes from particular time periods and jurisdictions is used to inform the development and implementation of policies, administrative arrangements and institutions in different temporal or spatial settings (Stone 1999, p. 51).

At this point another concept, *learning*, deserves some attention as it applies to the study of innovation and innovation parks. Learning serves as the bridge between information and knowledge. It also links knowledge to institutions in a complex yet concrete manner. Learning refers to the cognitive processes through which information is translated into a stock of knowledge and also how existing knowledge paradigms are replaced with new and more relevant knowledge paradigms. At least four different kinds of learning have been identified, all of which are a function of social interactions between actors and players within the system. On an increasing scale of interaction, these are: imprinting, rote learning, learning by feedback and searching (Johnson, 1992). Other terms such as “learning-by-doing,” “learning-by-using,” and “learning-by-interacting” are also used in the literature (Arrow, 1962; Lundvall, 1992; Malerba, 2002).

In the complex, knowledge-based economies, innovation is increasingly associated with systematic searching for new knowledge. Consequently, there is a need for a consistent dialogue and continuous interaction and communication between actors with different kinds of knowledge including the "know-what, know-how, know-why, and know-who" (Phillips, 2007). It is through such active search for new knowledge that new combinations of knowledge are produced that ultimately lead to innovation. Johnson (1992) has identified two such kinds of organised searching. One is "learning-by-producing" which is driven by market imperatives; the other is "learning-by-exploring" which aligns with the basic research logic of universities (Johnson, 1992, p. 32-33). A combination of these two types of organised learning, also referred to as 'interactive-learning' is considered to be the fundamental driver of innovation.

It is important to note at this point that while systems approach acknowledges the role of interactive learning within an institutional context, NSI and RSI scholars continue to maintain a strong focus on learning that occurs within institutional silos. Systems approach conceives of knowledge generation in the "Mode 1 variant" (Gibbons et al., 1994), whereby each of the institutional domain (state, firms, academia, and civil sector) are responsible for producing and governing only certain types of knowledge (see table 2.4). Even though there is, theoretically, cross cultivation of knowledge through interaction and communication across institutional domains, such interactions do not radically challenge the institutional structures. They only influence established institutional design in an incremental manner. Institutional rigidity, in the case of innovation parks, is evident in the intellectual property rights regimes of the academic organizations, as well as cultural expectations – manifest as soft institutional signals – of the public, private and academic organizations involved in the development and operation of innovation parks.

The explanations of cluster formation ascribe a central role to knowledge, particularly tacit knowledge, and learning processes (Wolfe & Gertler, 2004). However, the knowledge flows are not confined to local or regional levels; rather knowledge can be disseminated at national and international levels as well. Thus, knowledge transmission across spatial levels creates a "more complex knowledge chain" whereby local knowledge may be only one element in the cluster. Knowledge flows within and across the cluster are often a combination of both local and global sources (Wolfe & Gertler, 2003, p. 22). Successful clusters effectively leverage knowledge from a variety of global sources while also building capacity to implement this knowledge in a local context (Wolfe & Gertler, 2004, p. 1077).

Table 2.3. Characteristics of Mode 1 and Mode 2 Knowledge

	Mode 1 (Traditional)	Mode 2 (New)
Problem set and generated in	Disciplinary Communities	Trans-disciplinary economic and social context
Nature of communities	Homogeneous	Diverse & Heterogeneous
Organizational structural	Stable Hierarchies	Transient Heterarchies
Type of Quality Control	Peer review judgements about the contributions made by individuals	Temporary, heterogeneous sets of practitioners, collaborating in special and localized contexts

Source: Table reprinted from (Gibbons et al., 1994).

Bathelt, Malmberg and Maskell (2004) have differentiated between knowledge-based clusters that create local "buzz" versus those that act as global "pipelines." "Buzz" refers to "the learning processes taking place among [physically co-located] actors from the same industry" whereas "pipelines" refer to the process of attaining knowledge through sources "located outside the local milieu" (Bathelt, Malmberg, & Maskell, 2004, p. 35). These pipelines are, therefore, responsible for important knowledge flows, with their effectiveness maximized through the "quality of trust that exists between the firms in the different nodes" (Wolfe and Gertler 2003, p. 1078). A combination of buzz and pipelines is important for comprehensive knowledge flows, with their effectiveness maximized through "quality of trust that exists between the firms in the different nodes" (Wolfe & Gertler, 2004, p. 1078).

Several local and international organizations have played an important role in convergence around a set of common principles that define the global discourse on innovation. There is ample evidence in the academic literature that points to policy convergence across different spatial and sectoral levels that has taken place through transnational organizations such as the Organization for Economic Co-Operation and Development (OECD) and World Trade Organization (WTO) (for example, see Daniele Archibugi & Immarino, 2002; Danniele Archibugi & Michie, 1995; Hotz-Hart, 2003; McBride & McNutt, 2007; McBride, McNutt, & Williams, 2007; Narula, 2014). Similarly, the literature on policy communities and epistemic networks (Haas, 1992; Rhodes & Marsh, 1992; Sabatier, 1987) highlight the role of transnational networks in acting as channels of transfer.

An important aspect in the case of policy learning and transfer is the distinction between evidence-based “adaptation “and “adoption.” Bennett (1991, p. 220) refers to this distinction as “emulation” and “diffusion” – the former referring to evidence-based uptake of policies whereas diffusion refers to adoption of policies without adaptation or lesson learning. According to Stone (1999), policy transfer ideally requires decisions-makers to use in-depth data to evaluate and compare policy lessons across different jurisdictions and time periods. However, such rational evaluation is often constrained due to the non-transferability or tacit nature of knowledge. Certain forms of knowledge – such as tacit knowledge – practices and policies are highly specific to given spatial or temporal contexts and cannot be transferred. Such instances can create implementation problems and “policy failures with sub-optimal outcomes” (Stone, 1999, p. 54).

These theoretical underpinnings of learning and knowledge transfer are thus important in the context of innovation parks for a number of reasons. First, as I argued in the preceding section, learning and knowledge transfer enable convergence of ideational frames at the macro level. Enabled by global and transnational organizations such as the OECD and AURP, over time a common understanding has developed around “knowledge-based economy” and government’s role within it. Second, at the meso- and micro-level, it enables the actors within Innovation Parks to learn about each other’s institutional frameworks – for example, academic entrepreneurs come to realize the expectations of the private sector and vice versa. Thus, innovation parks facilitate transfer of tacit knowledge. The cross-fertilization and exchange of individuals creates the “local buzz” which facilitates generation and transfer of Mode 2 knowledge. Often this local buzz creates heuristic behavioural models for innovation park stakeholders that centre on success stories in certain jurisdictions and desire to adopt rather than adapt the practices resulting in those outcomes elsewhere.

2.7. 3-I Rationale for Public Policy Intervention in Innovation Parks

Taken holistically, institutions, interests and ideas interact in complex ways to shape a certain policy or give form to a particular policy instrument. According to Atkinson-Grosjean (2006, p. 40), these “three mutually interacting influences shape and constrain policy formation” by acting as “gatekeepers to the process of agenda setting.” In his analysis of economic policymaking in Britain, Hall (1993, p. 289) suggests that actors influence policy through their ideas (referred to as “puzzling”) as well as their power (referred to as “powering”). Combination of ideas and power is instrumental in institutional change as the competition for power can also lead to new ideas through “social learning” (Hall, 1993, p. 289)

As Hall (1993, p. 289) has argued, interest groups cannot affect the outcomes of state-society relations only through the “pressures” they exert. Rather, ideas also play an important role in influencing the state-society relations through social learning. Key individuals involved in policy formation – including politicians, bureaucrats and policy practitioners – learn from the current political discourse which legitimizes certain interests over others (Hall, 1993, p. 289). The ideas embedded in the discourse also “delineate the accepted boundaries of state action,” create links between current developments and “particular interpretations of national history,” and extend specific understandings and interpretations of policy problems (Hall, 1993, p. 289). Thus, ideas and social learning allow interest groups to gain power in addition to exerting it (Hall, 1993, p. 290).

Ideas exert a similar influence on the developments of policy paradigms as embodied by institutions. Hall (1993, p. 290) argues that ideas and institutions reinforce each other as institutional routines are a reflection of dominant normative ideas of what can or cannot be done. Similarly, ideas can also shape actors' preferences and allow them to tackle most pressing problems (Bleich, 2002). Importantly, ideas also allow the marginalized groups, in addition to powerful advocacy groups and state institutions, to influence policy formation over time (Bleich, 2002). The framing of policy issues provides the cognitive and moral legitimacy to policy ideas and ties them to the interest groups' preferences. However, it is important to note that ideas often provide broad generalizations regarding policy orientations and cannot alone provide granular details regarding policy development, implementation and change (Simeon, 1976). We need to understand their interplay with institutional and interest-group structures to understand the policy issues in a holistic manner.

Similarly, institutional trajectories create path-dependent lock-ins which in turn institutionalize interests and ideas. In an attempt to reduce uncertainty through routines and formal rules (such as IPR), institutions create rigidities that create conflicts across ideas and interests over time. Change can be brought upon these institutionalized elements through one of the four mechanisms, namely displacement, layering, drift, and conversion, discussed in section 2.6. 1. Nonetheless, the institutional inertia often shapes the landscape where interests and ideas play out – leading to a virtuous cycle of interdependency between institutions, interests and ideas which provide unique rationales for government policy interventions.

Although the theoretical approaches reviewed in this chapter differ in their rationales, they nonetheless ascribe some role for public policy and state intervention in the innovation processes. In this regard, we can differentiate between three types of policies: “science policy,” “technology policy,” and “innovation policy” (Lundvall & Borras, 2005). Each of these policies serves different, yet related, purposes and utilizes different instruments to achieve these goals. Often the science and technology policy are considered to be the same; however, there are some subtle differences across the two domains. For example, the focus of science policy is largely on the production of scientific knowledge and some of the most commonly used instruments in this policy are public research funds, tax incentives to firms, higher education and intellectual property rights. Technology policy, which is somewhat broader than science policy, focuses on the advancement and commercialization of sectoral technical knowledge. It achieves these goals through public procurement, public aid to strategic sectors, employment and skills training, standardization, and providing performance metrics for industrial sectors. Innovation policy, which is an amalgam of science and technology policies, aims at the overall innovative performance of the economy. To this end, it seeks to draw synergies across industrial policies including corporate law, competition regulation, consumer protection and leverage policies in other areas including education, labour, and environment (Lundvall & Borras, 2005).

Regardless of the characterization of the policy domain, two conditions have to be met for government intervention: One is the existence of systemic problems and second is the ability of public actors to solve or mitigate the problems (Chaminade & Edquist, 2010). Innovation policy, like other policy areas, is not neutral; rather it represents a political process which entails negotiating and power brokerage between interest groups, dominant ideas and political institutions and organizations. All of these factors compound the fact that innovation in itself is a complex process. It is therefore important to understand the political as well as economic and sociological dynamics that are captured in the innovation process. At the input level, innovation policy may be constrained by financial and human resource constraints. Moreover, in the case of innovation parks, government support and intervention are motivated by macro and micro institutional constraints, conflicting interests, and ideas that shape the broad discourse. The interplay of the 3-I elements creates multidimensional tensions and impediments – leading to systemic problems that necessitate government intervention. Some of these countervailing 3-I forces that provide the rationales for government intervention and support for innovation parks are outlined in Table 2.4.

Table 2.4. 3-I elements of Innovation Parks

3-I Element	Sub-element	Examples
Institutions	Formal Institutions	- Leases; - Planning documents; - Annual reports
	Informal Institutions	- Organizational Cultures
	Political Institutions	- Levels of government (national and subnational)
	Academic Institutions	- Incentives for pure and applied research
	Hybrid Institutions	- Governance mechanisms – Rules governing innovation parks
Interests	Individual actors	- Academics; - University Administrators; - Entrepreneurs; - Government Bureaucrats; - Tenants of innovation parks; - Innovation Park Managers
	Organizational actors	- AURP; - Civic Organizations – Farmers' association - Industry organizations: Real Estate and Construction consortia; - Bridge organizations (Incubators):
Ideas	Political ideologies	- Marxism/Keynesianism; - (neo) Liberalism
	Dominant discourse	- Knowledge-based economies; - Economic development; - Competitiveness
	Ideational convergence (Policy Learning and Transfer)	- International Organizations e.g. OECD, WTO; - National organizations e.g. AURP; - Personnel Exchange and Networks

At the macro-level, government intervention to establish innovation parks is an attempt to steer academic institutions towards applied research. Motivated by the macro-level neo-liberal discourse, governments are increasingly interested in "value-for-money" for their investments in post-secondary institutions. Governments are also struggling with budgetary constraints – forcing them to reduce spending on public research and grants to universities. There is a strong desire to commercialize university research, promote applied research and facilitate university-industry collaboration. In this context, innovation parks are an instrument for institutional change – through layering and displacement. They are meant as hybrid institutions at the margins of academia, industry and government that enhance the salience of private institutions and facilitate retrenchment of public institutions.

Doern, Castle and Phillips (2013) argue that as a result of the increasingly complex nature of innovation processes within the knowledge-based economy, government policies can no longer be formulated to achieve deterministic outcomes. Rather governments are constrained to devise “strategies” to foster collaboration and develop “networks of interaction” (Doern et al., 2013, p. 22). These notions of limited government involvement have been further strengthened by the ideas of new-public management including value-for-money, “steering-not-rowing” and alternative service delivery models (Yescombe, 2011; Zussman, 2002). The non-linear nature of innovation networks implies that it is inherently a complex process, with emergent properties that cannot be foresighted by any government policy. Governments’ attempts to intervene directly in innovation domains often leads to the “proverbial sin” of “picking winners” – with rather poor outcomes due to the complex, emergent nature of innovation process (Doern et al., 2013, p. 22). Consequently, government intervention in the S&T policy domain has been on the decline. Nonetheless, the governments remain involved – albeit somewhat removed from the actual processes, as discussed above. In the case of innovation parks, government involvement may be largely driven by gaps in private sector involvement and investments in the innovation park enterprise. As Massey and Wield (1992b, p. 250) note, “universities vary widely in their financial endowments and private sector investment in innovation parks may be confined to a limited and highly defined parts of the country that offer high returns on investment, lower risk, prestige and status.” Regions with lower yields on real estate can experience significantly lower private sector investments in the infrastructure. This provides an ‘ideal case’ for public-private mixture, whereby the public sector (government) subsidizes production by providing premises at rents which make them uneconomic from a property point of view (Massey & Wield, 1992b).

Another variation of public-private interface in innovation parks is where the public-sector steps into wade off private sector fears and conservativeness. The ‘subsidy’ which is involved in this case is simply that of opportunity costs potentially forgone. In such cases, the public sector may provide a commercially viable product which, because of the nature of the investment (the perceived riskiness of innovation parks due to the possibility that many of its start-up tenants may fail and unable to pay the rent) and its geographical location, the private sector fails to provide. These subsidies may often be extended in the form of lower rents to start-ups and providing easier access to venture capital. Finally, and perhaps more commonly, public sector may turn the innovation park into a development which the private sector will invest in. In this case, the public sector is effectively subsidising private capital to make profits out of property development, so that sites can be provided for production (Massey & Wield, 1992b, pp. 254–255). In the next chapter, I delve into a detailed analysis of how these 3-I dynamics interface with each other in the Canadian case, followed by their application to the three case studies in later chapters.

3. Innovation Parks in Canada

The development of Innovation Parks in Canada is a relatively new phenomenon – the early park developments appeared in the late 1970s and early to mid- 1980s. Over the years, Innovation Parks have become a significant component of the research and innovation infrastructure in Canada (AURP, 2013, p. 6). Innovation parks promote collaboration and innovation by bringing together actors from university, industry and government in pursuit of pure and applied R&D as well as incubation and commercialization. They act as a catalyst in the commercialization process by helping the formation of new knowledge-based companies and helping those companies transform into significant contributors to regional economic growth (AURP, 2013, p. 6).

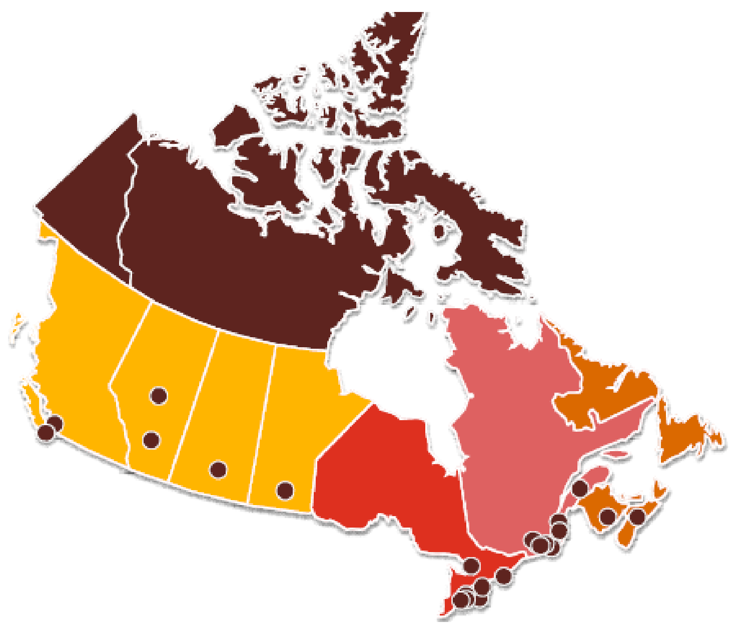
At present, according to AURP, there are 21 Innovation Parks in Canada which are regionally disbursed across all four regions namely, Atlantic, Western Canada, Prairies and Central Canada (see Table 3.1 below). Innovation parks are located in every province with majority of them in large urban centres in Southern Ontario and around the Montreal-Quebec City area (Association of University of Research Parks, 2013, p. 3). According to a study by Shearmur & Doloreux (2000) – one of the seminal studies on innovation parks in Canada – Canadian Innovation Parks tend to be located within a Census Metropolitan Area (CMA) [urban regions with population greater than 100,000 people] which points to their high-tech focus. Moreover, majority of the innovation parks are located in areas with populations greater than 350,000 (Shearmur & Doloreux, 2000, p. 1075).

Table 3.1. Regional Spread of Innovation Parks in Canada

Region	**Number of Parks**	**Percentage**
Atlantic	2	9
Central –Quebec	5	24
Central – Ontario	8	38
Western	6	29
Total	**21**	**100**

Source: Author's compilation based on Association of University Research Parks Canada, 2013

Figure 3.1. Location of University Innovation Parks in Canada



Source: Reprinted from AURP, 2013, p. 4.

In this chapter, I will situate the innovation parks in the context of broader Canadian S&T and innovation/industrial policy. The chapter will also situate the innovation parks within the 3-I framework developed in the previous chapter.

3.1. Innovation Parks in the context of Canadian S&T and Innovation Policy

Innovation parks are directly and indirectly linked to the evolution of S&T and innovation policy in Canada. Whether we consider the innovation parks to be an implementation tool for the innovation policy or as a component of the policy itself, the historical changes in policy on basic and industrial R&D have driven the shifts in focus on innovation parks. In this section, I present a brief overview of Canadian S&T and innovation/industrial policy in an attempt to decipher how innovation parks gained prominence within the policy discourse in Canada.

Innovation Parks gained prominence in the 1970s and 1980s – an era which saw considerable shifts in federal and provincial S&T policy landscape. Canadian S&T policy until then was largely defined by active government involvement in the S&T – National Research Council (NRC) was the central organization that carried out basic and applied R&D to advance Canada's national goals. The focus during this time was on the promotion of local technological development capacities – following a Canadian-specific version of American Fordism. According to Smardon (2014), this paradigm led to a specific trajectory of dependent technological development in Canada. Whereas the American industry had been able to fulfill state's R&D needs, Canadian industry lacked the capacity to undertake such large scale R&D due to their "reliance on U.S. technological practices in earlier period of Fordism" (Smardon, 2014, p. 130).

Canadian Fordism transcended into Canadian Keynesianism in the Post-World War era whereby the practices of reliance on the American Foreign Direct Investment and technological capabilities continued in to the 1960s (Smardon, 2014, p. 135). Canadian industry continued to experience technological disadvantages which transcended into Canadian labour relations in the form of higher wages and rigid bargaining stance by the organized labour (Smardon, 2014, p. 179).

It was under Pearson Liberal government (1963-68) that undertook the development of a broader and more explicit federal science policy than was developed by the National Research Council (Doern et al., 2016, p. 55). Federal R&D policy was premised on a state-centred understanding of the problem of low industrial R&D (Smardon, 2014, p. 263). The federal Liberals were, however, not prepared to challenge the dominance of American capital in the Canadian economy throughout the 1960s and 1970s. Instead the focus of the government remained on carrying out R&D through its science laboratories to support the industry (Smardon, 2014; Doern et al. 2016).

In the 1970s, P.E. Trudeau's Liberal government (1968-79) led the development of a coherent federal S&T policy. The focus of this policy shifted considerably from the earlier periods. This shift was reflected in the Lamontagne Report, which focused on shifting R&D responsibilities to the industry and diluting federal government's influence in the S&T domain (Doern et al., 2016, p. 55). According to McFetridge (1981, p. 255 cited in Doern et al., 2016, p. 55), a number of agencies designed to direct, coordinate, and evaluate federal scientific activity began emerging in the 1970s. The Liberal government undertook a comprehensive review of its R&D incentive programs in 1972 in order to better align these programs with the private sector's needs and therefore promote greater innovation in the private sector. Among other policy areas, the review was the first conducted by the federal government that looked closely at the patenting and licensing practices (Doern et al., 2016, p. 56).

Several tax incentives including the Scientific Research Tax Credit (SRTC) were introduced in the 1980s by the Liberals. A new Office of Industrial Innovation was also created to increase the use of micro-electronic technology. This accompanied an overall increase in expenditures on research and development to 1.5 percent of the value of the Gross National Product (Doern et al., 2016, p. 56). The Mulroney Conservative government (1984 – 93) offered and intermittently expressed S&T and innovation agenda that included abolishing SRTC in 1985. It was replaced with the Scientific Research and Experimental Development Tax Credit (SR&ED), which was intended to be especially favourable to smaller Canadian R&D firms without taxable revenue by enabling them to receive refundable tax credit payments for outlays for "experimental development" (Doern et al., 2016, p. 57).

The Mulroney government was also involved in negotiating new energy and trade accords including the Canada-US Free Trade Agreement (CUFTA) and North American Free Trade Agreement (NAFTA). These agreements would prove significant in shaping the S&T future of Canada on the lines more closely aligned with the United States than ever before. These trade agreements led to Canadian transnationals to establish R&D facilities in the United States rather than in Canada and led to a large increase in Canadian foreign direct investment (FDI) into the United States, much of it in manufacturing

(Smardon, 2014, pp. 182–183). The free trade agreements thus further accentuated Canadian subsidiaries' dependence on their parent corporations' in making R&D and investment decisions (Smardon, 2014, p. 188).

When the Conservatives came into power in 1984 under Brian Mulroney's leadership, they used their first Speech from the Throne to announce a "four-point program" to support the S&T and education domains (Doern et al., 2016, p. 59). As part of this program, the National Advisory Board on Science and Technology (NABST) was formed with the mandate to introduce a more market and industry-based approach to the S&T domain. Majority of its committees were comprised of advisors from the private sector (Doern et al., 2016, p. 59). Around the same time, the Task Force on Federal Policies and Programs released its report – also known as the Wright Report – which lamented the weak relations between the federal government laboratories and industry. The government used the findings of this report as the basis to merge the Ministry of Science and Technology (MOSST) with a number of other regional economic development agencies to form the new Department of Industry, Science and Technology Canada (ISTC) (Doern et al., 2016, p. 59). ISTC's creation signaled the intention of the government to shift its pure R&D focus towards applied R&D by transferring the R&D responsibilities from its laboratories to the private sector.

A new set of programs was established in 1987-88 within ISTC including Sector Campaigns; Strategic Technologies; and Microelectronics and Systems Development. While these programs maintained a subsidy component, they were much more oriented toward providing information and advice to firms that were interested in forming technological networks, such as pre-competitive research consortia (Smardon, 2014, p. 448). Moreover, the programs moved away from "single company grants" to funding tied to collaborative alliances and networks across a broad range of actors (Smardon, 2014, p. 448). These changes in federal suite of innovation programming were, in large part, led by the bureaucratic cadre of the government who were closely monitoring policy shifts in other parts of the world particularly in the United States.

Networks of Centres of Excellence (NCE)

The most substantive impact of Mulroney-era innovation-policy development came in the form of the Networks of Centres of Excellence (NCE). The NCE may be considered a precursor to the widespread development of innovation parks in the following years. According to Atkinson-Grosjean (2006, p. 24), the NCE represented the "most dramatic change in Canadian science policy since the [NRC] was established in 1916." While some Centres of Excellence were established under Trudeau Liberals, the program was formally launched under the Mulroney Conservatives in 1988 (Doern et al., 2016; Smardon, 2014). The NCEs were intended to "promote greater technological networks and collaboration" in the academic sphere by providing "an internationally competitive environment for Canadian researchers and students to work together with industry and accelerate the exchange of knowledge and new technology to the private sector" (Networks of Centres of Excellence Canada 2004, p.4). The NCE program marked a "significant cultural shift" in policy thinking around S&T and innovation that also transcended the research community which aligned itself behind the new paradigm (Networks of Centres of Excellence Canada 2004, p.4).

The NCE program was based on the notion that university research needed to be linked to a market-based logic by increasing the role of universities in the commercialization of knowledge. It was established to remove the perceived isolation of university R&D from the private sector – or in other words to bring the researchers out of the “ivory tower” and connect them with the realities of commercialization in the market (Smardon, 2014, p. 450) A central criteria for network selection was thus based on the degree of linkages and networking with the private sector and the relevance of the projects to future industrial competitiveness (Smardon, 2014, p. 451).

The program represented a significant attempt to include the public universities in the shifting S&T discourse and wider trends in public administration that emphasized either the movement of public sector, or greater coordination with private capital through public sector “partnerships” with private sector organizations. The federal bureaucracy and science community had long been subject to the neoliberal politics; with the NCE, the University domain was brought into this sphere as well. According to Atkinson-Grosjean (2006, p. 83), the decision to embark on the NCE program was made in an ideological climate that promoted the outright privatization of the public-sector functions.

It can be argued that NCE program during the Mulroney government set the stage for a widespread adoption of the university-industry-government nexus in the realm of R&D and innovation. It also acted as a precursor to a large-scale drive towards building collaborative spaces in the form of innovation parks that would facilitate the collaboration across the three institutional spheres. However, the innovation parks became a central innovation policy instrument during the second mandate of Chrétien Liberals (1993-

2003), when the NCE program came to its decennial anniversary and it was realized that co-locating would be needed to realize the collaborative potential of the Centres of Excellence.

The Liberal governments from 1993 to 2006 undertook a number of measures to further the partnerships between universities, research institutions and the private sector including the establishment of Canada Investment Fund and the Canada Foundation for Innovation (CFI). These measures were part of the “knowledge and creativity” discourse that intended to develop a leading edge national innovation system (Doern et al., 2016, pp. 61–62). The Chrétien-Martin Liberal governments leveraged this discourse to re-pack the economic development agenda under the “combined rubric of innovation strategies, knowledge infrastructure and strategic investments in network activities” that form the basis of NCEs and Innovation parks (Doern et al., 2016, pp. 62).

The period defined by Mulroney Conservatives (1984-93) and Chretien-Martin Liberals (1993-2006) experienced an explosion of innovation parks across the country. Of the 21 innovations parks now established in the country, approximately 80% were developed during this period. These parks reflected the broad movement in the Canadian S&T policy discourse that relied heavily on the industry-government-academia linkages over time. Innovation parks – in the same spirit as the NCEs – institutionalized these linkages. As will be shown in the later chapters, these parks were intended to facilitate the university-industry-government linkages and act as spaces to encourage collaborative activities across the three domains to promote innovation and economic development.

The interest in innovation parks began to disappear during the Harper Conservative government (2006-15). As a matter of fact, the entire S&T policy took a backstage in the Conservative government agenda from 2006 to 2015, with the government focused largely on economic recovery and employment growth in the aftermath of the 2008-09 recession. Any focus on innovation policy – as noted in its 2013 Speech for Throne and the subsequent Science, Technology, and Innovation Strategy – was on "making targeted investments in science and innovation chains from laboratory to market" (Doern et al., 2016, p. 64).

The story of Canadian S&T-innovation policy has thus far focused on the federal government. The other piece of the puzzle is the considerable breadth of policies at the provincial level, which attempt to fill the overall void left due to the lack of an integrated national innovation policy. However, the federal government and provincial governments have acted in largely uncoordinated ways to tackle the varied aspects of innovation. Provincial governments – acting independently of federal oversight in this area – have developed their own "broad mix of [innovation-related] policies administered through an equally broad range of departments and agencies" (Creutzberg, 2013, p. 105). As will be shown in the following chapters, some provinces have played a much larger role in supporting innovation parks as a policy instrument. For instance, Saskatchewan Innovation Park operates as a provincial crown corporation.

Canada's innovation policy operates in the context of federalism, with a myriad of federal and provincial departments and agencies holding direct or indirect mandates for innovation. These departments and agencies operate in tandem with a number of organizations that facilitate networks within and across the innovation parks. Federalism, along with interest groups and the overarching ideas of knowledge-based economy and economic development provide the rationale for innovation parks. In the following sections, I present the 3-I analysis of innovation parks in the Canadian context – as related to the above policy discussion.

3.2. Institutions - Federalism, Multi-level Governance

Canada being a federal country means that different levels of government have defined jurisdictional responsibilities for various policy fields. The written constitution delineates these responsibilities across national and sub-national levels of government. In addition, there are also non-codified 'norms' that shape the practices of political institutions. From an institutional point of view, federalism has significant impacts on the development and implementation of various policies – including innovation, economic development and S&T policies – in the country. The Canadian federal system gives rise to important intergovernmental dynamics among national and sub-national levels of government. These dynamics influence various dimensions of policy including scope, implementation and coordination across many areas (Garcea & Pontikes, 2004, p. 333). .

Policy development across different levels of government brings about particular challenges of coordination and negotiations. (Salazar & Holbrook, 2007). According to Watts (1998), federal systems give rise to complex intergovernmental relations because each level of government has its defined jurisdiction and is not hierarchically inferior or superior to the other level. Moreover, the "overlap and interdependence" between the different levels of governments in regards to "the exercise of their constitutional powers" necessitates significant "intergovernmental consultation, cooperation and coordination" (Watts, 1998, p. 129). Presence of multiple "veto points," particularly in cases where unanimous consensus is required, makes policy innovation more difficult. It also limits the scope of government to act under various situations. Simeon (1976, p. 575) contends that multiplicity of veto points necessitates use of "consensual and voluntarist means" which in turn leads to more distributive rather than redistributive policies. (Simeon, 1976).

In Canada, from the constitutional perspective, provinces are the only recognized level of sub-national government in relation to the federal government; municipal institutions are completely under provincial jurisdiction. The constitution sets out jurisdictional division of powers for both the federal and provincial governments with 16 specific enumerated powers given to the provinces and 29 federal powers. For instance, the federal government is responsible for patents and copyright policies, whereas the provincial government is responsible for education (for a complete list of constitutionally defined areas, see Government of Canada, 2017). Moreover, the constitution also assigns residual powers to the federal government through section 91. Essentially, this means that the federal government has jurisdiction over those areas that are not explicitly enumerated in the Constitution. However, there are several policy areas such as health and environment that have not been identified and assigned to any order of government in the *Constitution Act*, 1867 (Government of Canada, 2017a). The jurisdictional ambiguity on these issues has been resolved by the courts on a case-by-case basis (Government of Canada, 2017). Similarly, innovation, science and technology and industry policies also fall into this last category whereby jurisdiction is ascribed to both federal and provincial governments due to their horizontal nature.

Federalism in Canada leads to somewhat chaotic policy process wrought with distrust and coordination problems. According to Howlett and Lindquist (2007), these issues have worsened since the 1990s when the federal government unilaterally reduced transfer payments to the provinces and moved away from the tradition of cost-sharing. Moreover, provinces have become more vocal in demanding greater policy autonomy and greater share in the federal fiscal coffers (Good, 2007; MacKinnon, 2003). According to Dunn (2010), the varying conditions of the fiscal health of federal government also had a galvanizing effect on the state of the spending power and federal-provincial relations in general (Dunn, 2010, p. 24).

Federal spending and fiscal powers have had significant impacts on federal-provincial relations in several policy domains. For instance, using its spending powers, the federal government has attempted to reach into those areas that have been constitutionally marked as provincial jurisdiction. In order to do that, the federal government utilizes unconditional block grants and conditional cost-sharing programs. Health transfers – mandated under the Canada Health Act – are an example of the conditional cost-sharing program; whereas, unconditional block grants have been a regular feature of transfer payments to provinces for post-secondary education and social programs.

Federalism also impacts federal government's involvement in regional economic development and S&T policy (Salazar & Holbrook, 2007). Regional and federal considerations are always paramount in the S&T-innovation policy discourse in Canada. Funding decisions are almost always impacted by the location of science infrastructure and its potential "multiplier impacts" on regional economic development (Salazar & Holbrook, 2007). Federalism also provides an opportunity for regional interests to exert their pressure to steer science and technology priorities of the region. These considerations – along with those concerning the potential for S&T exploitation and commercialization – are the primary drivers of federal-provincial relations in the S&T policy domain (Salazar & Holbrook, 2007)

Lazar (2006) highlights the types of intergovernmental regimes in Canadian policy areas. These regimes are defined by reference to two dimensions: independence versus interdependence and hierarchical versus non-hierarchical. The regimes are classified as depicted in Table 3.2.

Table 3.2. Intergovernmental Regimes in Canada

	Independent	**Interdependent**
Hierarchical	Beggar-thy-partner	Unilateral
Non-Hierarchical	Classical	Collaborative

Source: Adapted from Lazar (2006, p. 28).

"Unilateral federalism" regimes arise when policy actions under the constitutional jurisdiction of one level of government are constrained by unilateral action of another level of government (Lazar, 2006, p. 28). Conditional fiscal transfers are an example of this relationship, whereby the federal government provides funding for policy areas under provinces' jurisdiction and rely on provinces to implement the conditions (Lazar, 2006, p. 28). On the opposite end of this spectrum is the "Classical federalism" regime in which each level of government acts independently in policy areas within its respective jurisdiction. This regime type is an example of non-hierarchical-independent intergovernmental relationships (Lazar, 2006, p. 29). "Beggar-thy-neighbour" involves both hierarchy and independence where different levels of government compete for jurisdiction in a given policy area and the actions of one level of government impose "substantial obligations on the other" (Lazar, 2006, p. 29). Finally when different levels of government work together to achieve a common goal in the absence of clearly defined jurisdiction or hierarchy, such instances are referred to as "collaborative federalism" (Lazar, 2006, p. 29). Programs with shared cost responsibilities between federal and provincial governments can be an example of such collaborative relationship, particularly if governments are willing partners. However, collaborative federalism does not always entail "easy and friendly" intergovernmental relations; often it involves ongoing and difficult bargaining (Lazar, 2006, p. 29).

As Salazar and Holbrook (2007) argue, collaborative or cooperative federalism is manifest in the Canadian S&T and innovation policy domain which belongs to neither federal nor provincial levels of government. It highlights, what Garcea and Pontikes (2004) refer to as "pluri-jurisdictional characteristics" of the S&T-innovation policy. Science policy is a federal responsibility; however, it is also a sub-set of education policy which falls under provincial jurisdiction. Post-secondary institutions (universities and colleges), which are created through provincial statute, are of particular relevance in advancing the science and technology priorities. Given their importance in this context, the federal government actively funds these institutions through its grant councils and CFI for infrastructure development (Doern et al., 2016, p. 32). Similarly, technology and innovation policy, which are a sub-set of economic development policy, also provide a gateway for the federal government to intervene under the rubric of industry and regional economic development policies (Salazar & Holbrook, 2007). In general, however, provinces tend to act cooperatively rather than competitively with the federal government in pursuing complimentary programs and policies. Federal-provincial programs in the S&T-innovation domain tend to fill the gaps in the policies and programs of the other level of government by providing additional measures that are necessary to foster innovation.

One of the challenges in the federal-provincial interface of innovation policy is that at the federal level, innovation policy tends to follow the 'one size fits all' principle. However, any such policy, to the extent that it exists, is largely derivative of a breadth of S&T, innovation, and regional economic development policies and programs at the sub-national level. There are important differences – such as size and sectoral specialization – in the regional economies and innovation systems in Canada that need to be accounted for in the national discussion of S&T-innovation policy. Consequently, the STI and innovation programmes in Canada manifest 'network governance' – which allows for greater regional participation and regional influence on federally funded programs (Salazar & Holbrook, 2007).

Although provinces have the constitutional jurisdiction over education, there is little sustained provincial focus or strategic organization vis-à-vis S&T and innovation. Most provincial efforts are embedded in provincial departments and regional or sectoral strategies with little or no legislative power or engagement (Doern et al., 2016, p. 33). However, each province has their own "variety of capitalism" that defines their specific STI story vis-à-vis the federal government. Canadian provinces exhibit different kinds of capitalism, ranging from more state-centred varieties historically in Quebec and Saskatchewan to market-based varieties in Alberta and Ontario (Doern et al., 2016, p. 36).

While the provinces often jealously guard their policy jurisdictions from unwarranted involvement by the federal government, there are exceptions to this across provinces and policy domains. For example, Saskatchewan and Quebec often have different policy priorities vis-à-vis the federal government and the former takes a more collaborative approach in its relations with the federal government. This is partially a function of provinces' principle-based stance within the confederation and their "strategic positioning in federal-provincial negotiations" (Garcea & Pontikes, 2004, p. 335). It also draws attention to the relative financial positions of both provinces, whereby Saskatchewan often finds it disadvantageous to compete against federal government. Unlike Quebec, it is not part of the "big-four" provinces. It has relatively limited fiscal capacity which is further accentuated by its reliance on agriculture and natural resources.

When subjected to volatile swings in its economic fortunes, the province has to rely on equalization payments from the federal government (Garcea & Pontikes, 2004, p. 354).

Ontario, on the other hand, has loomed large across the nation since confederation. The province has been known for its exceptionalism – in terms of its size, population and the magnitude of its economy. Ontario's characteristics gave it a place much distinct from other provinces – it assumed the role of "big brother" or "the first among equals" that put common interests ahead of its own (Bryden, 2013, p. 37). Historically, Ontario represented the "Laurentian Consensus" – whereby cities within the St. Lawrence River watershed including Toronto, Ottawa, and Montreal focused on consolidating the commercial and industrial base from Montreal and Toronto. The suite of federal interventions in the economy, from monetary policy to investment in infrastructure, was conducted with this system in mind (Hjartarson, 2013, pp. 50–51). The Laurentian system thus put Ontario in a favoured position, which in turn contributed to a willingness on part of the province to underwrite the prosperity of the country through the regional redistribution of stable portions of its wealth. It chose to be a passive player on key national discussions, so long as the framework policies that preserved its prosperity remained in place (Hjartarson, 2013, p. 55). However, with a shift towards knowledge-based economic growth and a decline in Ontario's industrial base and thus its economic fortunes, the province's status in the confederation has been challenged. From 1990s onwards, when the changing tides set in and the innovation discourse took over the federal agenda, provincial governments in Ontario from most ideological stripes have increasingly found themselves confronting Ottawa and decrying "unfair treatment" of

Ontario (Hjartarson, 2013, p. 57). In the aftermath of the 2009 recession, it went from a "have" province to somewhat of a "have-not" province, when it found itself in receipt of equalization payments rather than a net contributor.

Further complicating the federal dynamics are the Canadian city-regions or municipalities, which are the central spatial units where innovation processes unfold at the most micro-level. City-regions are the locations where social forces – organized interests of all kinds are most visible and active (Young, 2013, p. 1). In the Canadian multi-level governance mix, however, local governments and city-regions are relatively weak – politically and financially. This relative weakness stems from the fact that municipalities are not a recognized constitutional government in Canada – they are "creatures of provinces" because they are created by provincial statutes and do not have direct relationship to the federal government (Doern et al., 2016). Most collaborative arrangements between the three levels of government are mediated by the provinces. Municipalities remain reliant on provincial transfers – 17% of municipal revenues in 2001 were in the form of transfers or grants from provincial governments (McMillan, 2004, p. 48). At the heart of municipal financial weakness is the assignment problem apparent in the Canadian fiscal federalism model which highlights the challenges in balancing expenditure and revenue raising power across jurisdictions: (McMillan, 2004, pp. 60–61). Often the city-regions shoulder the greatest expenditure burdens in the form of social services and yet the most inelastic tax base comprising of property and development taxes.

In the recent past, provinces and municipalities have advocated for greater decentralization with an increased role and stronger voice for larger metropolitan areas in matters of governance (Courchene, 2004). There is a greater recognition that Canadian cities are at the centre of innovation discourse – including their contribution to the formation of the creative class (Courchene, 2004, p. 85). The federal government announced the “New Deal for Cities and Communities program” in its Budget 2005, which set aside $5 billion in funds for municipalities. Similarly, the Ontario Opportunity Bonds were introduced by the provincial government in 2003 with the goal to “fund municipal infrastructure lending” (McMillan, 2004, p. 67). In the 1990s and early 2000s, provincial governments moved to enact legislative changes, including high-profile amalgamations of city-regions to provide them greater policy development capacity and autonomy and to increase their critical capacity to innovate. In Ontario, under the revised legislation, municipal governments gained considerable latitude to operate in a number of policy spheres, most importantly in the realm of economic development services.

These attempts toward greater collaborative multilevel governance arrangements in the Canadian federation, however, did not prove sustainable over the long term. With the election of Stephen Harper’s Conservative Party to the federal government in 2006 and the Financial Crisis of 2008, the federal government’s priorities and focus shifted to reducing government expenditures and providing help directly to industry sectors during the crisis. The collaborative spirit also took a hit during this time as the federal government preferred to concentrate governing powers in the centre (Savoie, 1999). The New Deal for Cities and Communities was terminated by the Conservative government.

Consequently, city-regions remain dependent on conditional grants from the federal government which are in relatively modest amounts and are reserved primarily to fund the debt servicing costs of capital projects (McMillan, 2004, p. 64).

Similarly, the provincial legislative reforms in 1990s and early 2000s, in Ontario and Alberta, have not led to creation of Global City Regions (GCRs) that could lead the innovative agenda of the 21st century. They have not tilted the power balance away from large municipalities such as Toronto, which had been the magnet for the creative class even before the reforms were enacted. As David Siegel (2004, p. 193) has noted in his commentary of these legislative reforms in Ontario, the mayors of larger single-tier municipalities (for example, Toronto) enjoy significantly greater authority than the chairs of upper-tier regions (for example, Waterloo or York). Smaller municipalities, on the other hand, continue to rely heavily on mayoral leadership for effective collaborations with higher government levels (Young, 2013, p. 6).

Furthermore, the legislative reforms undertaken by the provinces, notably in Ontario in 2006, further augmented the joint-decision traps that are evident in federations and in multi-level governance paradigms(Siegel, 2004). With these legislative changes, provinces transferred more responsibilities to the municipalities, while taking away provincial transfers thus forcing city-regions to rely more heavily on own-source revenues from property taxes and user charges (Siegel, 2004). As a result of jurisdictional divisions, municipalities can experience a “notable increase in their powers” accompanied by greater personal accountabilities for senior municipal leaders. That explains why municipal councillors may prefer to keep limited power as that allows them to shift “the blame to the province or other municipal governments for problems or missed opportunities" in their jurisdictions (Siegel, 2004, p.194). Although municipalities gained greater autonomy through the new legislation (*Municipal Act 2001, Amended 2006*), provinces continue to hold other powers that give them a controlling stake in restraining municipal activities across all domains (Siegel, 2004, p.194).

These changes coincided with significant interest across the country in the development of innovation parks. A number of innovation parks were founded during the early/mid-2000, including the McMaster Innovation Park (2005) in Hamilton and David Johnston Research and Technology Park (2002) in Waterloo, Ontario. The municipal and provincial governments aggressively pursued their infrastructural development – under the rubric of economic development, to take advantage of the federal budgetary windfall along with a greater push to put the city-regions at the forefront of their innovation agenda.

The inter-jurisdictional dynamics and characteristics of multi-level governance strongly influence the functioning of innovation parks in Canada. Provincial varieties of capitalism can be observed – directly and indirectly – in the matters of Innovation Park governance and funding. For instance, Ontario and Saskatchewan have utilized different models of governance of innovation parks – whereby Saskatchewan has opted for a Crown Corporation model and Ontario has relied on hands-off, market-led operation of innovation parks. Similarly, while innovation parks are a central infrastructure feature of municipal development plans, they highlight the financial weakness of city-regions to support them in totality. As will be demonstrated in the following chapters, innovation parks in Canada have largely relied on funding support from federal and provincial governments whereas city-regions have acted as secondary support largely playing in the domains of zoning by-laws, peripheral development and infrastructure support services that fall under the purview. These aspects of Canada's federal-provincial-municipal relations and multi-level governance vis-à-vis innovation parks will be explored in greater detail in the following chapters.

3.3. Interests and Social Power

The structure of economic and social power in the innovation-S&T policy domain reveals the importance of globalization, even before the terms of power and policy took hold in the 1980s. Canada's industrial landscape under nation-building and the national policy had been dominated by large firms working at the margins of the resource economy, global markets and profitability. The same is true in many ways in the recent and present context, where globalization of power is both a problem and an opportunity (Doern et al., 2016, p. 227).

In the dirigisme era (1960s and 1970s), and to some extent in the following periods as well, regional interests lobbied to produce regional and special purpose agencies (for example, Western Economic Development, Federal Development Agency of Southern Ontario, Genome Canada). While their mandate and power remained constrained, they nonetheless developed policies to deal with regional socio-economic needs and opportunities, including more recently explicit S&T and innovation plans and funding programs for innovators and entrepreneurs (Doern et al., 2016, p. 227). The federal and provincial bureaucracies – with their vested interests to maximize their own budgets and departmental reach - provided a strong support mechanism to these social interest groups (André Blais & Dion, 1990).

Interest group pluralism is a defining feature of S&T and innovation policy in Canada. The capitalist nature of Canadian economy provides the corporations and industry groups with significant influence on policy direction. These groups normally exert this pressure through their lobbying activities and "direct access to ministers and to officials in the Department of Finance" (Doern et al., 2016, p. 33). Overall in the policy and governance histories of Canada, business power is dominant; however, business interests have also shared their power with political parties and prime ministers in each of the Chretien –Martin and Harper eras (Doern et al., 2016, p. 227). They also lobby sectoral, science-based departments whose ministers and arms'-length agencies make expenditure, tax, and regulatory decisions that differentially affect S&T and innovation policy in often very different competitive situations. S&T-innovation policy and governance functions also reside in the middle, and often micro, levels of at least forty federal agencies, funders and laboratories (Doern et al., 2016, p. 36). Combined with provincial and municipal departments, public sector bureaucrats form yet another interest group that exerts influence in the innovation policy domain. The bureaucratic arm of the governments is often viewed as "self-interested" in the pursuit of its goals, thus epitomizing the principal-agent problem (Cook & Wood, 1989; Gailmard, 2010). The complex industrial, resource, and social settings – which are often complicated by diverse spatial contexts – allow bureaucrats to promote programs and policies that strengthen their managerial control (Doern et al., 2016, p. 37).

Interestingly, as a number of studies have noted (for example, (OECD, 2002; Phillips & Castle, 2010; Smardon, 2014), private sector or industry has been consistently less engaged in R&D in Canada than the rest of the OECD. The weakness of the Canadian private sector is not just confined to R&D spending; rather, the industry also lags significantly in collaborating in innovative activity (Smardon, 2014). This absence of private sector from the innovation landscape, according to Smardon (2014, p. 503), can be attributed to the "dependent technological development" which has meant that insufficient private sector partners were focused on building up their research networks in Canada and making use of the available opportunities.

The weakness of private sector creates a void, which is filled by other institutional interests. Key among these are the advisory, lobby and bridge organizations such as the AURP, CFI, Innovation Factory (MIP), Ag-West Bio (SIP) and National Research Council – Industrial Research Assistance Program (NRC-IRAP). These organizations act as an intermediary between funding organizations and entrepreneurs. Consequently, they enjoy high centrality in the S&T-innovation policy landscape which is marked by complex social networks where power is exerted by those who control the production, dissemination and translation of Mode 2 knowledge (see section 2.6) as well as those who control valuable knowledge production resources such as financial and human capital. Many of these organizations – particularly AURP which is headed by current and former innovation park Chief Executive Officers (CEOs) and presidents - exert this power by advocating for higher government spending in innovation parks. They form strong advocacy coalitions with university and innovation park administrators and industry organizations such as local chambers of commerce, producers, and farmers' associations. They also utilize different forums such as parliamentary committee hearings, international conferences and marketing campaigns to gain traction at political level.

Yet another interest group, in the context of innovation parks, is university administrators and researchers. For university administrators, innovation parks present a unique opportunity to expand the scope of their organization and more importantly, leverage the funding through all three levels of government. In the wake of decreasing funding and grants accompanied by exponentially increasing enrollments, university administrators see innovation parks as a multi-purpose infrastructural avenue. Their leadership and advocacy with different levels of government is therefore crucial to obtaining necessary funds and political support for innovation parks. Similarly, university researchers view innovation parks as a venue where they can take their research with the aim to commercialize and market it (Munim, 2011). Innovation parks provide the necessary organizational support to house these academic entrepreneurs and present opportunities to collaborate with larger and well-established companies.

3.4. Ideas and Policy Learning/Adoption

Ideas feature prominently in the evolutionary study of Canadian S&T-Innovation policy and in the development of innovation parks in the country. One sees a clear transition from state focus on S&T supplemented by R&D tax credits for smaller firms to state support for industrial or innovation policy focused on networks and clusters (Doern et al., 2016, p. 226). Federal tax credit programs eventually became more corporate centric – focusing on larger, multinational firms. S&T-Innovation policy space has seen a clash and shift of purposes – in other words, a shift in cognitive frames – reflected in nation building and then enthusiastic dirigste industrial policy from the post-Second World War to the late 1970s and then a more hands-off approach. Much of the innovation policy discourse over the decades has been shaped by the emerging global context and has been "assimilated to the Canadian context" (Doern et al., 2016, p. 226). This discourse has ultimately influenced the understanding of S&T and innovation among the policy makers as a non-linear process that is facilitated through regional networks across the country (Doern et al., 2016, p. 226).

Emergence of innovation parks and innovation networks in Canada coincided with the ideas that were mainstreamed in the increasingly global discourse. From the mid-1980s onward, as the world changed, and national boundaries became less influential, S&T-innovation policy ideas were submerged under the strong shift from macro-economic stabilization policy to micro-economic pro-market growth ideas, which proscribed a more limited role for the state. Regional economic development, nonetheless, remained the lens through which most federal programs were developed and implemented. For example, the Centres of Excellence were promoted as a central innovation policy instrument in the Mulroney-led Conservative government whereas "Clusters" were the centrepiece of Chrétien-led Liberal government in the 2000s. The 1999 Speech from the Throne was couched in the language of the new imperatives and opportunities of the global knowledge-based economy (KBE) (Doern et al., 2016, p. 61). Similarly, the 2001 Speech from the Throne opened with a commitment to build "a world-leading economy driven by innovation, ideas, and talent" (Doern et al., 2016, p.

61). National Research Council was among the pioneers in advancing network and cluster-based research competencies with the changing role of its research institutes in the regions and the restructuring of NRC-IRAP to offer advice and funding on a more networked basis. In all these instances, regional economic growth has provided a strong ideational frame of changes that have ensued.

Beyond ideational push at the federal level, ideological positions at the provincial level may also influence the government's support for innovation parks. For instance, governments of centre-left stripes have been keener to take active interest in economic management. On the other hand, centre-right ideologies – influenced by the neo-classical economic and neo-liberal political paradigms – prefer a more laissez-faire approach to economic management. These different ideological positions become institutionalized over time – as is evident in different intensity of provincial government support for and involvement in innovation park management.

Policy Learning and Globalization

The institutions in Canada were influenced by particular systems of international relations, power, and dependency in the scientific realm. S&T-innovation policy has always been a part of and been influenced by liberalized markets and the construction of international and regional free trade agreements such as the post-Second World War General Agreements on Tariffs and Trade (GATT), now the World Trade Organization (WTO), and a multitude of regional agreements, such as the NAFTA. A number of international organizations such as the OECD have also helped shape Canada's convergence to an internationally recognizable social context. At the minimum, policy learning has influenced the lexicon of S&T policy by developing a common set of concepts such as knowledge-based economy (KBE).

At the paradigmatic level, Canada has been strongly influenced by technologies and laws from other countries. Some of the S&T instruments were adopted whereas others were adapted to Canadian needs. At the operational level, in English-speaking Canada, the land grant model was imported form the United States and the collegiate system transferred from the United Kingdom. Policy learning and globalization have played a central role in shaping Canada's innovation parks and the broad innovation policy discourse (Doern et al., 2016, p. 76) .

Innovation parks – as well as the broader S&T- innovation policy discourse – have largely been influenced by the ideas embedded in neoliberalism and new public management. Globalization theory over the recent decades has posited that all policy is influenced by strong and complex forces including economic liberalism and new transformative technologies but also global public interest and societal, non-governmental forces (Doern et al., 2016, p. 69) . The global movement to neoliberalism, and the role of states in supporting this movement has led to the creation of a well-developed set of mechanisms – including "national treatment" clauses and prohibitions on "trade-distorting" practices in various trade agreements – for disciplining states to follow particular types of policies (Smardon, 2014, p. 75). Ideas embedded in the New public Management (NPM) paradigm have drastically forced the public administration to adopt more "problem oriented, fluid, entrepreneurial and collaborative approaches to policy design" which necessitate building trust and shared goals with other sectors of the society (Young & Leuprecht, 2004, p. 11). Innovation parks appeared on the horizon as a tool to further such collaborations.

As has been discussed in the previous sections, Canadian S&T-innovation policy was largely influenced by the prevalent paradigms in the United States. Canada's S&T-innovation policy landscape involves both the dominant Canada-United States relationship and an array of global engagements (Doern et al., 2016, p. 70). U.S. corporate structures and interests have been central to the Canadian economy given the strong trade interdependency between the two countries. Technology-related policy debates and actions were pivotal in the 1960s to 1980s when Canada's foreign-owned (mainly US-based) manufacturing sector was accurately described as a "branch plant economy" (Blais, 1986; Doern et al., 2016; Harris, 1988; Smardon, 2014). NAFTA represented a "constitutionalising of neoliberalism" that ruled out the kinds of nationalist industrial strategies that defined earlier S&T policies in Canada.

Canadian academic institutions have also been visibly influenced from across the border. Despite the significant differences in post-secondary research systems and structures between Canada and the United States, the debates and structures from the United States have penetrated into Canada (Doern et al., 2016). The United States has an extremely complex and diverse multilevel higher education system, consisting of over four thousand public and private colleges and universities. Canada, on the other hand, has relied primarily on public finance and administration at the provincial level. These systems remained isolated for much of the time; however, more attention has been placed on U.S. debates and reforms related to making universities a part of the innovation economy and restructuring them to be closer to the innovation process and to different modes of knowledge production (Doern et al., 2016). Development of innovation parks – to foster alliances with industry and provide spaces to academic entrepreneurs along with technology transfer offices to commercialize technologies developed in the university labs – have been part of this larger policy transfer in the academic realm (Doern et al., 2016).

Ideas, including those from across the border and those embedded in local political ideologies, have thus played a significant role in the development of innovation parks in Canada. Innovation parks in Canada appeared to emulate US experiences in Silicon Valley and Route 126.These ideas along with specific federal-provincial-municipal relations and multitude of interests attempting to influence decisions concerning innovation parks.

The interactions between institutions, interests and ideas that affect innovation parks are analyzed in depth in the following chapters. In these chapters I undertake detailed case studies of Saskatchewan Innovation Park, McMaster Innovation Park and David Johnston Research and Technology Park followed by comparative analysis that utilizes the 3-I framework outlined thus far. An analysis of these innovation parks, in the local-provincial contexts will help us understand the 3-I interactions as they influence the policy rationales for government intervention in innovation parks.

4. Saskatchewan Innovation Place

4.1. Background and History

Saskatchewan Innovation Place (SIP) is located across three cities in Saskatchewan: Saskatoon, Regina and Prince Albert. The park is owned and managed by the provincial government. Its first campus originated in Saskatoon in 1980 and since then it has expanded to other cities. It is a curious case in the Canadian context, where most parks are city-based and are owned and managed by non-government (universities or private sector) actors. It is therefore imperative to understand the history of park's development in both provincial and municipal contexts, rather than solely in terms of one city.

Saskatchewan has historically been an agricultural and natural resource dependent prairie province. It boasts 40% of Canada's cultivated farmland and is the most important grain producing and exporting region in Canada. It supplies one-third of world's exports of durum wheat, produces 50% of Canada's total canola, and is the second largest livestock province in Canada. In 2015, Agricultural products created one-third ($15.3 billion) of the export revenues for the province (Government of Saskatchewan, 2017c). Energy production, mining and forestry are the other key sectors of the province: one-third of Canada's primary energy is produced in Saskatchewan through oil, gas and coal. It has the largest potash and uranium deposits in the world – accounting for 45% and 22% of global reserves respectively. Similarly, forest industry is well-established in the province, owing to the large forested area available for commercial and non-commercial harvesting activities (Government of Saskatchewan, 2017c).

Over the years, however, the province has diversified its economic base and invested significantly in the life sciences and biotechnology research and development activities to shore up the strength of its agriculture and natural resource sectors. This has transformed the province, in particular Saskatoon, to develop as an innovation hub. Saskatoon has, over the years, developed a significant mining and Agri-food cluster. Consequently, its fortunes are closely tied to the variations in the domestic and international resource and commodity markets. According to Phillips and Webb (2014), the continued strength of commodity markets, particularly oil and gas, potash and uranium, and the sustained research enterprise at the University of Saskatchewan have allowed the city's economy to remain resilient in the face of global financial crisis of 2008-09. University of Saskatchewan and related research facilities have been particularly vital in developing technologies to discover and exploit profitable resource deposits in the province. The development of these technologies has garnered significant funding that has put the city on a sustained growth path through the otherwise uncertain global economic recovery (Phillips & Webb, 2014). The vibrancy of the city is manifest through a number of economic indicators. It has experienced higher than national average population growth (14% versus 11% nationally), employment growth (+24% between 2000-2009 versus 14% for Canada as a whole) and increases in property-market prices (Phillips & Webb, 2014).

Despite the downturn in commodity prices in recent years, Saskatoon has thrived as a medium-sized creative city. Saskatchewan boasts an exceptional innovation record in "uranium mining, farm machinery fabrication, crop varieties, and cross-cutting biotechnologies" (Phillips & Webb, 2014, p. 271). The three levels of government have also actively invested in the soft infrastructure (research networks of HQP) as well as hard infrastructure including buildings and laboratories (Phillips & Webb, 2014). These investments, which have been ongoing over multiple decades, have been part of a long-term national and provincial growth strategy that is unique to the city.

What is also unique to Saskatchewan is active government involvement, through crown corporations, in regional economic development activities and in managing business enterprises. Starting in the early twentieth century, Canadian provinces became involved in the generation, distribution and sale of electricity. The standard mechanism was a Crown corporation, which is "an organization structured in many way like private corporation except that all the shared are owned by the provincial government" (Sancton & Dunn, 2010, p. 251).Traditionally, crown corporations have provided governments with a tool to influence the economy – they are employed as "ways of dealing with regional social and economic issues not addressed, or addressed poorly, by for-profit corporations or market-based economic systems" (Rice & Lavoie, 2005, p. 371). Canadian federal and provincial governments have frequently established crown corporations "as a way to influence economy, protect Canadian sovereignty or to protect a resource or industry of national strategic importance, and to ensure wide-spread access to utilities and public services" (Rice & Lavoie, 2005, p. 369). Crown corporations have usually produced and/or marketed products for sale, generally in the expectation that, in the long run, there would be at least full recovery of costs and even some profit for provincial treasuries (Sancton & Dunn, 2010).

Saskatchewan's case, however, may be unique: it has the highest number of crown corporations as a percentage of privately held and privately traded firms – 45.4% versus a national average of 11.4% (Rice & Lavoie, 2005, p. 372). Moreover, the crown corporations provide an entry point for both industries – global and national – into the province which is critical for developing economic development opportunities. Saskatchewan had initially experimented with the crown corporation model as a way to introduce new technologies and facilities with the expectation that modern facilities would attract businesses to the province (Rice & Lavoie, 2005). When the crown corporations did not deliver the anticipated economic development, they became a "coping mechanism with a lack of private-sector industry leading to the use of crown corporation as replacements for private industry" (Rice & Lavoie, 2005, p. 372). Saskatchewan Innovation Place is one of eight crown corporations currently operational in Saskatchewan. The park had its origins in 1977-78 when the University of Saskatchewan entered into a lease for 78 acres of land with the provincial government for an 84-year term ending in 2061. Initial lease payments were set at $42,000 per year for the first 21 years and $5000 for the next 63 years. Upon the expiration of the lease, the university is entitled to ownership of all land, buildings and improvements (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

At the time of creation, there were discussions within provincial government circles regarding the suitability of various provincial departments in managing and governing the park. A number of organizations, including Innovation Saskatchewan, Enterprise Saskatchewan and Saskatchewan Ministry of Economy were considered;

however, given the park was to be set up as a crown corporation, its governance responsibility was given to Crown Investment Corporation (CIC), which is a special agency for the oversight of crown corporations in the province (Key Informant no. 8, Personal Communication on SIP, August 7, 2016)

The agreement between University of Saskatchewan and Government of Saskatchewan stipulated that the land be used solely as a research park which would contribute to the advancement of scientific endeavours. The stipulated uses of the research park property included applied R&D, prototyping, and marketing of innovative technologies in industrial, commercial and agricultural sectors (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). The lease also limited the use to "complement and supplement the research activities at the University of Saskatchewan" and forbade commercial activities such as large-scale manufacturing and warehousing (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). More importantly, the lease agreement codified conditions for the park's growth and development beyond the initial concept to maximize the utilization of the land, buildings, structures and improvements. These conditions limited any such further growth of the innovation park so that it supplement and complement the activities of the landlord as the University of Saskatchewan (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). Thus, the park was envisioned as a 'value-added proposition' for the university that would supplement its research activities rather than diminishing its responsibilities.

Commenting on the park's changing direction over the years, the respondent suggested that the park has shifted away from its originally conceived role:

> "When the lease agreement was entered into, the vision and the language of the agreement was closer to the science & technology model of innovation parks. Since the original agreement in 1977, I think that model has certainly drifted towards the real estate model – where the primary outcomes of the SIP are the total amount of revenue generation" (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

Another respondent suggested that the original covenants of the lease agreement were 'restrictive' in terms of the purpose for which the buildings and facilities could be used. The original conception of the park was more akin to a research park which would serve as an extension of the university's research activities. However, over the years, this "idealistic notion" may have changed due to pragmatic reasons or concerns for "paying the bills" – that is, revenue generation, profitability and other financial considerations (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). Consequently, the focus is now more on applied research and business development for technologically innovative companies (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). As pointed out in chapter 2, this pattern of change is a common institutional feature whereby institutions such as the codified rules drift away and lose their relevance due to either lack of maintenance or conversion to new goals (Streeck and Thelen, 2005).

4.2. Infrastructure

The Saskatoon campus commenced its operations in 1980. It is spread over 1.3 million square feet and comprises of 20 separate buildings with a total of 111 tenants (Skelton & Isman, 2016). In 2000, the SIP expanded its presence into Regina in 2000. The Regina campus comprises of six buildings, built over 465,000 square feet, and housing 27 tenants. In 2005, SIP further expanded into Prince Albert by acquiring the Prince Albert Forest Centre Building. This building is, however, being marketed for sale amidst persistently high vacancy rates and "setbacks in the softwood lumber business and the subsequent closure of the pulp and paper mill in Prince Albert" (Skelton & Isman, 2016, p. 4). According to one key respondent, the Prince Albert Forestry Centre building was an experiment, undertaken for political reasons rather than as a response to an evolving need for such facility in the city. The experiment eventually failed and consequently has fallen outside the scope of Innovation Place (Key Informant no. 11, Personal Communication on SIP, October 21, 2016).

Until 2014, Innovation Place also managed the Bio Processing Centre which is a fee-for-service processing centre in Saskatoon. The Bio Processing Centre "extracts active compounds from plant material, primarily for cosmetic and specialized food purposes" (Wiks & Tastad, 2008, p. 2). The building was leased out in April 2014 and the equipment and inventory were sold to a third party, which continued to employee several individuals from SIP. According to the 2014 Annual Report, this divestment was undertaken in response to the "greatly diminished demand from Saskatchewan businesses for such a facility" (Skelton & Isman, 2014, p. 4).

A key feature of the park is its physical infrastructure facilities that provide collaborative working spaces such as boardrooms and meeting rooms with advanced communication technologies and specialized laboratories that allow tenant companies to undertake R&D. The park also has a truly unique social environment, boasted by picturesque outdoors and an upscale restaurant, *Boffins*, that allows the tenants to engage in friendly atmosphere.

Table 4.1. SIP - Key Infrastructure Statistics

Campus	**Developed / Acquired**	**# of Buildings**	**Total Tenants**	**Area**	**Focus**
Saskatoon	1980	20	115	1,300,000 sq. ft.	Agriculture, Information Technology, Environmental and Life Sciences
Regina	2000	6	31	465,000 sq. ft.	Petroleum, Environnemental Sciences, Information Technologies
Prince Albert	2005	1	20	115,000 sq. ft.	Forestry

Source: Author's tabulation from various information sources

Table 4.2. List of Buildings – Saskatoon and Regina Campuses

Saskatoon Campus	Regina Campus
National Hydrology Research Centre	The Terrace
Canadian Space Agency	Saskatchewan Disease Control Laboratory
SED Systems Inc.	ISM Building
The Galleria	2 Research Drive
Boffins Public House	Petroleum Technology Research Centre
The Atrium	Pilot Plant
SRC Analytical Laboratories	Greenhouse Gas Technology Centre
Dr. Jack McFaull Building	
411 Downey Road	
Dr. Burton Craig Building	
L.F. Kristijanson Biotechnology Complex	
108 Research Drive	
110 Research Drive	
112 Research Drive	
The Concourse	
121 Research Drive	
Maintenance/Energy Centre	
3 North Access Road	

Source: Author's tabulation from various information sources

4.3. Organizational Structure + Governance

Saskatchewan Innovation Place (SIP) is legally called the Saskatchewan Opportunities Corporation (SOCO), which operates as a provincial crown corporation(Government of Saskatchewan, 2017a). Two sets of legislations, namely *The Saskatchewan Opportunities Corporation Act* and *The Crown Corporations Act*, provide governing oversight to SOCO (Government of Saskatchewan, 2017a). *The Crown Corporations Act* gives supervisory authority to the Crown Investments Corporation (CIC) which serves as the holding company for the province's eight crown corporations including SOCO (Government of Saskatchewan, 2017c). CIC reports to the Minister of Crown Corporations and is supported by the CIC board which is a cabinet committee that acts as a liaison between Cabinet and crown corporations (Government of Saskatchewan, 2017b). In relation to SOCO, CIC is responsible for the management of the governance framework of SOCO, which sets out the strategic direction of the park, evaluates and manages its performance and provides financial accountability (Government of Saskatchewan, 2017a). The Universities of Saskatchewan and Regina are the owners and landlords that have leased the lands to the province, as described in the previous section. While the universities do not operate the park, they do provide important oversight and advisory functions that will be explained shortly. There are three critical elements in the governance of the park, namely Board of Directors, Management and Advisory Committee. Each of these serves a complementary role from strategic direction to management to goal alignment across different stakeholders.

4.3.1. Board of Directors

SOCO's members and board of directors are appointed by Lieutenant Governor in Council – appointments that are made directly by the Lieutenant Governor, representing the Crown, acting on advice of the provincial cabinet. The appointments, for three years and renewable, are established under the CIC Board of Directors Appointment Policy (Government of Saskatchewan, 2017a). The policy sets out the roles and responsibilities and remuneration guidelines, among other things, for the members of the Board. The Board of Directors are responsible for managing the affairs and business of the corporation (Government of Saskatchewan, 2017c). The *SOCO Act 1993* requires the members of the board to be selected based on their expertise in Saskatchewan's innovation ecosystem and have well established credentials in a wide array of professional and civic fields.

4.3.2. Management Team

The management team, led by a Chief Executive Officer or the President, is responsible for the functioning and management of the park. There are three organizational divisions of the corporation, namely "the President's Office, Finance and Administration and Operations" (Skelton & Isman, 2014). The President's office oversees and manages stakeholder relations, hospitality services, and brand management such as in-house creative services and corporate services (Skelton & Isman, 2014). Functions including strategic planning, risk management, policy development, financial reporting, information technology and human resources are all managed through the Finance and Administration arm of the park. The Operations division oversees the maintenance of buildings, delivery to technical services including central heating and cooling, leasing, client relations and project management for construction and repair activities (Skelton & Isman, 2014).

4.3.3. Management Advisory Committee

An independent Management Committee which includes representatives from industry, academia and municipal government is also part of the governance structures at each of the Saskatoon and Regina campuses (Skelton & Isman, 2014). The two advisory committees are led by the vice presidents of research at the respective university and are responsible for reviewing and approving “all tenants that locate within park facilities” (Skelton & Isman, 2014). The members of neither Board of Directors nor the management team have a decision-making role in the Advisory Management Committees. These committees serve the challenge function and ensure that park activities remain aligned with the universities’ research mandate (Key Informant no. 11, Personal Communication on SIP, October 21, 2016).

4.3.4. Governing Dynamics

Given the appointments process is carried out at the direction of political class, including the cabinet ministers, the appointment of board members is essentially political in nature. The Minister of Crown Investments Corporation is a member of the corporation by default and has the authority to approve or reject any strategic decisions undertaken by the Board and Management. The board selection process is inevitably political in nature – while the board members are not partisan, they are “kindred spirits to the government in power” (Key Informant no. 11, Personal Communication on SIP, October 21, 2016).

The Board’s role is to develop strategic plans for the park; however, it does so collaboratively and with input from the park management. The Board also often plays a supporting role for the Innovation Park in the wake of financial pressures from the government and desire to generate more profits. One respondent suggested that while it does not happen frequently, when there are differences of opinion between park management and political establishment in regard to strategic decisions, board members support the park management in achieving favourable outcomes and to continue pursuing their goals in the wake of financial pressures (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). Similarly, while the CIC is responsible for overseeing park’s activities, it “tends not to get involved in terms of decision making” (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). Although the government does not necessarily dictate the operations of the park, there is often alignment between the goals of government and the park which leads to a close working relationship.

The role of management advisory committee vis-à-vis Park’s management team is somewhat different. One of the responsibilities of the management advisory committee is to review and (dis)approve the tenancy applications based on its judgement of alignment between the tenant and university’s research objectives. The committee also assesses the impact on park promotion and liaison with business community. One respondent suggested that these committees “keep the park management honest” and keeps them from inviting tenants “solely for financial reasons” (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). The committees thus serve the check and balance function; however, in most cases they defer to park management's decisions and rarely block any tenants from acquiring space in the innovation park. Nonetheless, their very presence and inclusion in the governance mechanisms is considered sufficient to keep the management from "bringing forward someone that would not be an appropriate fit" (Key Informant no. 11, Personal Communication on SIP, October 21, 2016).

4.4. Purpose, Role, Activities

The intent of the Saskatchewan Innovation Place (SIP), at the time of development, was to be a facility that promotes commercialization and industrial collaboration between the University of Saskatchewan and a broad range of partners (Key Informant no. 8, Personal Communication on SIP, August 7, 2016). Innovation Place's mandate, as presented in governance documents, is "to create, encourage and facilitate business opportunities in the Saskatchewan technology sector" (Skelton & Isman, 2013). The strategic goals provided by the CIC to SOCO include provision of "world-class scientific and social infrastructure that promotes collaboration, growth and innovation"; stakeholder engagement; financial resiliency and profitability of SOCO; and promotion and utilization of innovation practices that promote commercial success of the stakeholders (Skelton & Isman, 2014, pp. 3–4).

While these goals highlight the broad strategic directions provided by CIC, SIP's business model allows it to translate these goals into outputs and outcomes. As highlighted in the business model (Table 4.3), the critical link between input and outputs/outcomes are the value-added elements or activities that the park undertakes. Some key activities and services include: business arrangements such as flexible lease arrangements with space upgrade or downgrade provisions and educational and social programming such as networking events, seminars and workshops and lunch 'n learn series.

The park provides a nurturing area – incubation space – for new companies to establish. It offers them space to work in a collaborative-coop-etive environment. Once the companies reach a post-commercialization stage where they start production at a larger scale, they are shifted out of the park (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). In addition to providing laboratory or office space, the SIP provides critical supporting infrastructure and services including meeting rooms, common areas, cafeteria and a club for social networking events (Key Informant no. 11, Personal Communication on SIP, October 21, 2016). It also provides custom-designed space solutions to large organizations such as the Saskatchewan Research Council's fermentation plant currently being developed. Most importantly, the park provides opportunities for social engagements between the varied stakeholders and tenants of the park by organizing "family-oriented events" on special occasions and holidays. The park also provides information dissemination services through its newsletter, lunch-n-learn seminars and R&D engagement sessions for the tenants. The innovation park is not just a landlord; rather, it actively "provides a creative environment that fosters networks, engagement and innovation" (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

Table 4.3. The Business Model of Saskatchewan Innovation Place

Business Model		
INPUTS	Innovation Place Brand; Specialized Facilities and Infrastructure; Financially Sustainable; Strategic Partnerships; Skilled and Engaged Workforce	Components of value creation
ACTIVITIES	Supportive and Flexible Business Arrangements; Attract and Retain Key Tenants; Asset Maintenance and Renewal; Technical and Specialized Services; Build and Maintain Stakeholder Relationships and Partnerships; Employee Training and Development; Educational and Social Programming	Value added elements
OUTPUTS	Environment that Encourages Innovation, Collaboration and Entrepreneurship	Key products
OTUCOMES	New Technology Companies Growth of Existing Companies; Growth to the Technology Sector in Saskatchewan; Sustainable Operations	Value Generated

Source: Reprinted from (Skelton & Isman, 2016)

Another tenant highlighted the role of lunch ‘n learn events organized by the Park in “facilitat[ing] the cross-fertilization of ideas” (Key Informant no. 26, Personal Communication on SIP, November 10, 2016). These events are often held around noon –

to allow tenants to utilize the lunch hour to network with their colleagues and learn from their peers. Founders of companies in the park, entrepreneurs and experienced business developers are invited to deliver presentations and share their ideas on best practices. The key function of such events is to "disseminate knowledge and share information" (Key Informant no. 26, Personal Communication on SIP, November 10, 2016).

4.5. Focus Areas and Tenant Profile

Interestingly, when Innovation Place was being planned, it was envisioned as an information technology hub for the Prairie region – along the lines of Route 128 and Silicon Valley. However, given the dominant role of agriculture in Saskatchewan's local economies, the park morphed into an agriculture biotechnology hub with many small and large multinational agricultural companies locating on the Saskatoon campus (Key Informant no. 8, Personal Communication on SIP, August 7, 2016). The lease agreement specifically included agriculture and natural resources as focus areas for the park, due to it being located in the middle of a large agricultural area. However, multiple respondents contended that agriculture was not the intended exclusive focus for the park; rather, it has pursued multiple focal points to capture province's diversification and growth since the original agreement was signed. Nonetheless, the percentage of agriculture-related firms locating on the Saskatoon campus is higher. The situation is however different on Regina campus which has no agriculture-related tenants. The Regina campus boasts a higher concentration of service-based including Information Technology firms as its tenants (Key Informant no. 10, Personal Communication on SIP, October 21, 2016).

SIP's primary tenancy focus is the "Saskatchewan-based, private technology companies" (Skelton & Isman, 2014, p. 9). Secondary targets include "business and technical service organizations, research institutes and national and international technology companies" (Skelton & Isman, 2014, p. 9). The tenants of the park are from different institutional spaces (public-private), jurisdictional bases (local, national or international) and varied in size (start-up to established SMEs). This adds significant diversity to the tenancy profile of the park (Skelton & Isman, 2014). In 2014, 72% of Park's tenants belonged to industry while public (government) and academic sectors represented 13% and 7% of the tenants, respectively. The remaining 8% were non-profit organizations and services organizations (Skelton & Isman, 2014, p. 9).

Table 4.4. Institutional Breakdown of SIP Tenants

Institutional Affiliation		Number	Percentage (%)
Industry		106	72
Academic		10	7
Government	Federal	5	3
	Provincial	14	10
Bridge/Cross-sectoral		12	8
Total		**147**	**100**

Source**:** Author's compilation based on information provided on SOCO website (Government of Saskatchewan, 2017a)**.**

4.6. Key Organizations

Innovation Place's ecosystem relies on a number of key academic, government, private and non-profit bridge organizations. University of Saskatchewan in Saskatoon and University of Regina in Regina provide the critical research competencies in engineering, medicine, veterinary medicine and major agricultural research programs. Federal and Provincial governments have also invested significantly in building key applied research facilities – largely with the aim of regional economic development (Key Informant no. 27, Personal Communication on SIP, November 30, 2016). For instance, Saskatoon received a major federal and provincial funding investment to develop the Canadian Light Source (CLS) – a national light source synchrotron facility – on the University of Saskatchewan campus near the Innovation Place. There are also a number of other federal research institutes and laboratories on University of Saskatchewan's campus including the National Research Council, the Veterinary Infectious Disease Organization (VIDO), and the Sylvia Fedoruk Centre for Nuclear Innovation. These organizations, along with the technology start-ups and small-medium enterprises in the Innovation Place form the core of the biotechnology cluster in Saskatoon. The ecosystem is further supported by intermediary organizations that link the R&D to the market that is the incubators, industry liaison offices for both Universities of Saskatchewan, the Saskatoon Economic Development Authority (SEDA) and Regina Economic Development Authority (REDA) – organizations that provide financial and educational support to new start-ups and small businesses (Key Informant no. 27, Personal Communication on SIP, November 30, 2016).

4.6.1. Government Organizations

The federal government has a significant presence in the Saskatoon campus of Innovation Place with five facilities, namely Canadian Grain Commission, Canadian Food Inspection Agency (Operations and Laboratory), National Research Council (NRC – IRAP). These organizations undertake direct and indirect research – in collaboration with academic, private and non-profit organizations within the Innovation Place and provide direct or indirect financial support to the park by the virtue of being rent-paying tenants there.

4.6.1.1. National Research Council – Industrial Research Assistance Program (NRC-IRAP)

The federal government manages the Industrial Research Program (IRAP) through the National Research Council. The program provides “technology assistance to small and medium-sized enterprises (SMEs)” and supports them through “all stages of the innovation spectrum” including development and commercialization (Government of Canada, 2017b). The NRC-IRAP also plays an important linkage between SMEs and R&D expertise in Canada. It collaborates with national and regional organizations to develop a strong R&D and support network for the SMEs. NRC-IRAP has five regional offices that employ sectoral experts, known as industrial technology advisors (ITA). These ITAs have extensive experiences in specific sectors and are well-connected with local and regional networks of innovators, entrepreneurs, industry and academics (Government of Canada, 2017b).

In the Innovation Place-Saskatchewan-Saskatoon innovation milieu, NRC-IRAP plays an important role. Not only is it a tenant at SIP, it also interacts with regional and provincial economic development and innovation agencies such as Innovation Saskatchewan to advance regional innovation goals. Speaking to the role of NRC-IRAP, one key respondent suggested that the organization fills an important gap, namely funding for applied research for small-medium enterprises. While the multinationals or large organizations are able to access the funding for applied research, smaller organizations, including SMEs have a much more difficult time accessing such pools of funds and expert advice. The IRAP fills an important gap in the innovation milieu by "engaging with smaller-scale organizations" that have R&D based technological focus and "directing them to funding opportunities" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016).

Provincial government – by way of being the administrator and lease signatory for the Innovation Place with the University administration – has a more vested interest in the operation of park. In addition to the administrative offices of SOCO, the Saskatoon and Regina campuses also host several other provincial departments and research organizations. These are listed in the table below.

Table 4.5. Provincial Government Organizations in SIP

Organization	Location(s)
Water Security Agency	Saskatoon
Saskatchewan Ministry of Environment	Saskatoon, Prince Albert
Innovation Saskatchewan	Saskatoon
Saskatchewan Research Council	Saskatoon, Regina, Prince Albert
Saskatchewan Research Council – Analytical Laboratories	Saskatoon
Saskatchewan Disease Control Laboratory	Regina
Ministry of Economy	Prince Albert
Ministry of Justice	Prince Albert
Health Quality Council	Saskatoon

Source: Author's tabulation based on the tenants list published on Innovation Place Website (Government of Saskatchewan, 2017a)

4.6.1.2. Innovation Saskatchewan

In 2009, the Government of Saskatchewan established Innovation Saskatchewan as a special operating agency. Prior to 2009, Innovation Saskatchewan existed as a division of Enterprise Saskatchewan (Key Informant no. 19, Personal Communication on

SIP, November 14, 2016). It is controlled by and reports to a Board of Directors, which includes two ministers including one responsible for innovation.

Innovation Saskatchewan is the policy centre for the Government of Saskatchewan for S&T, R&D, demonstration and commercialization activities. It also coordinates government's activities in the innovation domain. Its core mandate is to provide analysis of science and technology policy, guide the Government of Saskatchewan to achieve optimal efficiency, and develop and foster "an innovation driven economy in the Province of Saskatchewan (Government of Saskatchewan, 2017d).

4.6.2. Anchor Organizations – Incubators and Facilitator Organizations

While the applied R&D is largely carried out by industry, in close collaboration with academics and funded by government agencies such as NRC-IRAP and Innovation Saskatchewan, the innovation activities including incubation, commercialization, and networking are carried out by facilitator organizations. These organizations provide the critical linkages between ideas, R&D, commercialization and economic growth. The bricks and mortar of SIP are complemented by key facilitator and bridge organizations such as AgWestBio, Universities' Industry Liaison Offices, and Genome Prairie. Most of these facilitator organizations are not-for-profit, receive a mix of funding from federal and provincial governments as well as industry clients. These are further complemented by industry organizations such as Saskatchewan Pulse Growers, Canola Council of Canada as well as fee-for-service providers that provide advice and consulting services related to intellectual property, marketing and business development for SIP tenants.

4.6.2.1. Ag-West Bio

Ag-West Biotech is a "non-profit, membership-based organization" with a mandate to promote Saskatchewan's ag-biotech cluster (Ag-West Bio, 2017). It was established by the Ministry of Agriculture in 1989 and was amalgamated with the International Centre for Agricultural Science & Technology in 1997. Ag-West Bio was further merged with Bio-Products Saskatchewan and the Saskatchewan Nutraceutical Network that expanded the organization's reach in "agriculture, environment, industry, energy and bioprocessing as well as nutrition and health" (Ag-West Bio, 2017). A number of provincial and federal organizations such as the Saskatchewan Ministry of Agriculture and Agri-Food Canada, Western Economic Diversification, and the National Research Council's Industrial Research Assistance Program (NRC-IRAP) are key funders of Ag-West Biotech (Ag-West Bio, 2017). The core activities of the organization are centred on three themes, namely business support, communication, and regulatory and policy support. Key activities under each of these themes are detailed in Table 4.6.

Table 4.6. Themes and Activities of Ag-West Bio

Focus Area	Activities
Business Support	- Market Analysis and business plan assistance - Training and development - Search for Innovative Research Ideas, - Intellectual Property and Advanced Technologies - Matching Protégés with mentors – operated through the Raj Manek Mentorship Program - Provide early-stage funding for bioscience companies through the Commercialization Fund
Communication	- Representation on provincial, national and international committees and focus groups - Website which includes online directory of Saskatchewan Bioscience companies - Bio-Bulleting online newsletter - Ag-West Bio events for networking and business development - Leading delegations to relevant conferences - Conducting conferences and workshops that bring together industry and research leaders
Regulatory and Policy Support	- Provide industry perspective to government - Develop an understanding of current policy and regulations and their impact on bio-business - Encourage the development of efficient policy and regulatory frameworks

Source: Reprinted from Ag-West Bio (2017).

Ag-West Biotech has been a longstanding tenant of SIP, going back all the way to 1989 – when the organization was formed. According to a key respondent, it is a "mutually beneficial relationship, whereby SIP provides the traffic from campus and visiting delegations due to its brand attraction and Ag-West Biotech in turn serves as the catalyst and facilitator for those visitors" (Key Informant no. 23, Personal Communication on SIP, November 14, 2016). It is one of the key anchor organizations, which along with other organizations serves to develop the agricultural bio-economy in Saskatchewan. Many of the SIP tenants, both start-ups and larger scale organizations, that were interviewed for this study highlighted the central role played by the organization and highlighted their “beneficial interactions” with the organization in developing their business capacity.

4.6.2.2. Genome Prairie

Genome Prairie – an extension of Genome Canada – was created by the federal government as a non-profit, arms length organization to “support stakeholders across Manitoba and Saskatchewan in capturing and maximizing the benefits of advanced research in genomics and related bio science” (Genome Prairie, 2014). Genome Prairie has provided $260 million in research funding to academic and research institutes over the span of 15 years since its inception (Genome Prairie, 2014). These projects are “often in partnership with the industry” and develop a “pipeline of research activities from discovery to development to commercialization” (Genome Prairie, 2014). Federal government provides over $110 million to the organization through Genome Canada. Provincial government, industry and international organizations comprise of other funding sources for Genome Prairie. These contributions are financial as well as in-kind support from national and international organizations (Genome Prairie, 2014). The organization undertakes three primary types of activities, namely, project development; research management; and, community engagement.

Engagements and collaborations across a broad network of regional researchers and industry partners provide an opportunity for Genome Prairie to “identify and explore new project opportunities and attract investment into the regional innovation system” (Genome Prairie, 2014). It boasts significant experience and knowledge in project management which makes it a natural contender to conduct value-added research at regional level thereby enabling innovation and contributing to economic development in the Prairie Region (Genome Prairie, 2014).

Prior to 2005, Genome Prairie was responsible for Alberta, Saskatchewan and Manitoba with its headquarters located in Calgary. In 2005, Alberta decided to create a separate Genome Center – leading to the formation of Genome Alberta. This left Genome Prairie with the option of moving its headquarters to Saskatoon or Winnipeg. Ag-West Biotech which has had a strong historical interface with the organization and had strong cross-organizational networks, pursued the case of Genome Prairie's headquarter move to SIP's Saskatoon's campus. Ag-West Biotech's active and, according to a key informant, "aggressive push" led to Genome Prairie co-locating with Ag-West Biotech while maintaining parallel regional presence in Manitoba. Both Genome Prairie and Ag-West Biotech share the same office space and complementing administrative functions. Initially, Saskatoon was designated as the headquarters for Genome Prairie and Winnipeg office was the satellite location; however, with change of guard in the senior management at Genome Prairie, both Saskatoon and Winnipeg locations have been given equal status (Key Informant no. 13, Personal Communication on SIP, November 7, 2016).

According to a key respondent, SIP is the "ideal spot" to host Genome Prairie because of the complementarities between the two organizations. Being in SIP enables Genome Prairie to assume a central place in the biotechnology cluster and allows it to highlight its key achievements in agriculture, environment and human health fields. It also allows the organization to "maintain a buffer zone" between itself and the University which is a primary recipient of its funds (Key Informant no. 13, Personal Communication on SIP, November 7, 2016).

4.7. Outcomes and Impacts

Saskatchewan Innovation Park's economic impacts were last captured in 2008 through an Economic Impact Study. The analysis – based on a survey to obtain data on each tenant / client's gross and net salary expenditures, number of full-time and total employees, capital expenditures – provided estimates of direct and in-direct economic impacts of SIP in Saskatoon, Regina and Prince Albert. The method for economic impact analysis was developed by the University of Saskatchewan.

Overall, the SIP contributed approximately $292 M - in direct impacts including net payroll and provincial purchases – and 4,299 in total employment. These impacts augmented to $647 M in indirect impacts as well as 8,528 in full-time employment. The results, broken down at municipal level, are presented in the table below along with a comparative with 2006.

Table 4.7. Saskatchewan Innovation Place – Economic Impacts

		Saskatoon Facilities	Regina Facilities	Prince Albert
Total Impact	Municipal	$335 M (+72%)	$153 M (-26%)	$17M (+31%)
	Provincial	$426 M (+64%)	$193 M (-28%)	$28 M (-13%)
Employment (FTEs)	Municipal	5,456 (+48%)	1,650 (-13%)	310 (+17%)
	Provincial	6,274 (+48%)	1,898 (-13%)	357 (+17%)

*Provincial total impact and employment effects are cumulative, that is, include values for municipal impacts.

Admittedly, these numbers are significantly outdated, as they represent a time prior to the 2008-09 global recessions when the economy was experiencing significant growth. Moreover, the scope of this study did not allow for a detailed quantitative impact analysis. However, the in-depth interviews provided a qualitative picture of the overall impacts of the park. One of the key respondent suggested that undoubtedly the tenancy rate fell considerably in the aftermath of 2008-09 recession; however, the park remains financially sustainable with positive contributions to the provincial and regional economies. The greatest impact is provided by the Saskatoon facilities – both economic and spillover R&D and innovation – whereas Regina is considered more of a "real-estate play" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016). The lower impacts of Regina and Prince Albert facilities can be seen in the numbers presented in table 4.7 whereby facilities at both these locations demonstrated lower contributions to the regional and provincial economies in 2008 compared to 2006.

Respondents highlighted the significant networking and leveraging benefits of SIP. Start-up tenants, particularly in the ag-biotech field, highlighted the benefits of co-location with some large private sector organizations such as POS, Dow Agriculture as well as Genome Prairie and Ag-West Biotech. One respondent from a start-up tenant highlighted the importance of ties with some of these organizations. The respondent noted that the SIP has a "wide variety of organizations that touch every aspect of the innovation spectrum" and that are valuable to their company (Key Informant no. 36, Personal Communication on SIP, January 25, 2017). Organizations such as the Vaccine and Infectious Disease Organization (VIDO) and BearCrop Science have allowed smaller organizations to undertake collaborative R&D projects. Similarly, presence of provincial organizations such Innovation Saskatchewan and Genome Prairie provide access to funding opportunities and access to provincial and federal decision-makers in the innovation milieu. Finally, presence of organizations such as the University of Saskatchewan's Industry Liaison Office (ILO) "provides critical linkages to commercialization opportunities" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016).

A number of respondents also highlighted the importance of cross-fertilization and exchange of highly qualified individuals. According to one respondent, the informal networks are an important source of job creation and transfer of individuals "with specific technical knowledge across different organizations" within the park (Key Informant no. 24, Personal Communication on SIP, November 25, 2016). These networks act as a source of information sharing about latest developments in organizations within the park and about developments in the R&D-innovation domain. The fact that "everybody knows everybody" is critical to the cross-fertilization (Key Informant no. 24, Personal Communication on SIP, November 25, 2016).

While formal and informal networking emerged as the most cited benefit by those interviewed, other positive impacts were also highlighted. Some of these included: proximity to the university, participation in lunch 'n learn and other learning activities, infrastructure facilities including parking, public transit and the social events at Boffins Public House – a restaurant facility that is part of SIP's Saskatoon location. This later aspect was particularly highlighted as a "significant infrastructural element" that "facilitates the development of innovation community at SIP" (Key Informant no. 13, Personal Communication on SIP, November 7, 2016). It was noted that events such as the wine tasting at Boffins are "very important" in driving a "sense of community" (Key Informant no. 13, Personal Communication on SIP, November 7, 2016). It also hosts political leaders for holiday events which "brings further attention to the overall activities of the organization" (Key Informant no. 13, Personal Communication on SIP, November 7, 2016).

4.8. 3-I Analysis of SIP

4.8.1. Institutions

Governance of SIP as a Crown corporation is an important institutional element that defines the scope of government's support of the innovation park. The provincial government enjoys considerable leverage in exerting direct and indirect influence on SIP's strategic decision-making and to some extent day-to-day operations. Formal legislative mechanisms such as *The Saskatchewan Opportunities Corporation Act* and *The Crown Corporations Act* provide for political oversight of SIP's activities and management. Economic management through crown corporations has been a hallmark of Saskatchewan which is largely a function of institutional path dependency and its reliance on natural resources and agricultures as it primary staple. The institutional route of management through crown corporations is also influenced through the historically prevalent political ideologies and interest groups such as the Canada Council of Canada and Saskatchewan Pulse Growers. I will discuss this aspect in greater detail in the following sections.

In addition to macro-institutions, the governance documents, primarily the lease agreement, codify the organizational expectations between the University of Saskatchewan and subsequently, University of Regina – both assuming the role of principal as the lessor - and the provincial government which is the lessee of University lands and the agent for SIP. The enforcement and implementation of the statutes brings to light the "cultural" conflicts – government sees SIP as an instrument for revenue generation and economic development, whereas the university considers SIP an extension of its R&D mandate. Over time, as key informants noted, SIP "drifted" away from its key objectives outlined in the lease documents towards the "real estate model" with the establishment of campuses in Regina and Prince Albert.

From Federal-Provincial-Municipal perspective, SIP's Crown Corporation status also imposes significant constraints on direct federal and/or municipal funding for SIP. Municipal governments in Saskatoon and Regina are largely absent from SIP and do not provide significant direct or indirect support. SIP does not feature as an economic development instrument for these municipalities. However, the federal government provides indirect funding through its arms-length organizations such as Genome Prairie and Ag-West Biotech. Moreover, the federal government has made significant investments in R&D investments around the SIP including the Canadian Light Source Synchrotron (CLS), National Research Council's Plant Biotechnology Institute (NRC-PBI) and Agriculture and Food Canada (AAFC)'s research facilities - which support the entrepreneurial activity in the SIP.

4.8.2. Interests

As outlined in section 4.5, private sector dominates the tenant list at SIP with 72% of tenants belonging to this institutional domain. This would suggest that private sector tenants are in a position to exert significant influence on strategic and operational considerations of SIP. However, this inference needs to be carefully qualified. While it is true that private sector, through class segment coalitions, influences the macro political economic landscape at the provincial or the national level; however, only large multinational corporations are able to exert such influence with their dominance over financial and economic resources. Owing to significantly well-developed agriculture and natural resource sector in Saskatchewan, corporations like Monsanto and Potash Corp. enjoy such influence in the innovation landscape. SIP, on the other hand, is populated by small-scale entrepreneurs and few established enterprises.

The weakness in the capacity of private sector in SIP is largely filled by "producer check-off organizations – also termed P4s)" (Phillips et al., 2013). A number of these organizations such as the Canola Council of Canada, Saskatchewan Pulse Growers as well as federally and provincially mandated bridge associations such as Genome Prairie and Ag-West Bio, have emerged as major players in the innovation landscape within the SIP. These organizations have had significant success in raising funds annually to complement the federal-provincial funding. In addition, these organizations enjoy considerable social power by virtue of their boundary spanning characteristics. Their strong networks with a large number of federal and provincial bureaucracies such as NRC-IRAP, Innovation Saskatchewan and Saskatchewan Research Council further strengthens their influence over strategic policy direction. These organizations stand to greatly benefit from their location in the SIP and hence they are strong proponents of the SIP.

A strong counter-push to SIP is provided by the commercial real estate developers that are, perhaps unintentionally, affected by the development of innovation parks. These developers perceive innovation parks to be venturing into their territory and competing against their interests. Innovation Parks often provide subsidized rate to start-ups and innovative enterprises. In the absence of innovation parks, these companies would be locating in a commercial space, where prices are set under the normal market influences. Although the primary tenants of innovation parks are new companies, that go through a learning and development phase, and not fully developed enterprises, these are often perceived by the real-estate developers as ‘lost business’. SIP, which is managed by the government and has a large presence in the provincial innovation as well as infrastructure landscape, is often subject to push-back from the commercial real estate groups.

Given the economic influence of real-estate groups in attracting businesses to the region and bringing private infrastructure investments, they have significant structural power over government decisions to financial support innovation parks. As a result of these pressures, the SIP management and the provincial government by virtue of its role in managing the Crown Corporation have been restricted from undertaking expansion projects and developing further buildings and campuses of SIP. A key respondent highlighted that "SIP is a very expensive" real-estate space as compared to its alternatives. This is a function of the strength of real estate lobby which exerts pressure on provincial government and management to increase the rents at the SIP to avoid "unfair competition from the government" (Key Informant no. 14, Personal Communication on SIP, November 9, 2016). Another respondent noted that while the interaction between the government agencies, the University and private sector companies is helpful in creating a "strong innovation network," it also leads to the perception of "competitive real estate play" among the business community. In turn, the commercial real estate sector undertakes "significant lobbying to reduce the ability of SIP to provide space to new companies" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016). These lobbying efforts ultimately led to a "significant change in policies, [evaluation] metrics" and ultimately "significant shift in direction and loss of momentum" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016).

Another respondent attributed the conflicts to the marketing of SIP as a real-estate model. According to the respondent, the park boasts of beautiful landscapes and "premium real estate space" which is not located in the core-downtown area. This puts it in conflict with those organizations "who are trying to develop the downtown core" (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). Moreover, SIP's active attempts to expand its real estate in Saskatoon as well as its foray into Regina and Prince Albert signalled a shift towards the real-estate model. This perceived change alerted the real-estate sector and "created tensions between those trying to develop and attract business to revitalize or maintain a vibrant downtown area" (Key Informant no. 26, Personal Communication on SIP, November 30, 2016).

The government's role in the face of such opposition is normally that of mediator; however, the potential to arrive at an optimal solution is complicated when the government is itself a stakeholder. As a number of key informants, government's response to such opposition has also been sub-optimal: the park management has substantially increased the rents for the office space to be "competitively priced" with the private-sector owned buildings. Moreover, the provincial government has significantly retracted or disguised its support for its Prince Albert and Regina campuses of SIP by relocating its core departments into these buildings.

4.8.3. Ideas

Provincial government management of SIP as a crown corporation can be traced to the historical dominance of socialist and Keynesian ideologies in Saskatchewan. The province was home to the CCF and birthplace of universal healthcare in Canada. In the early post-World War era, left-leaning governments in Saskatchewan actively undertook economic development – including utilities and agriculture management – through the crown corporation model. Later governments found it difficult or lacked political will to alter the institutionalized trajectory of economic management. Moreover, the province has been strongly influenced by the ideas embedded in the “co-operatives culture” which preferred risk-management through certain modes of social engagement that are closely mimicked in the innovation park model.

Further socialization of the concept of Innovation Park has been provided by high degree of communication of key ideas and transfer of best practices through exchange of key personnel. Many of the senior leaders of organizations such as Genome Prairie, Ag-West Biotech and Saskatchewan Research Council have occupied positions across these organizations at different times. They also serve on the advisory boards for a number of business enterprises within the innovation park. In this process, they have enabled a certain dominant discourse on innovation parks thus facilitating cognitive convergence around ideational frames.

5. McMaster Innovation Park

5.1. Background and History

McMaster Innovation Park is located in Hamilton – a mid-sized city with a long history of manufacturing that has served as home to the Canadian Steel industry (Warrian, 2014). The city has traditionally had a strong, "unitary industrial identity that exhibits all the potential gains and risks of such specialization" (Warrian, 2014, p. 197). Over the last 30 years, Hamilton found itself in throes of economic transition – starting with a "protracted decay and decline of steel industry" (Bramwell, 2014, p. 112). The city felt the early warning of impending globalization and deindustrialization with the closure or relocation of many local and international manufacturing firms dating back to the turn of twentieth century. Many of the firms – particularly the steel giants Algoma, Dofasco, and Stelco – were ill-prepared for the technological and organizational supply-chain innovations. Consequently, these companies found themselves burdened by the constraints of their "old world production role, as decreasing returns combined with the highly capital-intensive nature of innovation in the steel industry to limit the research and development resources, including retention of highly qualified personnel" (Warrian & Mulhern, 2003, pp. 37–38). The introduction and implementation of North American Free Trade Agreement (NAFTA) in 1994 exacerbated the steel industry's decline as the steel companies were forced to shift to the "American model of vendor-led technology development instead of relying on indigenous [local] technology development" (Warrian & Mulhern, 2003, pp. 55-56).

The decline and eventual demise of these large, medium and small industrial enterprises led to significant job loses – 11,000 manufacturing jobs were lost in 2006 alone (Bramwell, 2014, p. 113). These dramatic and sustained jobs-loses in the manufacturing sector threatened to expose the underlying cracks of city's social and economic fabric. At the same time, however, Hamilton had developed significant strength in its regional health care sector, anchored by Hamilton Health Sciences (HHS), which emerged as a major player in the local economy. The health care sector helped cover some of the job losses in the manufacturing sector – employing 10,000 workers (Bramwell, 2014, p. 113).

Curiously, as Warrian (2014) and Bramwell (2014) argue, the emergence of new knowledge-based health-care economic institutions was closely linked to the old-economy manufacturing institutions. What is unique to the Hamilton case is the impact of unions and old-economy labour market institutions on the demand side of the equation. While Hamilton Health Sciences, housed at McMaster University, acted as the source of ideas and critical R&D, the revenue streams were provided by union agreements – paid as union dues and health insurance premiums - in the health sector which allowed the private firms to become sustainable over the course of their development (Warrian, 2014). In many cases, employees covered through union agreements became the clients for the innovative medical technologies. In similar vein, steel industry executives were instrumental in building the Hamilton Health Sciences complex, as they brought to the table their expertise in how to manage multi-site, high-capital intensity, highly unionized environments (Warrian, 2014). Thus, amidst the chaos of transition, Hamilton developed a unique collaborative governance mechanism which relied heavily on the blending capacities of the civil society (unions) and policy entrepreneurship exercised by the non-governmental actors to drive change and implement policy innovation (Bramwell, 2014).

During this transition in the late 1990s and early 2000s, a number of non-industrial and non-governmental institutions emerged in a leadership role. McMaster University, which has had a strong research imprint on the Golden Horseshoe region, filled the institutional void that was created by the exit of industrial leaders. More importantly, it helped repair the structural holes in the knowledge networks that were previously assumed by Dofasco and Stelco. The university has both provided an alternative health science R&D base, but also strengthened the weakening manufacturing base through its strong engineering and entrepreneurship programs. It helped reboot the industrial linkages by partnering with Dofasco and Stelco and creating the academic-industry linkages that were previously missing in the ecosystem.

It was in this context that McMaster University administrators started considering the development of the Innovation Park in the early 2000s. The departure of Cameco – and the resulting loss of jobs and economic downturn in Hamilton – forced the key policy thinkers and administrators in the city to consider the options for future and ways to revitalize the city. Cameco reached out to the University administrators to "explore options to sell the lands privately as opposed to putting them on the open markets" (Key Informant no. 6, Personal Communication on MIP, June 6, 2016). University administrators considered it as "an ideal opportunity" to purchase the 37+ acres of land on the offer. The University thus obtained the land that housed Cameco's 100-year-old

Westinghouse/Cameco Warehouse and Manufacturing plants to be converted to an innovation park. Following the demolition and site reclamation activities that commenced in 2005, the building was completed in 2009. It has since developed a niche in the innovation community in Hamilton while maintaining linkages with the city's historical manufacturing and steel-town legacy.

5.2. Infrastructure

McMaster Innovation Park (MIP) occupies 50-acres of land in the core of Hamilton (McMaster Innovation Park, 2017c). The Park is located approximately two (2) kilometers from McMaster University at the helm of Provincial Highway 403, connecting to Queen Elizabeth Way. MIP consists of four completed buildings – called the ATRIUM (Central Building), McMaster Automotive Resource Center (MARC) and CanmetMATERIALS. The fourth building, BEAM which houses the Fraunhofer Centre has recently been completed and became functional in early 2018. These buildings provide office space, state-of-the-art technologically equipped laboratories, conference facilities and collaborative spaces for researcher and entrepreneurs in the region (McMaster Innovation Park, 2017c). Key amenities include: technologically equipped conference rooms, fitness facility, cafeteria and parking space.

Table 5.1. **Key MIP Buildings and Functions**

Building	**Area**	**Development Year**	**Focus**
ATRIUM @ MIP	18,600 sq. ft.	2009-2010	Start-up companies, accelerators, advanced research laboratories
CanmetMATERIALS	167,000	2011	Federal Research Laboratory
MARC	92,000 sq. ft.	2013	University Research and Teaching Facilities
BEAM	20,000 sq. ft.	2018	Health & Life Sciences Multi-tenant

Source: Adapted from McMaster Innovation Park (2017c)

5.3. Costs and Funding

The total cost of construction for the three buildings was $115 million. Land acquisition costs from Cameco, which amounted to $13 million, were additional to the construction costs. The cost of building was financed by the University through issuance of debt under the Trust. The University reached out to all three levels of government to seek their support towards the development of MIP. The federal government committed to locating one of its research laboratories, valued at $60 million; the provincial government committed $10 million to the park; and, municipal government provided $5 million. These funds have been further supplemented by federal ($12M), provincial ($4M) and municipal ($4M) support for the development of the Fraunhofer BEAM centre in 2017. It is important to note that the governments do not provide direct or indirect tax subsidies to the park or any break from developmental charges (Key Informant no. 1, Personal Communication on MIP, April 26, 2016). This highlights a lack of ongoing financial support from the municipal and provincial governments.

5.4. Organizational Structure and Governance

The governance structure comprises of a management team and a board of Directors – in line with “current best practices for public entities” (McMaster Innovation Park, 2014b). The board of directors “provide strategic guidance and maintaining accountability on behalf of the shareholders” (McMaster Innovation Park, 2014b). The management is responsible for developing “the vision, mission, values and strategic goals” and “executing the strategic and financial goals set out in the business plan of the park” (McMaster Innovation Park, 2014b). The MIP functions as a “separate arm’s length entity from the University” whereby the University is the owner and the park management serves as the trustee (Key Informant no. 1, Personal Communication on MIP, April 26, 2016). The management is responsible for providing “property and facilities development services and management support in support of the commercialization and innovation agenda” (Key Informant no. 1, Personal Communication on MIP, April 26, 2016).

The trust structure that governs the McMaster Innovation Park provides the park “a fair degree of independence to function as the custodian and developer of the assets while allowing McMaster University as the ‘owner’ of the assets to have an appropriate level of oversight and governance” (McMaster Innovation Park, 2014b). The trust is officially called the “First Longwood Innovation Trustee Corporation.” The Park operates under confirmation and direction to trustee between itself and McMaster University (Annual Sustainability Report 2013). It is a for-profit entity, whereby the profits accrue to the university under the trust agreement (Key Informant no. 1, Personal Communication on MIP, April 26, 2016).

The decision to keep MIP as a separate arm's-length entity from the university was "a strategic choice" (Key Informant no. 1, Personal Communication on MIP, April 26, 2016). According to another key respondent from the university administration, "the decision was made quite deliberately to set it up this way" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). While the university explored the option of retaining control of the park and operating it as "a department of the university", at the end of the day it was felt that the park would function better "as a standalone entity than in the hands of the university" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). This decision reflected a realisation by the university administrators that the academic organizations have "slower speed of action" than the commercial developers. It was then considered "in the best interest of the university, the researchers and the innovation community to set it up on a more remote basis" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

5.4.1. Board of Directors (BOD) and Management

The Board of Directors for MIP – appointed by the First Longwood Innovation Trust – is responsible for overseeing "the management of MIP's business and affairs in the interest of the beneficiary of the trusts, while continually monitoring the integrity of MIP, its officers and employees" (McMaster Innovation Park, 2014b). MIP's governance policy dictates that the BOD "should consist of a cross-section of highly professional and competent members" who bring in expertise to further the park's broad "legal, financial, operational and societal objectives (McMaster Innovation Park, 2014b).

The primary duties of the BOD can be categorized into five categories, namely: management selection, retention, succession and remuneration; strategy determination; monitoring and acting; policies and procedures; reporting to stakeholders; and general legal obligations (McMaster Innovation Park, 2014b). While the Board is responsible for managing the business of the park, it delegates most of its management responsibilities, including spending authorization, to the President and Chief Executive Officer (CEO). The CEO is responsible for overseeing the day-to-day affairs of the park and executes the goals, objectives and policies established by the Board of Directors (McMaster Innovation Park, 2014b). The management also provides regular updates and evaluation assessments of its activities and apprises them of key achievements and challenges in meeting the goals and objectives of the park.

5.5. Purpose, Functions and Activities

McMaster Innovation Park envisions being "an internationally recognized focal point for innovation, creativity, learning and research excellence aligned with the research strengths of McMaster University" (Graham & Douglas, 2014). Broadly speaking, the innovation park supports the creation of an innovation ecosystem. However, the Park does not run specific programs to support innovation. Nor does it undertake any business development and acceleration-incubation functions. These functions are performed by the

Innovation Factory or FORGE – organizations that are tenants within the MIP. The functions of these organizations are discussed in subsequent sections.

Formally, MIP's mission, as highlighted by the Mission Statement, is to develop and sustain an environment that is conducive to generation and transfer of knowledge through collaboration between educators, researchers and practitioners (Graham & Douglas, 2014). The overarching goal of the innovation park is to drive economic and social development by fostering and accelerating innovation and commercialization (Graham & Douglas, 2014). It aims to extend its global reach while building on McMaster University's research strength. It undertakes different activities with the aim to "educate and excite the community about the vital role of the University in the innovation process and inform them of the new developing technologies" (Graham & Douglas, 2014).

According to a key informant, the intent at the time of development was to "create a research park, leveraging the strengths of the University's engineering and health sciences" (Key Informant no. 6, Personal Communication on MIP, June 6, 2016). Similarly, another respondent highlighted the "strategic focus" of the park on "McMaster University's research expertise in the areas of in areas of engineering, automotive and health" (Key Informant no. 18, Personal Communication on MIP, November 11, 2016).

The park provides a physical as well as virtual space that is amenable to innovation. A key feature is the provision of co-working space at subsidized rents which provides an initial boost to the start-up companies locating in the park. The rents are graduated – which means that, for instance, if the market rate were $16 per square foot, the Park would offer a subsidized rate to the tenant of $10 per square foot and then gradually ramp up over time – until it gets to the point of cost recovery. These subsidized rates are offered for specialized services and organizations that "co-locate, connect and commercialize" – that is, facilitate interactions between different organizations and individuals in the innovation ecosystem. These may also include university research institutes (Key Informant no. 1, Personal Communication on MIP, April 26, 2016). In the words of a key informant, the Park "provide[s] a centralized place for businesses, start-ups, and supporting organizations to co-locate," to bring "innovative technology companies to Hamilton to work closely with the University", and provide a "supporting environment" to students from the University to acquire entrepreneurial skills and resources to "start technology-related businesses" (Key Informant no. 12, Personal Communication on MIP, October 21, 2016). According to another key respondent, the defining idea for MIP was to connect academic research and "promising inventions or discoveries" from other research-based organizations to the market. The park would serve as a "forum where individuals with skills in new [technology] development would come together to potentially further the idea and take it through the various stages of commercial development so it could be turned into a product that can be sold into the commercial market" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

A senior university administrator – closely involved with the functioning of the park – agreed that the park's primary function is "to provide space in which researchers and people who are in the business of developing discoveries can be housed next to one another and benefit from that proximity" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). However, this function has somewhat evolved since the inception of the park and increasingly MIP has become a place "entrepreneurs experiment with ideas and explore their commercial potential" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). This experimentation along with close proximity to people who are able to build the commercial potential of the discovery, these ideas tend to move more quickly towards truly being commercialization (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

Although the management of the park does not engage in direct innovation-related programming, there is a strong focus on stakeholder engagement. The engagement process with stakeholders, which include employees, tenants, McMaster University and local communities, takes various forms such as newsletters, conferences, and social media and community events. These engagement activities allow the park to gain visibility and capture a key place in the network. It becomes the location for both network buzz and knowledge pipeline (Bathelt et al., 2004, p. 35).

5.6. Tenant Profile and Focus

According to individuals familiar with the planning process and development of the park, the MIP was intended to "reflect the research strength [the university] had in areas of engineering, automotive, and health" (Key Informant no. 18, Personal Communication on MIP, November 11, 2016). From that point of view, one of the first opportunities was to attract the federal laboratory called CanmetMATERIALS – which is one of the laboratories under the Department of Natural Resources Canada and is considered the top national laboratory with regards to materials research. The University also has had long term partnerships with the three Original Equipment Manufacturers (OEMS) from Detroit, namely General Motors, Chrysler and Ford. The University recognized that a physical space was required to help these partnerships flourish and also work with the part suppliers for those companies. It was estimated that for each one assembly line job, which is really important for the province, there are two supply part jobs in Ontario: there are 40,000 people working in non-automotive assembly lines whereas there are 80,000 people working in parts manufacturing and supplying jobs (Key Informant no. 18, Personal Communication on MIP, November 11, 2016). In order to leverage these partnerships and build on the potential reach of McMaster's mechanical engineering and automotive research capacity, the McMaster Automotive Resource Center was established in the MIP with support from the federal government. Finally, the third element was healthcare – which has been developed around McMaster University's exceptional Health Science Program as well as the advanced health sciences services in the City of Hamilton (Key Informant no. 18, Personal Communication on MIP, November 11, 2016). The health sciences activities at MIP thus focus on biomedical engineering and commercialization of related R&D. MIP has recently opened its doors to a collaborative initiative with the German-based Fraunhofer Institute to advance biomedical engineering innovation. The overall focus, however, remains on advanced manufacturing – in materials, automotive as well as biomedical sciences.

According to a key respondent, "the development of central themes was both organic and deliberate," reflecting the geographical and historical realities of Hamilton

(Key Informant no. 3, Personal Communication on MIP, May 16, 2016). The City has been a "very significant player in the steel, auto-parts, and metal areas" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). This, combined with McMaster University's strengths in mechanical engineering and "metal research," led to MIP's central focus on advanced manufacturing. Another "natural area of focus" would be the Health Sciences, which is bolstered by the "high volume and quality of health sciences research done at McMaster University" and a strong network of hospitals and health-care providers in the City of Hamilton (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

Over the years, however, other organizations involved in Information Technology have also been a tenant of MIP thus diversifying the focus areas for the innovation park. As shown in tables 5.2. (a & b), MIP has predominantly private-sector tenants (65%) that deal with cross-sectoral issues (45%) – a combination of advanced materials, health sciences and information technology.

Table 5.2. (a) MIP - Institutional Breakdown of Tenants

Institutional Affiliation	Number	Percentage (%)
Industry	36	65
Academic	13	24
Government	3	5.5
Bridge/Cross-sectoral	3	5.5
Total	**55**	**100**

Source: Author's Compilation based on (McMaster Innovation Park, 2017c)

Table 5.2. (b) MIP - Sectoral Breakdown of Tenants

Sector	Number	Percentage (%)
Advanced Materials & Manufacturing	10	19
Health & Life Sciences	10	19
ICT	9	17
Cross-Sectoral	24	45
Total	**55**	**100**

Source: Author's Compilation based on (McMaster Innovation Park, 2017c)

5.7. Key Organizations

Table 5.3. Key Organizations and Roles

Organization	Sector	Role
McMaster University	Academic	Landlord / Board of Directors/ Funder
Ministry of Research, Innovation and Science	Government – Provincial	Funder
National Research Council – Industrial Research Assistance Program (NRC-IRAP)	Government – Federal	Funder
City of Hamilton	Government – Municipal	Funder
Innovation Factory	NPO/Government	Accelerator/Bridge Organization

5.7.1. Government Organizations

5.7.1.1. Municipal - City of Hamilton

The City of Hamilton has a strong presence of academic institutions that provide a "diverse and strong research and talent base" (City of Hamilton, 2017). The City also boasts strong infrastructural facilities and institutional expertise in manufacturing owing to its "historical manufacturing legacy" (City of Hamilton, 2017). As highlighted at the beginning of the chapter, the city has gone through significant upheavals over the last two decades as a result of the demise of its steel industry. Subsequently, the municipal government has tried to bring the city to limelight by further diversifying its economic and R&D base into the life sciences fora. The municipal government has also made deliberate attempts to develop a global manufacturing and R&D reach by inviting American corporations to invest in the local steel manufacturing. The German Fraunhofer institute has entered into a collaborative arrangement with the McMaster University to develop the life sciences/medical biotechnological innovation capacities within the Innovation Park (Key Informant no. 18, Personal Communication on MIP, November 11, 2016). In this regard, the city officials have particularly marketed the city's strategic geographic location and its proximity to the United States as well as accessibility to transport and communication networks that facilitate its linkages to the rest of the world (City of Hamilton, 2017).

City of Hamilton is a significant collaborator and supporter of MIP – it funds and promotes the park as a key tool within its economic development agenda. As mentioned previously, the city has funded approximately $ 9 million for the development of various MIP buildings. It also actively promotes the activities of the park on its website and other promotional materials (City of Hamilton, 2017). The City, however, does not play a role in the management of the park – neither the councillors nor the City officials are represented on the Board of Directors. As highlighted by one of the respondents, this impedes the city's ability to have an effective input into the governance and strategic planning of the park activities (Key Informant no. 6, Personal Communication on MIP, July 22, 2016).

5.7.1.2. Provincial Government – Ontario Centres for Excellence

The Ontario Centres of Excellence (OCE) was originally established in 1987as a not-for-profit organization comprising of seven independent centres. These centres were eventually amalgamated into one central organization in 2004 (Ontario Centres of Excellence, 2017). The OCE is considered a key driver of "commercialization of cutting-edge research" in "strategic market sectors" that contribute to the economic development and competitiveness of the Province nationally and globally (Ontario Centres of Excellence, 2017). Its mandate is to help generate economic growth for the province of Ontario through connecting companies with research and development opportunities. The central focus of OCE's work is those projects and areas that have the greatest potential for providing both economic and social impact across the province. The OCE partners with the industry to actively "co-invest" in emerging technologies and research from the province's research organizations and academia (Ontario Centres of Excellence, 2017). It provides technical and financial support to early-stage projects, which in its assessment have the potential for "substantial returns" and "commercial success" (Ontario Centres of Excellence, 2017). The OCE also focuses actively, through its "entrepreneurship fellowships and programs for students and youth," on the development and training of "next generation of innovators"(Ontario Centres of Excellence, 2017). It is currently funded by the Government of Ontario's Ministry of Research, Innovation and Science, and has partners across a broad set of federal organizations including the NSERC, NRC-IRAP, Connect Canada and BDC, all of which provide complimentary programming to OCE. These partnerships ensure effective and efficient delivery of "complimentary innovation services and funding

The OCE has offices and Business Development Managers located within several innovation parks including the MIP and DJRTP. One of the key respondents affiliated with OCE and servicing the MIP-DJRTP-London corridor suggested that the OCE servers as the "advisors and connectors" (Key Informant no. 25, Personal Communication on MIP, November 29, 2016). The Regional Innovation Centres (RICs), that are funded by the Ministry of Research, Innovation and Science, connect the entrepreneurs with the "residents that can help a company walk through the challenges of the innovation process" and "help the local entrepreneurs to commercialize or take their idea to the market" (Key Informant no. 25, Personal Communication on MIP, November 29, 2016). The OCE-RICs provide a wide range of services including "programming for entrepreneurship 101," entrepreneur residents with expertise in business development planning, and legal and accounting services to guide the clients on critical aspects of IPR and tax rebates for start-ups (Key Informant no. 25, Personal Communication on MIP, November 29, 2016).

5.7.1.3. Federal Government – CanmetMATERIALS

The CanmetMATERIALS research centre, part of the federal department of Natural Resources (NRCan), has the mandate of developing and deploying "clean-technologies" using and promoting Canada's natural resources, in particular metals and minerals (Government of Canada, 2007). The laboratory undertakes R&D in advanced manufacturing related to minerals and metals, including "metals and materials fabrication and processing and evaluation of value-added products derived from metals and minerals" (Government of Canada, 2007). The key focus areas of CanmetMATERIALS's research are: transportation, energy and metal manufacturing (Government of Canada, 2007; McMaster Innovation Park, 2017a). It works with leading vehicle manufacturers and their supply-chain providers to develop advanced manufacturing and clean technology solutions to improve fuel efficiency and enhancing safety and performance of vehicles (Government of Canada, 2007). Similarly, the laboratory also collaborates with energy companies to develop "clean energy solutions" and contribute to the development of reliable pipelines for the transport of natural resource products including diluted bitumen, and liquefied natural gas (LNG) (Government of Canada, 2007). In addition, it serves a number of other advanced technology sectors such as "defence, aerospace, health, and construction" (Government of Canada, 2007; McMaster Innovation Park, 2017a). .

The move of CanmetMATERIALS facilities from Ottawa to MIP in 2011 was influenced by the strategic consideration of being "located at the centre of the Canadian manufacturing sector" in Southwestern Ontario (McMaster Innovation Park, 2017a). The laboratory is located in a linked complex in MIP that constitutes of "high and mid bay laboratories, low bay laboratories, and non-destructive testing labs" that boast state-of-the-art industrial grade and advanced laboratory equipment and facilities (McMaster Innovation Park, 2017a).

The decision to relocate, according to a key respondent, was strategic and 'much over-due' for the federal laboratory. Many of NRCan's scientific operations date back to mid-1900s. Consequently, the equipment and the buildings in which they were based had reached their useful life and had to be renewed or renovated. NRCan had been considering rebasing its CanmetMATERIALS operations; however, action was delayed due to lack of capital funds. Departmental management continued the operations in innovative ways; however, by the early 2000s, some of the equipment and the facilities had become irreparable. Thus, the departmental advisory board had started to explore ways of improving the capital conditions. Among these considerations was the choice between renovating or rebuilding the facilities in Ottawa or rebasing some of the facilities in other regions in the country. In Ottawa, CanmetMATERIALS facilities were not near any of the major industries served by it. One of the Line Pipe Steel Plant in Canada was in Saskatchewan and most of the manufacturing occurs in the Southern Ontario region (Key Informant no. 31, Personal Communication on MIP, December 3, 2016).

Moreover, there are no universities within 100 kilometers of Ottawa with a specific Materials based research education program. Thus, the decision to locate in Hamilton – at the MIP – allowed the CanmetMATERIALS to be within 100 kilometers of five universities and colleges with programs in Materials, five automotive assembly plants and 450 manufacturing plants that supply to the Auto Industry (Key Informant no. 31, Personal Communication on MIP, December 3, 2016). The federal government also recognized the strength of McMaster University in materials R&D, which aligned with CanmetMATERIALS's mandate (Key Informant no. 31, Personal Communication on MIP, December 3, 2016).

The decision to move the facilities to MIP may have had some political underpinnings – that is, constructing or reconstructing a building in Ottawa might have been a harder sell than to relocate to the regions. Moving the facility to the region would highlight federal government's efforts in bringing high-paying jobs to the region, which was suffering an industrial decline (Key Informant no. 31, Personal Communication on MIP, December 3, 2016). While the analysts had been preparing options for new facilities – including move to a new location in one of the regions – the window of opportunity to locate to MIP was materialized through consistent support of senior management including the Deputy and Assistant Deputy Ministers at NRCan. Nonetheless, the decision was taken after deliberate consideration and an in-depth cost-benefit analysis which heavily weighted the benefits of easier access to industry and academic clients (Key Informant no. 31, Personal Communication on MIP, December 3, 2016). The laboratory thus relocated to MIP as a rent-paying tenant, which provided an opportunity for the federal government to funnel financial support to the park. It also allowed the laboratory to gain access to new laboratory equipment at the time of negotiations – which helped advance its scientific mandate (Key Informant no. 31, Personal Communication on MIP, December 3, 2016).

5.7.2. Research Organizations

5.7.2.1. McMaster Automotive Resource Center (MARC)

The MIP is also home to the McMaster Automotive Resource Centre (MARC), which is a Canadian research leader in advanced automotive research including electric and hybrid vehicles (McMaster Innovation Park, 2017b). The MARC brings together scholars and researchers from pure and applied sciences as well as social sciences to holistically tackle the issues experienced by the automotive industry. Some examples of the research focus of MARC includes "development of hybrid and electric powertrains, building highly efficient and cost-effective powertrain components and identifying light materials to make cars more fuel efficient" (McMaster Innovation Park, 2017b). The MARC complex at the MIP has three research institutes located in it including Centre for Mechatronics and Hybrid Technologies (CMHT), Centre for Automotive Materials and Corrosion, and the Network on Engineering Complex Software Intensive Systems (NECSIS) as well as an academic program on Automotive and Vehicle Technology. Each of these institutes is lead by leading scholars in the fields of mechanical engineering and computing and software technologies (McMaster Innovation Park, 2017b).

The research institutes in the MARC are all part of McMaster University's academic R&D programs. However, most of these institutions have strong linkages with industry – particularly OEMS such Ford, BMW and Chrysler. Other collaborators include: DMV, KATEX and local start-ups such as ATES and Nano-Spark (Key Informant no. 38, Personal Communication on MIP, March 2, 2017). Most of the research is sponsored by an industry partner who is generally benefitting commercially from the results of research. The industry also utilizes the research facilities on cost-recovery basis to undertake R&D. The funding of these laboratories, which is largely done through federal and provincial government grants, is also contingent on industry-leveraged funding at a 1:1 ratio – with half industry funding as cash and the rest as in-kind. Most of the grants require an industry co-applicant for these programs (Key Informant no. 38, Personal Communication on MIP, March 2, 2017).

A key mandate for these research laboratories is commercialization of R&D. A key informant with one of the research centers highlighted that the research centers are "always trying to commercialize [their] research" (Key Informant no. 38, Personal Communication on MIP, March 2, 2017). The research centers often have an industry liaison which aims to facilitate linkages between industry, academia and government.

5.7.2.2. BEAM

The newest addition to MIP is the collaborative initiative between McMaster University and the Fraunhofer Institute for Cell Therapy and Immunology that has been developed to foster innovative healthcare technologies in the field of "cell therapy and point-of-care diagnostics" (McMaster University, 2018). The new centre, launched in 2015 and inaugurated in March 2018, is called the Fraunhofer Project Centre for **B**iomedical **E**ngineering and **A**dvanced **M**anufacturing (BEAM). The centre will focus on "applied research and development in life sciences and biotechnology" including production of cells through novel, advanced procedures, stem-cell preparation, and biomedical devices and bioinformatics (McMaster University, 2018).

The collaborative initiative is expected to extend MIP's reach into the global biomedical industry through partnerships and "spin-off companies to commercialize new technologies" (McMaster University, 2018). A significant part of the collaborative efforts between McMaster and Fraunhoufer IZI will focus on automating cell production processes by using the cutting-edge biosensor technologies that enable real time monitoring. Moreover, the use of large-scale production methods is expected to give rise to opportunities for the development of point-of-care technologies which will further facilitate joint ventures and start-up businesses in this area (McMaster University, 2018) .

Several organizations, including McMaster University, Fraunhofer IZI and all three levels of government, have contributed a total of $33 million in funding for the new centre (McMaster University, 2018). Federal government, through the FedDev Ontario Agency, has committed $12 million and the provincial and municipal governments have allocated $4 million each towards the development of the centre. The project is expected to extend MIP's reach globally and increase collaborative R&D opportunities between Canadian and German researchers as well as small businesses and multi-national corporations. It is also expected to contribute significantly to the economic growth by creating 74 to 100 full time jobs (McMaster University, 2018).

5.7.3. Bridge Organizations – Incubators and Facilitator Organizations

5.7.3.1. Innovation Factory

Innovation Factory (IF) is one of the Ontario Network of Entrepreneurs (ONE) RIC that is mandated to contributed to economic development and job creation by "helping entrepreneurs bring new ideas to market" (McMaster Innovation Park, 2017b). It seeks to "build a dynamic culture and a community of innovation" by encouraging and supporting the SMEs to expand business opportunities by introducing innovative technologies into the market. The key activities of the IF include informational and support programming for entrepreneurs including workshops, collaborative peer sessions and one-on-one mentorship (McMaster Innovation Park, 2017b). The mentors work with individual clients on long-term basis as their "business coach" and advise them "through numerous stages of business growth" (McMaster Innovation Park, 2017b). They also help the entrepreneurs connect with the sources of venture capital and funding organizations such as OCE, Angel One and Futurpreneur. The IF also provides clients Intellectual Property consulting through its partner organizations (Key Informant no. 37, Personal Communication on MIP, February 21, 2017). In providing these varied services, it also fosters networks with the City of Hamilton, local post-secondary institutions, industry leaders, non-profit and other professional organizations.

Innovation Factory was created by the Province to further the provincial innovation and entrepreneurship agenda. 75% of IF's funding is provided by the provincial government; the other 25% comes from partner organizations such as McMaster University, City of Hamilton, Mohawk College, and private enterprises including KPMG, Deloitte, BDO – who want access to the IF clients with both their services and their knowledge. The organization is closely affiliated with the MaRS Discovery District in Toronto which serves as the head-office in managing financing and performance accountability of the Innovation Factory. The classroom events at IF are also conducted in close collaboration with MaRS (Key Informant no. 37, Personal Communication on MIP, February 21, 2017).

The Ontario Network of Entrepreneurs (ONE) essentially provides the funding for Innovation Factory in two ways: one is via an operational fund that comes out of the Ministry of Research and Innovation and Ministry of Economic Development. The funding is funneled through the ONE, which oversees the larger group. This operational funding is used to support the rent and operational staff. The other aspect of funding, known as the Business Advisor Program (BAP), is administered by MaRS Discovery

District in Toronto. The BAP funds the executives-in-residence and clients' services staff (Key Informant no. 37, Personal Communication on MIP, February 21, 2017).

The IF works closely with McMaster University and Mohawk College to co-apply for certain funding programs offered through provincial and federal governments. It also works closely with other large anchor tenants of MIP, in particular MARC, to coach and prepare students and young researchers to market their ideas and convert them into commercial products. According to key informants interviewed, there is a certain degree of confusion in regard to the relationship between MIP and IF. Sometimes these two organizations are considered as one entity. It was noted that this may be "because some of the large organizations like mARS are both a real estate play and innovation center" (Key Informant no. 37, Personal Communication on MIP, February 21, 2017). However, in the case of MIP and IF, there is a landlord-tenant relationship. The IF is a tenant and MIP provides discounts for renting the offices and meeting spaces to the IF. MIP also provides strategic advice through its involvement in the Board of Directors of the IF. According to a key respondent, "it is a good symbiotic relationship where the landlord [MIP] is promoting innovation through co-working spaces and the tenant [IF] has the grassroots people to work one-on-one with clients" (Key Informant no. 37, Personal Communication on MIP, February 21, 2017).

5.8. Outcomes and Impacts

According to the 2013 Economic Impact Report, commissioned by the park management, the economic impact of all tenants at MIP on the city of Hamilton is approximately between $38 and $50 million in terms of generated revenue and GDP. For

Ontario, the projected economic impact is approximately from $39 to $52 million. In terms of employment, approximately 700 to 725 jobs are attributed to MIP in City of Hamilton and Ontario. These impacts are based on the direct project impact of salaries, purchases and employment information and are further augmented by multiplier effects as a percentage of money spent in the local area is re-spent within the same region (for a detailed discussion of methodology, see (McMaster Innovation Park, 2014a).

However, these quantitative impacts were not corroborated during the course of this research. Many of the interview respondents remained sceptical regarding the realized impacts of MIP on the Hamilton and regional economy and its contribution to the innovation ecosystem. One respondent suggested that while the park has played a positive role in Hamilton's ecosystem, it cannot be quantified. While the MIP boasts a greater number of individuals employed by its tenant organizations than those employed by Cameco while it occupied this location, it is not clear if these numbers represent new jobs or "simply those who moved from another building in the city to this location." (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). The key informant suggested that "a large percentage of them would be those who have relocated" from other parts of the city (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). According to another respondent, the contribution towards innovation requires other measures than presence of university research institutes. While the research institutes create the "buzz" on a given day, they may not be a significant contributor to innovation and commercialization at the innovation park (Key Informant no. 6, Personal Communication on MIP, July 22, 2016).

While there was some recognition by the respondents that MIP has achieved its goals to a considerable extent, respondents also felt that the ‘momentum has been lost’. Some of it was attributed to the 2008 global economic downturn; ‘lack of vision and strategic planning’ were also deemed important in the failure of the park to achieve the targeted impact. Some respondents, primarily from the university and the park management, suggested that innovation parks require long time horizons to achieve their stated goals and given that the MIP has been in place since 2005 – not fully operational until few years later, it has done well to make progress. Another respondent attributed lack of success to funding availability from public sector which is “always hard to get and there is a lot of competition” (Key Informant no. 18, Personal Communication on MIP, November 11, 2016).

Nonetheless, majority of the respondents pointed to the positive contributions of MIP, including easy access to industry and academics, visibility with different levels of government and peers, and networking and collaborating with other entrepreneurs and innovators. For instance, one respondent suggested that “a significant advantage of being here is that [MIP] attracts a lot of visits by politicians and industry delegations – that helps the whole park. As well as those people might be coming into the park for other reasons and we get exposure to them as well” (Key Informant no. 38, Personal Communication on MIP, March 2, 2017).

A key respondent from one of the university research institutes at MIP highlighted proximity to CanmetMATERIALS laboratory as an advantage. They contended that it allows the researchers from other institutes on the MIP campus to be “better connected with" the CanmetMATERIALS researchers which can be a significant "learning experience" for the young or junior academics (Key Informant no. 38, Personal Communication on MIP, March 2, 2017). Another respondent suggested that over the years, the park has improved and learnt from experience (Key Informant no. 25, Personal Communication on MIP, November 29, 2016). According to the respondent, the MIP has recognized the gaps that existed in promoting its tenants as well as information sharing within the park (Key Informant no. 25, Personal Communication on MIP, November 29, 2016). The management has increasingly started to focus on internal and external communications to highlight its tenants and their achievements (Key Informant no. 25, Personal Communication on MIP, November 29, 2016).

5.9. 3-I Analysis of MIP

5.9.1. Institutions

MIP's institutional design is predicated on an arms-length Trust-Trustee relationship with McMaster University. In this sense, MIP operates independently – at least in theory - from the University, all three levels of government, and industry. This strategic choice was made to distance the university from management and operational decisions of MIP. However, this design was also intended to signal a separation between the pure R&D functions of the university and the entrepreneurial activities of the innovation park. It also provided the opportunity for the MIP to be nimbler and move quickly in response to the private sector needs.

In terms of government involvement, all three levels of government have provided funding – on a matching basis. The concept of matching funding means that after one proponent - McMaster University in MIP's case – commits funding for the project, all levels of government match those funds at a certain ratio (dollar for dollar or a certain multiplier). The matching funding approach is taken to signal collaboration across all levels of government; however, it is also a strategic attempt by each government to force the hand of other levels – primarily federal government which enjoys considerable fiscal leverage. Once one level of government commits funding, the other levels of government do not want to be seen as not acting to resolve a policy problem – in this case developing infrastructure to support innovation and knowledge-based economic development. Despite significant funding from all levels of government, none of these organizations are represented on the BOD which has implications for strategic direction of the innovation park.

Beyond these, the rationale for federal government's involvement in MIP was largely to renew its R&D laboratory that would be strategically located close to its industrial base – namely automotive and advanced manufacturing. The funding support for MIP also coincided with federal government's broader policy direction to collaborate with municipalities to support infrastructure development. The municipal government had a strong interest in the economic revival of the city which had experienced significant upheaval in the face of the exodus of steel industry. For the provincial government, support for MIP was an extension of its regional economic development and innovation agenda.

5.9.2. Interests

The departure of steel giants, namely Dofasco and Stelco, created a void for other powerful players to emerge. McMaster University took the leadership role in this regard and considered this an opportunity to expand its research mandate in strategic areas of engineering and health sciences. The preferential treatment given to the University by Cameco in land acquisition also points to the strong existing links between industry and academia. The setup of MIP also allowed the senior university administrators to expand and consolidate their power across diverse areas.

While private sector organizations make up 65% of MIP's tenant list, a closer look indicates a remarkable absence of large industry players. Most of the private sector organizations are small-scale start-ups. Another important feature that is evident from this list of tenants, summarized in table 5.2 (b), is the lack of clear sectoral focus. The specialization of tenant organizations is equally distributed across advanced manufacturing, health sciences and ICT sectors. This means that power is not concentrated in any one sector and rather organizations representing different sectors could exert relatively equal power in opposing directions thus diluting their influence even further.

What is most noticeable from the summary tables in section 5.6 is the significant presence of University-based research organizations lead by MARC, which focuses on automotive-based research. Along with CanmetMATERIALS laboratory of the federal government, these organizations bring considerable resources to the table and have the potential to influence strategic decision-making. While their representatives are not members of the board of directors, they certainly have the might within MIP to gain decision-maker's attraction. This also suggests that key activities within MIP focus on pure R&D contrary to its mission of undertaking applied R&D and commercialization. University administrators also hold a large number of positions on the Board of Directors positions, which gives them significant influence on the decision-making and setting of strategic direction for the innovation park. From university administrator's perspective, MIP could provide a highly visible real estate space which could advance their institutional mandate of pure R&D by expanding the financial avenues. The R&D programs placed in the innovation park are those that high on governments' radar for their potential to contribute to economic development and innovation. Their strategic nature makes them an ideal candidate for government funding, above and beyond the funding that is available to the university through regular channels of grants and transfers.

The network of bridge organizations that work closely with government organizations also provide another point of influence. The Innovation Factory enjoys considerable influence within the provincial government bureaucracies and work closely with the mar's innovation hub. It is potentially one of the largest benefactors of MIP and extends this advantage through its networks with private and public sector. The strong network of municipal, provincial and federal bureaucrats further provides a strong support base for the innovation park. These networks of front-line program administrators and government bureaucrats have also been responsible for propagating ideas and forcing an ideational convergence by using the financial resources at their disposal.

5.9.3. Ideas

The ideational frame at the centre of MIP has been Hamilton's economic revival and diversification of economic competencies. This theme was evident across multiple interviews of MIP stakeholders. As discussed at the beginning of this chapter, Hamilton underwent a strenuous period, with the large-scale exodus of local steel manufacturing base and take over by foreign multinationals. Hamilton experienced an existential crisis of sorts – with policy-makers scrambling for ways to put Hamilton back on the global competitiveness map. The economic revival discourse featured utilizing and expanding the R&D competencies residing in McMaster University. A key aspect of this strategy is the attraction and retention of world leaders in science and highly qualified personnel. Both federal and provincial governments provided funds to invite Dr. Ali Emadi – a globally renowned scientist specializing in hybrid powertrain – from the United States to setup the McMaster Automotive Resource Center (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). Much of the activity at MIP and MARC has thus been fuelled by the notion of developing a strategic knowledge-base in advanced manufacturing and automotive industry.

6. David Johnston Research and Technology Park

6.1. Background and History

The David Johnston Research and Technology Park (DJRTP) is situated in Waterloo, Ontario, on the campus of University of Waterloo. The University, the City of Waterloo and the Regional Municipality of Waterloo – comprising of mid-sized Ontario cities of Cambridge, Kitchener and Waterloo or “The Technology Triangle”– are widely regarded as one of the model economies for Canada and a “hotbed of innovation in information technology and high-tech manufacturing” (Nelles, 2014, p. 88). The “Canada’s Technology Triangle” – founded in the 1980s – has been central in driving the shift away from “traditional manufacturing” to the “new IT-based economy” (Munro & Bathelt, 2014). The new IT-based companies have led to “above-average results in regional economic growth highlighted through employment and household income indicators” (Munro & Bathelt, 2014, p. 220).

Several high-profile firms located in this region, including Open Text and Black Berry (Research in Motion), exemplify the success stories of spin-offs started by researchers and university students which have grown into large-scale, innovative technology firms in the region (Bathelt & Hecht, 1990; Munro & Bathelt, 2014; Wolfe, 2009). The success of these home-grown companies has attracted international attention and investment of companies such as Google, Intel, Electronic Arts, 3M, and Oracle (Nelles, 2014, p. 88). The region has also attracted significant federal and provincial funding to build the Ontario Technology Corridor, $50 million worth of funding for the Balsillie Centre of Excellence in Global Policy and recently in 2017 a swath of multi-level government funding to advance scientific R&D and public transit infrastructure capabilities of the Region (CBC, 2017; Government of Canada, 2016; Nelles, 2014).

Local economic development efforts in the Kitchener-Waterloo region are driven by private-sector associations and public-private partnerships such as the regional chamber of commerce, the high-tech industry association (Communitech), and the regional marketing alliance (Canada’s Technology Triangle Inc.). These partnerships have been incredibly active in visioning exercises, setting priorities for economic development, and stimulating processes of social learning and network building in support of the region’s innovative enterprise (Nelles, 2014).

Despite the focus on new-post-industrial high-tech industries as the driving force behind Waterloo region’s economic fortunes, the Region has historically been home to a diverse range of manufacturing firms (Munro & Bathelt, 2014). In the first half of twentieth century, the Region displayed “economic strengths in the rubber, textile, leather, furniture, and food processing industries; in the post-second world war period, manufacturing growth was driven by industries such as fabricated metals, machinery, and electrical products” (Munro & Bathelt, 2014, p. 225). It has also developed competencies in dealing with a thriving automotive and transportation sector supply-chain (Munro & Bathelt, 2014).

There are two somewhat contradictory accounts of Waterloo-Cambridge-Kitchener Region’s transformation from a traditional manufacturing-based economy to an IT-based focus. One strand of research attributes region’s transformation to individual-firm competencies (Munro & Bathelt, 2014) whereas the other (Nelles, 2014) ascribe it to collaborative and associative governance models.

According to Munro & Bathelt (2014), local firms do not necessarily have close ties to other local firms in terms of their technological and knowledge base. This is contrary to the popular belief that firms are regionally linked through cluster-like relations or other forms of inter-firm networks which facilitate knowledge transfer and growth triggers. However, this particular case study found such networks to be weak or lacking – consequently, limiting local networking opportunities and inter-firm knowledge flows (Munro & Bathelt, 2014). Instead firms engage in in international linkages to provide the necessary growth impulses, both within corporate networks and through inter-firm linkages. The researchers concluded that restructuring successes in the region were primarily due to individual-firm competencies, rather than being the consequence of collective action (Munro & Bathelt, 2014, p. 236).

On the contrary, Nelles (2014) has argued that in a city-region like Kitchener-Waterloo, where the governance coalition is undeniably led by economic actors, the prevailing discourse is liable to be driven by economic interests. This opens up the possibility that civic governance in the entrepreneurial community may pursue strategies that support profit over equity, and growth over inclusion, particularly in times of fiscal stress. Yet the culture of the community of self-helpers, of engaged corporate citizens of committed philanthropists – speaks to an ingrained tradition of collaboration and civic coalition's effects on the governance agendas. Over time the economic innovation agenda has evolved and incorporated a broader array of voices and concerns. This suggests that the struggle between economic and social governance agendas is not as zero-sum as it is sometimes portrayed and that economic-social hybrid styles of governance can emerge.

Accordingly, the mythical "Waterloo Way," in which civic actors are active in directing economic development trajectories, is as a manifestation of the associational model of governance in which the state is just one among several actors involved in orchestrating regional growth (Nelles, 2014, p. 89). Collaborative governance of this nature is based on "supportive social relationships among a range of actors that intensify processes of social learning. The implication is that, where civic engagement in economic development is encouraged, policy reflexivity, adaptability, and responsiveness will be enhanced" (Nelles, 2014, p. 90).

The social relations are further facilitated by the presence of hard (physical) and soft (high quality personnel) infrastructures. In the former category, the David Johnston Research and Technology Park has a central place. Known to house global IT powerhouses such as Google Inc. and OpenText as well as plethora of local, small to medium scale corporations and start-ups, the Park provides the infrastructural support necessary to bring together the disparate actors. Along with the bridge organizations (discussed below in section 6.7), the park acts as the vehicle and glue for civic engagement in the Waterloo region.

The Research Park owes much of its existence and development to the "vision and planning of the [former] Governor General of Canada, David Johnston, who was the president of the University of Waterloo at the time the park was developed and started operations" (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). Planning for the DJRTP began in the mid-90s, when the University of Waterloo launched a Campus Master Plan to provide a framework for future campus development that would be aligned with the University's entrepreneurial traditions and innovative nature. However, the government policy support was added to these plans in early 2000s under the leadership of David Johnston when he was appointed the President of the University. David Johnston was central in planning the park and bringing the key government and private sector stakeholders to the table. The Regional and municipal governments were the first to announce their support, followed by provincial and federal governments. The park officially started operations in 2002 with Sybase as first anchor tenant (University of Waterloo, 2017d).

6.2. Infrastructure

The DJRTP is situated on the South campus of the University of Waterloo – north of Columbia Street. The park consists of approximately 1.2 million square feet of floor space in several buildings that are built on 120-acres of University owned lands (University of Waterloo, 2017c). These eight buildings boast tenants from a wide range of technology intensive companies that collaborate with the University of Waterloo to pursue applied R&D and innovative technology development (University of Waterloo, 2017c). The Accelerator Center, which occupies 20,000 square feet of real-estate space, is at the heart of innovation activities as it provides space for new start-ups and growing companies in the technology fields. The Accelerator Building, on the other hand, houses tenants in the innovation support services fields such as consulting, venture capital and legal services (University of Waterloo, 2017c). The DJRTP also features open spaces – including accommodation for storm water ponds that reach to the heart of site from the

University's Environmental Reserve – and other informal gathering spaces as well as pathways and trails that link the various buildings together. The park is accessible by public transportation and is part of the provincial light rail transit plan that will be functional in 2018 (University of Waterloo, 2017c).

6.3. Costs and Funding

The DJRTP is a $214 million project, funded through joint contributions by the Federal, Provincial, Regional and Municipal governments. The City and Region of Waterloo were among the first supporters of the park with a combined $13.4 million funding towards the early phase development of the park (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016; University of Waterloo, 2001). The "Super Build Federal-Provincial Infrastructure Program," that was instituted to provide funding for municipal infrastructure, contributed approximately two-thirds of funding for the DJRTP (University of Waterloo, 2001). Both federal and provincial governments provided $13.4 million each towards the development of DJRTP as part of the Super Build program (University of Waterloo, 2001). The University of Waterloo provides ongoing funding towards the operations of the DJRTP – including the Accelerator Centre (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016).

6.4. Organizational Structure and Governance

DJRTP, being situated on the lands designated for the University, operates as part of the University of Waterloo administration system – that is, the park is governed by the public trust statutes of the University. The land management strategy is provided by the Campus Master Plan: Framework for Development. The framework stipulates the acceptable usage of North Campus lands, where DJRTP is situated – to “encourage activity…which has not only potential for transfer of knowledge between University research activities and the private sector, but also for formal linkages to be established enterprises where there are clearly-defined benefits for [the University of Waterloo]” (University of Waterloo, 2003, p. 1). The governing documents designate University of Waterloo as the title owner of the lands - upon which DJRTP buildings are constructed – thereby according the University wide-ranging authority over decisions concerning the type, size, number and objectives of the firms that locate at the DJRTP (University of Waterloo, 2001). The Board of Governors of the University of Waterloo is responsible for strategic and financial decisions concerning the DJRTP.

6.5. Objectives and Activities

The vision and the overriding principles for DJRTP at the time of development were to “capitalize the University of Waterloo talent – along with the Wilfrid Laurier and Conestoga College” (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). In doing so, the university administration and senior public officials looked to “leverage the intellectual property regime at the University of Waterloo,” which allows the inventor to retain intellectual property rights (IPR) to the invention – a practice contrary to most academic and public research organizations in Canada (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). The driving idea behind the development of the park was “to create the conditions for people to move their thought process – not only through the academic regime but also into a commercial thinking” (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016).

The key objective for the Research and Technology Park is to "assist in the economic and social enhancement of the surrounding community by facilitating the creation or relocation of companies or agencies employing highly skilled people" (University of Waterloo, 2017c)**.** Its mandate also includes development and provision of co-op employment positions for students and contributing financially to the University of Waterloo's revenues in order to "enhance the quality and relevance of its programs" (University of Waterloo, 2017c).

According to a key informant familiar with the functioning of the park, the "intended goals and outcomes of [DJRTP] go beyond commercialization and economic growth into community building and idea sharing" (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). Accordingly, much of the facilitative activities of the park are therefore focused on community development through network formation and facilitating linkages between large multinationals and small start-ups. Examples of such activities include community barbeques, family days, and sports tournaments for the tenants of the DJRTP as well as fundraising activities for charity organizations in the local community.

An important element of the park's activities is support measures to help start-ups graduate and scale-up. While the success of DJRTP and Waterloo region is often attributed to the start-up activity, one key respondent contended that the start-up activity does not contribute to the economic markets if it is not scaled up properly. The graduation-out is done in pragmatic manner, with the underlying understanding that not every company can achieve the success of BlackBerry or OpenText nor should there only be companies that “develop 10 cent apps with 2-3 employees” (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). Instead the focus is on supporting and scaling up companies that can become meaningful employment hubs and contribute to the local and regional economy (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016).

The Park management also provides opportunities for recreational and charity fund-raising events. The latter are particularly important in that the proceeds from charity funds go to a “tenants’ fund” at the Community Foundation which are then used for local community-based projects. Furthermore, the management also organizes sports activities – bringing together tenants from different companies – to “purposefully create a community in the park” (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). To this end, the key senior management representative suggested that a quarter of their time is devoted to community building activities (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). These activities combined with the program-based measures to develop and graduate start-ups and spin-offs form the core functions of the DJRTP. They also help strengthen the social inclusion and civic cohesiveness that is important for the innovation processes to unfold in the Region.

6.6. Tenant Profile

Given the IT-focus of DJRTP and University of Waterloo, an overwhelming majority of park tenants are related to IT-sector. Moreover, park tenancy is heavily tilted towards private sector firms – 88% firms belong to the private sector, 8% are academic research institutes and a meagre 2% are government organizations. There are no government sector research organizations (such as NRC laboratories) located in any of the DJRTP buildings. This points to the relative strength of the private sector which dampens the need for continued government support, directly and indirectly.

6.7. Key Organizations

6.7.1. Municipal and Regional Government

The regional municipal government is an upper tier municipality – created by the provincial government to cluster the resources and achieve economies of scale in urban regions. In other words, the regional government serves as "a federation of the local, lower tier municipalities within its boundaries" (Association of Municipalities Ontario, 2018). The Region of Waterloo comprises of Cities of Cambridge, Kitchener and Waterloo as well as Townships of North Dumfries, Wellesley, Wilmot and Woolwich. The regional government is responsible for provision of such services as: "arterial roads; transit; policing; sewer and water systems; waste disposal; region-wide land use planning and development; as well as health and social services" (Region of Waterloo, 2017).

The City of Waterloo and Region of Waterloo were one of the 'primary champions' and among the founding supporters of the DJRTP. The senior officials from both the municipal and regional governments took active part in developing the business case for DJRTP – including budget allocations and returns on investment matrices (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). As highlighted by one interviewee, the Regional government had "anticipated certain amount of uplift, not only in its tax assessment base, but also jobs in community" (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). The municipal and regional governments, as highlighted previously, contributed $13.4 million to the development of the park. The Regional government also acted as the principal applicant for the Federal-Provincial Super Build Municipal Infrastructure fund and consequently the administrator of the federal-provincial funds. As part of the regional development package, Regional government also provided funds for the development of connecting roads and supporting municipal infrastructure around the Park (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). Once the park was developed, the Region handed over the control to the University of Waterloo; however, the Regional government remains an integral part of the DJRTP. Senior representatives from the Regional government are members of the Board of Directors of the Accelerator Center and as such play an important advisory role (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016).

6.7.2. Provincial Government

The Provincial government played an active role in the development of the park – particularly in the early stages. A number of provincial organizations – central and line agencies including the Ministry of Economic Development and Science and Innovation as well as arms length agencies such as the Ontario Network of Entrepreneurs and the Ontario Centres of Excellence – were involved in the administration and accountability of funds. The provincial government continued to play an active role post-construction and retained a seat on the Board of Directors of the Accelerator Centre. In this capacity, the provincial government exerted “influence on how the Accelerator Center formulated its policies" (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016). However, this policy influence also tapered off eventually and the Accelerator Center was given policy independence while maintaining the financial support linkages. In this sense, the provincial government has now become a passive participant in the functioning of the Park (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016).

6.7.3. Accelerator Center

One of the key features of the DJRTP that distinguishes it from most other innovation parks in Canada is the incubator called the Accelerator Centre. It is a critical contributor to the "growth of high-tech firms" and acts as a "catalyst for the creation of new products and services" (University of Waterloo, 2017a). In addition to providing collaborative office and meeting space, the Accelerator Center also provides a " broad range of services" such as "IP management consultation, mentoring, networking events and investor matchmaking" that facilitate the development and growth of start-ups in the region (University of Waterloo, 2017a).

The Accelerator Centre is strategically located in the DJRTP, occupying 21,000 square feet within the park. The centre adds services element to the real estate – it goes beyond providing office space (University of Waterloo, 2017a). The Centre has also garnered significant government funding – for example, $945,000 from the Government of Canada to "provide entrepreneurship training and seed funding to help up to 30 science, technology, engineering and math entrepreneurs launch new innovative start-up businesses" (Government of Canada, 2013). The funding is "anticipated to bring in additional 5 million in private investment to support the new companies" (Government of Canada, 2013).

6.7.4. Communitech

Communitech is a private sector led, membership based centre that serves nearly 1,000 technology companies (Communitech Corporation, 2017). It was established in 1997 by a group of entrepreneurs with the goals to elevate the profile of Waterloo Region's tech community. Similar to other bridge organizations Communitech also "supports companies at all stages of growth and development – from start-ups to rapidly-growing mid-sized companies and large global players" (Communitech Corporation, 2017) . It brings together key players – from start-ups and global brands, to government agencies, academic institutions, tech incubators and accelerators – in order to facilitate innovation (Communitech Corporation, 2017).

According to the key respondents familiar with the DJRTP, Communitech has been an integral player in the development of the Park. Being an industry-led organization provided it the soft (social) capital to energize the investor base and foster critical linkages between public, private and academic organizations (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). Communitech's role, therefore, appears complementary to that of Accelerator Centre and provides the additional credibility to the private sector investors by the virtue of being an industry-led and industry-funded organization.

6.7.5. Canada's Technology Triangle (Waterloo EDC)

Canada's Technology Triangle (CTT) – now known as Waterloo EDC – was a regional marketing and economic development association that was formed in 1987 by local economic development officials. The original purpose of the organization was to coordinate regional marketing and business attraction efforts; however over time, the organization's scope expanded to broader areas of regional economic development such as land use, infrastructure development and immigrant integration (Nelles, 2014, pp. 95–96).

Like Communitech, CTT has been a central figure in the development and promotion of DJRTP. According to key informants, both these organizations were instrumental in bringing key industry players to the table and developing the private sector-led governance coalition that proved key to the transformation of the regional economy and the development of initiatives such as DJRTP (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). These organizations are also critical in facilitating inter- and intra-regional partnerships across institutional domain. Furthermore, they play an important role in shaping the cultural and social sphere of the Waterloo region (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016).

6.7.6. Open Text

Open Text can be considered an exemplary success story that emerged out of DJRTP and University of Waterloo's innovation milieu. It has been termed as a "market leader in providing Enterprise Content Management solutions that bring together people, processes and information in global organizations" (University of Waterloo, 2017b). Open Text started as a University of Waterloo student project in "computer indexing and string project" in 1984 which concluded in 1989 with the "creation of first search engine technology for the internet in the early 1990s" (University of Waterloo, 2017b). The software created by the company, called Livelink, is a platform for large organizations to collaborate, manage information and automate their processes (University of Waterloo, 2017b). Open Text has been an integral private sector player in DJRTP that emerged from the local innovation ecosystem in the Waterloo region. The company, which has seen enormous growth with a global reach across 31 countries, 2100 employees and 17 million users of its software, has moved its headquarters to the DJRTP. It occupies a dedicated 112,000 building – named after it – that houses 400 employees (University of Waterloo, 2017b).

6.8. Outcomes and Impacts

PriceWaterhouse Cooper – in collaboration with the Association of University Research Parks (AURP) – conducted an impact study in 2013 that provided estimates of direct (attributable) and indirect (facilitative) impacts of the DJRTP (Association of University of Research Parks, 2013). The attributable impact on cumulative firm output is estimated $150 million; GDP impact is $105 million; contribution to labour income is $79 million and tax base is $15 million (Association of University of Research Parks, 2013). In 2013, park employment stood at 1,645. In addition to the direct impacts, the park also has indirect/facilitative impacts which are four times higher than the direct impacts (Association of University Research Parks Canada, 2013). The impact study also anticipates the future direct impacts to be one-and-half times higher than the current levels through expansion of current and development of new facilities (Association of University of Research Parks, 2013).

While the qualitative nature of this study did not allow us to quantitatively verify these values, the individuals interviewed frequently pointed to the positive outcomes of the DJRTP. It was highlighted as an exemplar by many of the key informants associated with other innovation parks. The branding of the park – that is, being associated with Governor General David Johnston who championed the park in its initial stages – was considered a very important aspect of park's success (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016).

Many respondents also viewed park ownership and initial buy-in from flagship private sector companies such as OpenText, BlackBerry (Research in Motion) and Google as key to park's positive outcomes. While some respondents felt that the park still has not achieved "optimum results," there was overall consensus among those interviewed that the progress is generally there to be seen and tracking well into the future. In particular, the employment numbers – estimated around 5000 to 6000 by one respondent – were considered "quite encouraging" and DJRTP's role in creating high value-added jobs has been acknowledged (Key Informant no. 7, Personal Communication on DJRTP, July 26, 2016).

6.9. 3-I Analysis of DJRTP

6.9.1. Institutions

DJRTP's integration within the University of Waterloo has important institutional implications. The mandate of the innovation park is closely aligned with that of the

University, which has been historically mandated as a technology university in Canada (Doern et al., 2014). The university has, over the years, established and maintained a strong focus on partnerships with the industry including its highly recognized cooperative education system. The University is also perhaps the only academic institution in Canada that has a well-established IPR policy that assigns intellectual property rights to entrepreneurs rather than ascribing them to the University itself. A strong institutional focus on applied research, commercialization, and a start-up culture that is embedded in the university's R&D practices has also been overlaid onto the DJRTP. Essentially, University of Waterloo's historically well-established trajectory towards increased applied research, commercialization and entrepreneurial activities provided head start to the DJRTP which became an extension of the university.

In terms of political institutions, four levels of government – instead of three traditional levels – have been involved in the decision-making and operations of the park. While this could provide additional coordination challenges, it has played out better for the DJRTP. In addition to securing additional funding, DJRTP has found another proponent in the Regional municipality. The Region of Waterloo, comprising of three lower-tier municipalities (Waterloo, Cambridge and Kitchener), provides a stronger regional support and more influential political voice. The Region of Waterloo representatives also serve on the Board of Directors of the Accelerator Centre, which gives them significant leverage in overseeing strategic direction of the incubator.

6.9.2. Interests

Large private sector firms such as Open Text – as well as established small-to-medium enterprises are notable tenants of the DJRTP. Almost all these firms were a product of local technological capabilities in the information technology sector. These companies – along with the Research in Motion (BlackBerry) – form a strong network and provide a strong economic base for the Waterloo region and the province. The innovation park has also brought into its governance and operational folds the commercial real estate groups – who work closely with the University to develop various buildings of the DJRTP. Together the private sector exerts a significant power – by attracting global talent in ICT and contributing to the economic development.

While the influence of bridge organizations – including the Accelerator Centre, Communitech and Canada's Technology Triangle - is limited compared to the private sector, they nonetheless play an important role in promoting the local technological capacities through the innovation park. They provide the vehicles for civic inclusion and social licensing for the innovation activities of the private sector as well as the innovation park. As highlighted previously, these organizations are connected to and help coordinate the key players in the DJRTP milieu. In the process, they also aid in branding the innovation park as a key instrument in innovation and economic development of the region.

Apart from these organizational interest groups, individuals have also exerted significant influence in establishing the DJRTP. One of the strongest influencers for DJRTP was the former president of University of Waterloo and former Governor General of Canada, David Johnston. In his capacity as the president of the University of Waterloo, David Johnston, actively lobbied for the innovation park and played a significant role in its early years of establishment. Once appointed as the Governor General, the park was named after him, which further legitimized the park and increased its salience across all levels of government.

6.9.3. Ideas

The notions of “civic engagement” and “inclusive development” have been the driving force for the DJRTP. As mentioned in the introduction of this chapter, stories of entrepreneurs and communities of “self-helpers” have been the hallmark of DJRTP and Waterloo IT cluster. Collaborative and associative governance mechanisms have lead to the convergence of ideational frames focused on the collective success of the Waterloo cluster. It is important to understand the undivided focus of the university and stakeholders has lead to common understanding and buy-in from the innovation community.

Another frame that is important in the case of DJRTP is “regional development”. The DJRTP has been seen as a source of economic development across a consolidated geographic and political region – the Region of Waterloo. The integration of DJRTP in the broader regional economic development discourse has provided for a greater number of proponents.

7. Analysis: Institutions, Interests and Ideas

Real-estate, hard Infrastructure – the bricks and mortar – of the innovation parks are the core feature across the three innovation parks. Infrastructural facilities and services are also an important marketing characteristic of these parks. The location, space, and environment are all considered distinguishing features across different parks and with other establishments. The provision of physical, co-locating space has been highlighted by all those interviewed as vital to the innovation functions. Furthermore, the availability of state-of-the art communication technology – such as internet, video-conferencing and other amenities – distinguishes these parks from other business real-estate. Linking infrastructure to other organizations, particularly universities, has also been highlighted as a key element that influences the desirability of the main park campus.

It is interesting that the design of these buildings provides for a ‘very social’ setting that encourages and facilitates ‘natural communications’ in formal and informal ways (Key Informant no. 17, Personal Communication on SIP, November 11, 2016). The parks have vast areas of space dedicated to greenhouse, water reservoirs and immaculate landscaping – making them resemble amusement parks. As one respondent pointed out, these parks are also family-friendly, where tenants can bring their children and families for entertainment. SIP and DJRTP in particular have placed special emphasis in providing fine-dining services and spaces for social gatherings.

If we look at the design of all three – and presumably other parks across Canada and globally – special attention has been given to ‘greening’ and making the parks eco-friendly. All these parks boast environmentally-friendly establishments and operations.

Infrastructural facilities – particularly shared laboratory and R&D facilities - were singled out as the most common reason for locating at the park by small and new start-up companies that do not always have the resources to invest in full-scale facilities.

However, the single largest barrier related to infrastructure – as cited almost unanimously by the respondents – is the rental cost in the three innovation parks. Many respondents noted the prohibitive costs of being located in the innovation park which are higher than other commercial real estate in the regions. However, these were justified due to the "high quality space" and the branding of the innovation parks. Start-up and small enterprises also lamented the lack of subsidized spaces; however, all three innovation parks do provide subsidized space to select few start-up companies that gradually decreases with time. Moreover, the start-ups are allowed to stay at the innovation parks until a specified time period, after which they are graduated out and were unable to utilize the support provided through facilitator organizations. This was one of the concerns for the representatives of start-up companies that had to leave the innovation park during their expansion phase.

As I have argued in the earlier chapters, the complex nature of innovation policy – and by extension innovation parks as one of the instruments for the implementation of policy – require a holistic approach and intrinsic understanding of the interplay between institutions, interests and ideas. What is interesting about this complex interplay is that it highlights the underlying tensions, challenges and critical inflection points that lead to the emergence of new institutions, interests and ideas. When taken together, the interplay can help us understand the rationales for government support for innovation parks.

Having developed some understanding of individual innovation parks, we may now turn our attention to a comparative analysis of these innovation parks using the 3-I framework and answering the research questions at hand through this lens. That is, what are the policy rationale for governments to support these parks and what are the institutional, ideational and interest interactions that shape such decisions. From an institutional perspective, federalism and path-dependency can help us understand governments' different levels of involvement in the development and operation of innovation parks. Power and interests – particularly the influence of emergent interest groups such as AURP, commercial real estate lobby and facilitator organizations such as Ag-West Bio, Innovation Factory – also help us understand government's role in mitigating these pressures. Government bureaucracies – that fund some of the supporting organizations also play an integral role. Some of these interest group dynamics are uniquely a function of institutional interplay and historical trajectories as manifest in the governance structures. Underlying these struggles and governments' involvement are the ideational forces – global influences to adopt certain policies that are accentuated by policy communities. I develop these arguments further in the following sections.

When individuals were asked about their views on government support, they were near unanimous about the need for governments' support. While the reasons for government intervention varied, all respondents agreed that some form of government support was required to develop MIP, SIP and DJRTP – as well as other innovation parks domestically and internationally. Respondents viewed government playing an important role in providing "spaces for innovation" through innovation parks and incubators that incentivize innovation through subsidized rents and grants for entrepreneurs from universities. One respondent considered government's support as "valuable and worthy" to advance the "public good" by "being involved in innovation parks" with the aim to "promote knowledge-based economy." (Key Informant no. 18, Personal Communication on MIP, November 11, 2016).

Respondents, however, viewed on-going government intervention – financially and operationally – as unnecessary and often described it as counterproductive and disruptive. For instance, one respondent argued that governments "have to be strategic in terms of the extent they are involved. They should provide financial and political support, then fence off far of it, so that the park can run independently – as independently as possible" (Key Informant no. 20, Personal Communication on SIP, November 14, 2016). The respondent suggested that the government's involvement in supporting innovation parks is a "two-edged sword" which becomes detrimental to innovation when the government tries to "direct the course of the entity for public good" (Key Informant no. 20, Personal Communication on SIP, November 14, 2016). These views on policy rationales for innovation parks along with the challenges faced in the successful development and functioning of innovation parks can be understood in terms of ideational, power struggles and institutional constraints.

7.1. Institutions

As I argued in chapters 2 and 3, the institutional design of innovation parks follows the hybrid institutional structure that emerges from the interaction of academia, government and private sectors. The development of innovation parks – like many other innovation policy instruments – is influenced by the sociological interaction of institutional elements from each of these organizations involved. However, the interaction is not always a smooth process; it is often riddled with institutional and individual conflicts. It goes back to diverse interests, different agendas, and political and bureaucratic hurdles. Organizational and institutional differences, which are manifest through the peculiar collaboration of public, academic and private sector - impact the progress of innovation parks. The complexity of relationships, which is often implicit and hidden from the outside policy observer, often impedes meaningful collaboration in achieving the desired outcomes. As discussed previously, the 'two cultures' problem is often manifest in the governance of innovation parks (Young, 1996; Munim, 2011).

The most significant manifestation of cultural difference has been noted in the oversight of innovation parks by the university. Respondents involved with the governance and aware of the governing dynamics highlighted the necessity to find common ground amongst the governing institutions, namely university, park management, board of directors and government. The other aspect is the alignment of innovation park objectives with that of the broader government innovation strategy.

Institutional differences were frequently cited as impediments by those affiliated with MIP and SIP, whereas DJRTP-affiliated respondents indicated a more harmonized governance approach. Referring to the institutional complexity of governance dynamics, an MIP-respondent suggested that these dynamics are more of "an alchemy rather than a set formula" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). The governance structures – along with funding from governments – are set up with the hope to bring researchers and private sector actors together; however, “what actually happens on the ground in an innovation park is a peculiar kind of chemistry that cannot be supported by material resources alone” (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). A government official noted that it is “mandatory that the University has a vested interest in this model – and that seems obvious, but it is a challenge for any research institution that has external properties from their campus where they are trying to commercialize and spin things off” (Key Informant no. 6, Personal Communication on MIP, July 22, 2016).

Universities’ core mandate is education and research – often focusing on the ‘pure’ research rather than “applied” research, although the latter has been on a rise due to ‘federal expectations’. The increased focus on applied research necessitates a “culture that is supported, encouraged and expected from the research faculty” (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). In other words, the buy-in from university management and faculty has to be achieved for effective collaboration within the innovation park milieu.

In the words of a senior university administrator, who acknowledged the cultural differences between the university and industry, the challenge is that “universities are established to publish, whereas the industry benefits from keeping their discoveries secret” (Key Informant no. 39, Personal Communication on Innovation Parks, March 28, 2017). The cultural difference is visible in the attitudes towards patenting whereby the university seeks to “publish before applying for the patent” and the industry does not want to go public until a patent has been obtained. The industry also values secrecy around its trade secrets which cannot be patented. The bottom line is that the industry "knows how to do certain things and they do not always want other people to know what they know" (Key Informant no. 39, Personal Communication on Innovation Parks, March 28, 2017). This attitudinal difference is probably the most difficult to deal with from an academic perspective, as noted by many key respondents.

Innovation parks – and similar policy instruments that seek to foster closer collaboration between academia and industry – can be viewed as governments' attempt at institutional change at macro-level through displacement and layering (Streeck & Thelen, 2005). Governments introduce these instruments to shift the research model at public universities from 'pure research' to applied research and promote greater university-industry collaboration. Similarly, the underlying property arrangements such as leases, ownership, and management contracts form the institutional building blocks of innovation parks. While these institutional mechanisms change over time, they remain resistant to change and change at macro and micro institutional levels is rather evolutionary (Streeck & Thelen, 2005).

This takes us to the notion of institutional rigidity, which shapes the expectations of the actors involved in the governance of innovation parks. University administrators are largely driven by the 'pure research' mission of their organizations. The formal institutions –such as codified rules governing intellectual property, tenure and promotion, and agreements regarding appropriate usage of university property – act as significant barriers to the functioning of innovation parks. Individuals affiliated with SIP and MIP often cited these institutional rigidities as frequent impediments in establishing effective governing relationships. DJRTP respondents, on the other hand, noted the positive role played by these very institutional elements because they were set up with the intention to facilitate applied research and promote collaboration between academia and industry.

A respondent affiliated with DJRTP noted that industry-academic collaborations are in the "DNA of the University of Waterloo and that is something that has been done well for decades" (Key Informant no. 4, Personal Communication on DJRTP, June 6, 2016). The senior management – Presidents and Vice-Presidents – have been 'willing partners' with support from the broader academic community. Moreover, the university has embedded a strong commercialization aspect into its collaboration model with a strong emphasis on university's value-added contribution to funding by the private sector. As noted in the previous chapter, the University has a unique intellectual property regime, which allows the inventor to retain IPR to the invention. Moreover, the university has a well-institutionalized cooperative education program, which helps university students build linkages with industry from a very early stage. These rules are further supplemented by financial incentives such as favourable tax regimes and subsidies for start-ups.

In contrast, MIP and SIP respondents highlighted the complex IP regime and interface with the local technology transfer office as the most significant constraint in the local innovation ecosystem. University of Saskatchewan, in particular, was thought to have a very restrictive intellectual property policy – in that the university, by default, has ownership of any and all IP generated by its faculty which then requires significant negotiations and overhead burden for the entrepreneurial faculty. Moreover, the tenure review processes of both McMaster University and University of Saskatchewan do not favourably consider commercialization and IP activity of their faculty. These institutional constraints act as punitive incentives that hinder the movement from research milieu to a commercial milieu. According to a key respondent, these rules and institutional constraints have existed for many years – having ‘baked into any kind of interaction that happens in the context of innovation” (Key Informant no. 27, Personal Communication on SIP, November 30, 2016). These institutional elements “restrict the involvement of multinational enterprises and take indigenous companies and local small players of the picture” (Key Informant no. 27, Personal Communication on SIP, November 30, 2016).

A senior administrator from the University of Saskatchewan, on the other hand, claimed that the failure to facilitate and support academic-industry linkages and collaborations is due to a lack of comprehensive strategy on part of the government and innovation park management. Lack of new infrastructure development further limits the capacity of the innovation park to advance knowledge transfer and commercialization (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). Consequently, “opportunities for alignment, sharing and connectivity of key assets related to commercialization and technology transfer – whether that is human, infrastructure or financial – are not realized” (Key Informant no. 26, Personal Communication on SIP, November 30, 2016). The respondent argued that the Innovation Park has failed to develop and support the research mission of the university as was originally anticipated back in the 1970s and codified in the lease agreement. Consequently, this translates to a lack of research enterprises and university partners locating at the SIP.

Respondents also drew attention to the facilitative institutional aspects in the

United States where the Bayh-Dole Act has created significantly more opportunities to create partnerships between academia and industry. A respondent argued that such legislative incentives are completely missing and need to be developed in Canada nationally to incentivize collaboration across different institutional spheres. Absence of legislative incentives – and a national IP strategy – was highlighted as a significant stumbling block in a lot of institutions in Ontario. The respondent suggested that “it is understandable that when [universities] spend years and brain power in discovering, inventing and innovating, that they would want to protect it” (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). However, to scale and to take these to the market, funding and expertise is needed which in turn requires receptive IPR policies at the universities. These aspects are largely missing from Canadian universities. University IPR is often driven by faculty attitudes of protection and underlying desire of academic administrators for revenue generation (Key Informant no. 6, Personal Communication on MIP, July 22, 2016).

Other respondents argued that the governance structures – the boards of directors and advisory boards and the decision makers – can be the crucial difference in overcoming organizational and institutional difference. These institutional instruments can give rise to interest structures that can impact the strategic direction of the innovation park. Both DJRTP and SIP have established governance practices that are more inclusionary than that of MIP. While all three innovation parks have some private sector representation, MIP board of directors is heavily biased towards university representatives. SIP has a significantly higher government representation on the board of directors – being led by the provincial minister, which is expected given its crown corporation status. It has however mitigated lack of university representation by creating a special advisory body, comprising of Vice Presidents from both Universities of Saskatchewan and Regina, which has the authority to approve or reject projects based on their compatibility with Universities' research mandates. MIP does not have such advisory bodies to mitigate the lack of specific institutional representation.

Similarly, private sector inclusion, particularly venture capitalists and private real-estate developers, has been highlighted as a significant element that has been missing from both SIP and MIP. DJRTP, on the other hand, has been largely successful in including private sector representatives in its planning processes as well as governance and implementation of decisions. Higher level of private sector inclusion is also evident in DJRTP's tenancy rostrum. The DJRTP has an overwhelming majority of private sector companies including start-ups and small and medium enterprises as compared to SIP and MIP which have significantly higher government (and government-funded) and academic research organizations research organizations. One respondent argued that the presence of private sector in innovation parks is important because government (public-sector) and academic organizations cannot, and should not, do everything (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). Private sector is able to deliver at significantly shorter time horizons, which is not the case with academic and government organizations that are often riddled with significant bureaucratic red-tape (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

The differences in timing underlie many of the institutional differences. Decisions within academia and government are consensual and are made through elaborate consultative processes. The private sector is not necessarily considerate of consensus and its decisions are largely driven by profit-generating opportunities. “Speed-to-Market” is the most important consideration for the private sector (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). When a private-sector investor wants to decide to invest in building the park, that imposes significant pressures on the municipal (or regional) government and the university to approve building plans, architectural drawings and permits in order to proceed in-line with investor’s timelines (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). Similarly, the timelines are significantly longer when a technology is being developed in an academic or public laboratory which significantly hamper collaboration prospects between academia, government, and the private sector (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

While these may appear to be significant cultural differences, another respondent from McMaster University, reminded us that they may not have significant impact on the outcomes of innovation parks as they are merely physical space (Key Informant no. 37, Personal Communication on MIP, February 21, 201). The parks provide the physical space where efforts can be focused with all three groups – government, academia and industry – working together for common good. The institutional differences can then be viewed as merely possession and allocation of different resources: universities are responsible for providing human and intellectual capital in the form of ideas; companies have not only the financial capital but also the know-how to extract commercial value and convert the intellectual capital into financial capital; and the government plays a role in establishing social capital. Thus, the cultural differences may be overcome to some extent as a result of each organization contributing a unique competency to further collaboration across the different institutional spheres.

7.1.1. Governance Structures

The underlying institutional difference that partly drove this research enterprise was the governance mechanisms – Trust, Crown Corporation, University - in place for SIP, MIP and DJRTP respectively. These governance mechanisms are unique to each innovation park and can create institutionalized power dynamics as well as institutional trajectories that are embedded in the specific regional contexts. They also enable certain actions and decisions while constraining action choices on other fronts. These governance structures accentuate institutional differences, political pressures and resource constraints – discussed above.

When the governance structure is outside the university – such as the trust and Crown Corporation – the university merely acts in the 'landlord' or lessor capacity and may lose the ability to influence decisions in a meaningful manner. This may be mitigated to a certain extent by having university representatives on the boards of director or special advisory committees. However, the decision authority and accountability lie with the Chief Executive who, at the advice of the majority of BOD members (in the case of trust) or the minister (in the case of Crown Corporation), may choose to follow a different direction than the wishes of academic advisors. Even in the cases where linkages to academic mandates have been codified in legal documents such as leases and trust agreements, the interpretation and implementation leaves a large room for interpretation and may evolve over time. Thus, even the codified institutions that could constrain the behaviour of executive management of the innovation park are subject to change through drift or conversion (Streeck & Thelen, 2005). Examples of change through drift and conversion are evident in both SIP and MIP. In both cases, change in leadership at the political level as well as in the management of the park and university administration has led to a drift in the intended outcomes. The original lease agreements envisioned a different path along the lines of R&D functions; however, over time this has changed due to leadership turnover at the park as well as pragmatic considerations. Moreover, both parks have been forced to change directions due to the 2008-2009 economic downturn which led to an increase in vacancy rates. MIP has also started looking outwards – that is, away from university research and towards international research organizations (for example, the Fraunhofer Institute) to provide it with necessary impetus. There has thus been a change in direction from what was envisioned in the original lease/trust documents.

Governance mechanisms also have an impact on the funding of innovation parks. SIP, MIP and DJRTP, as well as other Canadian innovation parks, rely heavily on government funding from all three levels. However, SIP – being owned by the provincial government – is largely restricted from directly accessing federal grants and contributions (Key Informant no. 10, Personal Communication on SIP, October 21, 2016). This is a function of Canadian federalism where by federal-provincial fiscal relations are confined to higher levels of government and fiscal transfers are not made directly to specific provincial departments or provincial agencies. The federal government, however, has the shared jurisdiction of science and technology – which it leverages to fund federal laboratories that are located on or near the innovation park. NRC lab on SIP campus is an example of this. The federal government also provides funding to arms-length S&T based organizations such as Genome Prairie.

The crown corporation model may provide easier access to provincial funds compared to other governance models, courtesy direct incorporation with government treasury. Funds may be available more easily and at lower borrowing costs than would be for a trust, university or privately-owned innovation park. It would be significantly easier for a crown-corporation innovation park to seek funds for strategic infrastructure expansion than would be for other models. It may be particularly difficult for university to provide the necessary capital, as universities face significant financial pressures. An individual with experience across different innovation park models suggested that such funding accessibility is "really important" (Key Informant no. 1, Personal Communication on MIP, April 26, 2016). The respondent contended that a trust or university model has to compete against on-campus activities for funding which in most cases take precedence (Key Informant no. 1, Personal Communication on MIP, April 26, 2016).

The crown corporation may, nonetheless, experience somewhat similar funding pressures. Government's budgetary allocations are also subject to competition across different departments. Funding for the crown corporation may be susceptible to not only economic conditions but also political circumstances. Politicians would be more inclined to fund initiatives that are visible with the electorate and have a direct and short-term economic benefit for which they can claim credit thereby improving their chances of re-election.

Given the board of directors is chaired by the minister of crown corporation and a member of the provincial legislature, it may be subject to political and “ideological” influence in terms of its strategic direction (Key Informant no. 10, Personal Communication on SIP, October 21, 2016). These politicians have to ‘fight-it-out’ with their cabinet colleagues to seek funds for the corporation. Political pressure may thus lead to pragmatism rather than innovation (Key Informant no. 10, Personal Communication on SIP, October 21, 2016). However, some respondents argued that while the government of the day sets the priorities and strategic directions, there is significant freedom for the management to follow through on its plans. Nonetheless, there may be an element of compromise that could somewhat, if not drastically, change the direction.

Somewhat contrary to the point made earlier regarding political sensitivity, a government crown corporation may be more tolerant of financial losses resulting from higher vacancy rates and failed start-up projects as compared to privately-managed innovation park. Theoretically, bottom-lines are not as important to the government if it views itself as providing a public good, whereas the private sector is strictly driven by profit motives. The public good argument suggests that a privately-run park will not have extra space available to truly innovative enterprises, which may have a higher failure risk that could contribute to the innovation ecosystem of the region (Key Informant no. 20, Personal Communication on SIP, November 14, 2016). In such a case, either the rents would be too high for the tenants or the management would be drawn to invite ‘any and all' businesses regardless of their contribution to the innovation ecosystem (Key Informant no. 37, Personal Communication on MIP, February 21, 2017). A government run facility, on the other hand, can afford a higher level of risk by building more facilities than they need in a given year recognizing that there will be growth. Then if a major client comes, they can capture that client because it takes a long time to design and to build new facilities (Key Informant no. 23, Personal Communication on SIP, November 24, 2016).

In contrast to the crown corporation model, an independent trust provides the necessary separation, independence and 'operational nimbleness' or agility that may be difficult to achieve within government structures. This separation may be deemed important by certain private sector investors who may be wary of the differing timeliness and regulatory burdens in academia and government. A key respondent argued that innovation parks operating independently of government control are better able to respond to day-to-day challenges as they are "closer to local markets and ecosystems" (Key Informant no. 27, Personal Communication on SIP, November 30, 2016). However, this may create additional challenges, as has been the experience at MIP. Multiple respondents affiliated with MIP highlighted that the separation of MIP from governance and locational perspectives marginalized many of the operations of the innovation park. One respondent particularly noted that such separation makes it difficult to communicate with the researchers on campus and integrate park activities with core R&D functions of the university (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

Despite some of these challenges, most respondents argued that innovation parks are better-off functioning as completely independent or affiliated with the university governance mechanisms. The independence from university provides the necessary flexibility and nimbleness that these innovations require to respond to challenges and timelines of the private sector. While SIP is pointed out as a 'profitable entity' that, on average, contributes to the provincial funds, the bureaucratic and administrative hurdles and risk of partisan influence are frequently noted as barriers to innovation. A respondent asserted that while there is a need for "overall political oversight to ensure financial accountability," operational independence from government structures is essential for long-term effectiveness of innovation parks (Key Informant no. 6, Personal Communication on MIP, July 22, 2016).

7.1.2. Federalism and Subnational dynamics

Part of the differences in governance including preference for institutional lead for the three innovation parks can be understood through the federalism and sub-national politico-economic lens. Federalism has a significant impact on the relationships – particularly fiscal relationship - between different levels of government. A number of studies shed light on federal-provincial-municipal relations in different policy areas (as discussed in chapter 2); however, studies on S&T and innovation policy – and innovation parks by extension – are far and few. It is imperative to draw these linkages to develop a complete understanding of institutional dynamics of governments' role in innovation parks.

Canada has a unique federal system – with the constitution delineating policy areas across federal and provincial jurisdictions. However, it does not do so for all areas:

there are many undefined policy jurisdictions. Moreover, the residual powers for emerging and undefined policy areas reside with the federal government. In other areas, despite provincial jurisdiction, federal government plays a more active role, albeit collaboratively, due to its spending powers. As discussed previously, the S&T and innovation policy space is where such horizontality is clearly evident. Each level of government plays a complementary, consensual role in developing and implementing innovation policy instruments. Lack of clearly defined jurisdiction for innovation policy also means that there is room for each level of government to chart its influence and compel other levels of governments to act and extend support for large scale infrastructure projects intended to facilitate and promote innovation. Thus, Canadian federalism facilitates the establishment of innovation parks.

Nonetheless, in the case of innovation parks, multiple layers of inter and intra-government bureaucracy impose coordination challenges that are often insurmountable. Multiple levels of governments all have different constraints and perspectives on policy and programs. Differences in political as well as programmatic alignment at federal and provincial levels exacerbate the coordination challenges. Often, as many respondents argued, the timing of federal and provincial funding decisions do not match which creates significant uncertainty for the planners of innovation parks. Existing institutional constraints – for instance, current fiscal transfer arrangements between federal and provincial levels – may further impede horizontal collaboration across different levels of government. Furthermore, each level of government may be riddled by its own bureaucratic spread – with policy and program delivery spread across different departments.

Each level of government holds a certain lever regarding its support for innovation parks. These levers of support are uniquely tied to Canada's federalism. In the case of innovation parks, one can witness significant degrees of collaboration across the three levels – manifest through funding decisions. However, in most cases, support from one level is often based on support from another level. It is not uncommon for there to be "collaborative matches" that corresponds to the scale of such endeavours. The municipal government is important to innovation parks as it contributes to the planning process – such as economic development zoning. The funding base of municipal governments is however, quite small. Provincial and federal governments, mostly the latter, are critical in providing the funding linkages. Provinces are important connections as they are responsible for education and economic development – they provide the larger regional linkages that are important in bringing industry and investors to the innovation park.

3.1.1.1. Federal Government

As argued in chapter 2, federal government's involvement in innovation policy is largely influenced by the regional considerations. The federal government is interested in investing in major science infrastructure that has higher regional multiplier effects (Salazar & Holbrook, 2007). Federal interventions in innovation policy are largely driven by the potential impacts of "technology exploitation and commercialization" on the regional economic development (Salazar & Holbrook, 2007). Given the networked nature of innovation programmes in Canada, federal government has largely maintained a laissez-faire approach to investing in innovation instruments and mostly operating through regional economic development agencies such as the Western Economic Diversification (WD) and the Federal Economic Development Agency for Southern Ontario (FedDev Ontario). While maintaining the responsibility of national S&T and innovation policies – under the purview of the Industry portfolio (recently renamed to Innovation, Science and Economic Development) – the federal government does not generally directly interfere with the implementation of innovation programs and policies. Rather, it uses fiscal levers at its disposal – such as grants and contributions (G&Cs) and tax instruments to subsidize the operations of arms-length organizations such as Genome Prairie, ONE network and IRAP.

Another tool is the (re)location of national R&D labs such as CanmetMATERIALS in MIP and NRC-IRAP in SIP. Much of federal government decisions to locate science infrastructure at an innovation park are driven by the regional and political considerations. The federal government wants to be seen as supporting and advancing local economic sectors. It wants to act to incentivize private sector investment by providing the enabling frameworks and infrastructure. For instance, in SIP, MIP and DJRTP, the federal government is motivated to support the natural resources/agriculture, advanced manufacturing/health sciences, and digital/ICT sectors respectively. Federal support is particularly important in the context of economic revival of the economic region, where uncertainty about economic future is paramount in private sectors' investment decisions (Key Informant no. 31, Personal Communication on MIP, December 3, 2016). Thus, locating federal R&D infrastructure signals support and provides assurances to the private sector that the government is sharing the risk.

Canada's history of federal-provincial fiscal relationships shape many of these decisions. Visibility of investments as contributing to regional economic development and improving employment conditions in an otherwise economically repressed region – such as Atlantic Canada – are paramount. In most cases, the federal government wants to avoid large scale infrastructure investments in areas that are closer to the centre (Key Informant no. 31, Personal Communication on MIP, December 3, 2016). For instance, while the original CanmetMATERIALS were located in National Capital Region (NCR), the federal government decided to relocate the lab to MIP to avoid a perception of investment concentration in the NCR and instead achieve dual objectives of renewing laboratory infrastructure and supporting local economic development through the MIP.

3.1.1.2. Provincial Governments

Unlike federal government, provincial and municipal (regional) governments play a more significant and hands-on role in the development and implementation of innovation policy instruments such as innovation parks. However, each province differs significantly in its approach, given the vast geography and diverse politico-economic bases. The extent to which a government supports an innovation park – hands-off grants versus active involvement in day-to-day operations – is more of a function of the provincial political economy, the historical trajectory and the views towards how these institutions and the economy should be controlled and managed. Quebec, for instance, funds and manages innovation parks quite differently than the rest of the country. Given its nationalist identity struggles vis-à-vis federal government, Quebec has actively used economic development and innovation policy instruments towards these goals. These features of Quebec's political economy are also evident in its funding and support of innovation parks. The provincial and municipal governments play an active role in funding, operating and managing innovation parks on ongoing basis (Key Informant no. 4, Personal Communication on DJRTP/AURP, June 6, 2016; Key Informant no. 5, Personal Communication on AURP, June 14, 2016). Similarly, Atlantic Canada which represents a very small market segment, innovation parks are marketed as a strategy for bringing innovative companies to the region and creating employment opportunities. However, the innovation park ecosystem in Atlantic Canada is significantly different from that in Quebec – with relatively sparse networks and limited integration with academic organizations in the former than in the latter (Key Informant no. 5, Personal Communication on AURP, June 14, 2016).

Moving towards Ontario and Saskatchewan – where MIP, DJRTP and SIP are situated – one finds significant differences in provincial, regional and municipal government involvement and their rationales. Sectoral differences and historical trajectories are immanent across the two provinces – with greater provincial corporate ownership in Ontario and greater provincial corporate support in the Prairie region. Saskatchewan has a stronger provincial government presence in the form of Crown Corporations including ownership of utility companies. Ontario, on the other hand, has had a stronger corporate culture, with the governments of all ideological stripes favouring private sector ownership. The sectoral differences can be understood as a function of institutional path dependency and 'varieties of capitalism" at the provincial level (Malerba, 2002).

Ontario also has a significantly larger manufacturing base – key industries such as automotive, steel and advanced manufacturing playing a critical role. Whereas in Saskatchewan, the provincial economy relies more heavily on the natural resources – agriculture, mining and oil and gas. The latter are more prone to global market and environmental fluctuations. The provincial government therefore, has a higher tendency to intervene in different aspects of the economy. By extension, it follows logically that the government plays a hands-on role in setting up and managing the innovation park (Key Informant no. 8, Personal Communication on SIP, August 7, 2016). Another respondent argued that centralized government planning around innovation parks is much more difficult to do in Ontario than Saskatchewan due to its size. Ontario has a significantly larger number of academic institutions to start with in addition to the large geographic and demographic spread. Such geographic spread - along with a historical trajectory of private sector involvement and largely laissez-faire public policy – makes it much more difficult for the government to play an active role in the day-to-day management of innovation parks. While the other provinces might be geographically large, their population is smaller and tends to be somewhat concentrated in a few centers. Whereas in Ontario, the lager population is spread out over a pretty large area. This makes coordination across academic and industry actors more challenging in Ontario than in Saskatchewan (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

Nonetheless, Ontario still plays an active role in supporting innovation parks. The province is looking for economic renewal, healthy communities, and commercialization of innovative technologies as a way for economic renewal. This interest is more pronounced in regions where old industrial bases are declining such as in Hamilton. The province has therefore invested heavily in projects that would bring private sector and global investments to the regions (Key Informant no. 29, Personal Communication on Innovation Parks, December 2, 2016; Key Informant no. 33, Personal Communication on Innovation Parks, December 14, 2016). The province was, as a matter of fact, the first to support both MIP and DJRTP at the time these parks were announced. Federal funding for both the parks was only announced after provincial and municipal (and regional) governments had issued funds.

Government of Ontario started developing the Entrepreneurial Innovation Ecosystem that started with mARS by providing government funding. At the same time, the government also provided funding for three biotech incubators – one in London, one in mARS (Toronto) and two in Ottawa related to life sciences and industrial biotechnology. The government also actively created programs such the regional innovation network and regional innovation centres to provide support for entrepreneurial offices at colleges and universities (Key Informant no. 29, Personal Communication on Innovation Parks, December 2, 2016). These programs provide funding for activities such as entrepreneur residents, peer networks, Campus-linked Accelerators and On-campus entrepreneurial activities. The government has actively pursued disruptive technologies particularly in the information technology sector– with a program called strategic partnership stream and investments in an accelerator center at mARS, super-computing project with IBM, cloud platform, data analytics and blue mix garage for start-ups and software (Key Informant no. 29, Personal Communication on Innovation Parks, December 2, 2016). The government has also invested in two backbone infrastructure projects for the digital economy: one called the CENGN – Center of Excellence for Next Generation Networks; the other is with ENCORE group of companies which include Ericson, Siena and IBM with the intention to develop testbeds for wireless data (Key Informant no. 29, Personal Communication on Innovation Parks, December 2, 2016).

Despite its strong focus on innovation, the Ontario government has not invested actively in the Innovation Parks in recent years. The government has shifted its priorities towards developing industry-academic collaborations that are focused on student entrepreneurship. The entrepreneur innovation ecosystem, according to a provincial government official, provides the pipeline or “funnel” for entrepreneurship at colleges and universities that would ultimately lead to start-ups. The government co-invests in the start-up activities along with large multi-national corporations (Key Informant no. 29, Personal Communication on Innovation Parks, December 2, 2016).

3.1.1.3. Municipal and Regional Governments

Across the three levels of government, municipal and regional governments are the most constrained in terms of their financial capabilities. While Hamilton (MIP), Saskatoon and Regina (SIP) and Waterloo Region (DJRTP) have invested in the respective innovation parks, these are substantially lower than the funds provided by federal and provincial governments. Moreover, financial levers – such as taxes and grants

– at municipal governments' disposal are restricted through provincial legislation such as the Municipal Act in Ontario. The legislation restricts the municipalities to provide any tax discounts or incentives to businesses. Nonetheless, the municipalities have other levers such as development charges and infrastructure remediation funds that has been used to incentivize innovation parks. At the same time, municipal governments – being closest to the local economic development environment – have the most to gain from innovation parks as the drivers of economic growth.

Hamilton has come through a troubling few years from a commercial perspective from significant strength earlier prior to the turn of the century – as an industrial town. As those businesses faded away – often for cost reasons – new employment and new tax base need to be created. The municipality, therefore, has a strong policy interest in the innovation park in terms of jobs, in terms of economic stimulus, and economic revival. The municipality – after the tumultuous years in the aftermath of exodus of steel industry, is in the process of "reinventing its history and is trying to communicate and market its present and future" (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). The City of Hamilton has, over the last 15 years, pivoted its focus towards life sciences and relied on McMaster University and Mohawk College for providing R&D base and the HQP that support this "new knowledge-based economy" (Key Informant no. 6, Personal Communication on MIP, July 22, 2016). In this context, MIP is seen to play a major role and therefore has retained significant – at time flailing, support from the City officials and political leadership.

As discussed in chapter 6, Waterloo Region, which is an amalgamation of City of

Waterloo and other smaller municipalities and townships, played an active part in the development of DJRTP. It led the planning and funding of the innovation park and acted as the primary proponent for federal-provincial funding for the park. While economic development and expanding tax-base were the underlying motivations for the Region, it did not face the same challenges as Hamilton or another industrial municipality in Ontario. On the contrary, it has had a strong supply of entrepreneurs in the field of information technology and a strong entrepreneurial culture to build on courtesy the University of Waterloo.

Saskatoon and Regina on the other hand, have had a somewhat masked role in the development and functioning of SIP due to significantly strong provincial government involvement in the operations of the park. In terms of funding, the municipalities have not provided any funding to SIP; one SIP management respondent noted that “if ever funds are needed for SIP, municipal governments would be the last place where we would go to seek funds” (Key Informant no. 10, Personal Communication on SIP, October 21, 2016). On the contrary, SIP has provided funding to the municipal government for a number of economic development projects of mutual interest (Key Informant no. 10, Personal Communication on SIP, October 21, 2016). However, the SIP management has close working relationship with the City officials – including the City Clerk who has a seat on the advisory management committee and has a full vote (Key Informant no. 10, Personal Communication on SIP, October 21, 2016).

When analyzing the role of the three levels of government, one needs to be cognizant that innovation, and entrepreneurship in particular within the broader innovation policy, is a hyper-local level phenomenon. Individuals and entrepreneurs do not start a company in Ontario – they start a company in Windsor, or Waterloo or Toronto (Key Informant no. 33, Personal Communication on Innovation Parks, December 14, 2016). If this localization is taken further, companies are developed and managed at community level such as in Liberty Village or Yonge and Dundas. Federal and provincial governments have thus moved to establish innovation ecosystems that cater to this hyper-localization of innovation (Key Informant no. 33, Personal Communication on Innovation Parks, December 14, 2016). Organizations such as the Ontario Network of Entrepreneurs are mandated to work at the community level to harness entrepreneurial skills and talents while developing a collaborative network of provincially funded organizations that are regionally-focused and have a provincial mandate.

All in all, across the three levels of government as well as across the same level of governments, the rationales and capacity to support innovation parks are significantly different. These differences are magnified as we move from federal to provincial to municipal levels. Each level of government plays an important role: federal government has significant leverage over fiscal resources and plays an active role in providing an overarching national framework for innovation policy; provincial government has more control over developing the regional innovation ecosystem while working with relevant academic and private sector organizations and providing the necessary oversight; and finally, the municipal government is more apt with the ‘nuts and bolts’ of the ecosystem by providing support for the planning and implementation of innovation park infrastructure.

The support from each of these levels may largely be a function of acting in response to actions by another level of government. For instance, as noted, for MIP and DJRTP, federal government was the last level to throw its (financial) support behind the parks only after provincial and municipal governments had announced funding. This may be a function of federal government's desire to also establish its jurisdiction in the S&T and innovation policy domains – something it can do through its fiscal levers. Similarly, provincial ownership and support is largely a function of policy inertia, informed initially by political economic contexts of each of the province and driven by underlying ideational forces. These dynamics are reflective of the federal arrangements defined under collaborative federalism regime.

Saskatchewan has had a long history of government and crown ownership of its enterprises including utilities and insurance. Once the provincial government chose this path for SIP, it has become difficult to reverse and the province developed a vested interest in it. For Ontario, the initial investments also created sunk costs in fixed physical infrastructure that are innovation parks. The government never fully took ownership of the parks and largely steered clear of future ongoing investments in innovation parks in response to corporate sector pressures and the rapidly changing innovation ecosystem. While federalism and institutional path dependency play a more active role in the governance and ownership of innovation parks, these are only one explanation of government support (or lack thereof) for innovation parks. Thus, institutional explanation is only partial and needs to be combined with an understanding of interest group pressures and ideational forces to gain a holistic understanding of the development and functioning of innovation parks.

7.1.3. Timing and Political Pressures

Innovation's black box process generally requires a long time to unfold, with high risks of failure. The underlying relationships and collaborations thrive on trust and understanding of organizational cultures – which develop over time. Yet time is a luxury that the innovation parks, or other policy instruments, do not enjoy. Both MIP and DJRTP were developed in the last 10-15 years; SIP is the only park that was developed much earlier than the others. At the same time, these parks thrive on significant public funding by governments. Consequently, there are accountability pressures and desire to demonstrate success. Most importantly, politicians are constrained by their election cycles. They need to showcase 'early wins' for their policy decisions to invest in these initiatives (Key Informant no. 37, Personal Communication on MIP, February 21, 2017). A number of respondents acknowledged the short time horizons on part of the government are a limiting factor in demonstrating long-term viability and success of innovation parks. One respondent suggested that innovation parks and similar initiatives require time to perform up to their expected levels whereas "governments have really short time horizon for wanting to see results" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). The respondent noted that some parks need to be "evolved at their own rate to be able to demonstrate tangible benefits to the region" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

Often times, those who champion the Innovation Park – including university administrators and public officials – have high expectations at the time of initiation of these parks. However, things typically move more slowly than expected, with real benefits being intergenerational in nature (Key Informant no. 33, Personal Communication on Innovation Parks, December 14, 2016). A respondent pointed to the experiences from different innovation parks and suggested that "it actually takes time for Innovation Parks to demonstrate tangible successes" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). The respondent drew upon their experience from association with different research parks in Ontario, including Queen's University and Western Ontario, to suggest that all these parks have taken "a very long time to get going and some are still struggling" (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). Innovation parks evolve very slowly and "patience is required" for them to demonstrate quantifiable or tangible results (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

This begs the question of how realistic the expectations are to begin with, whether in terms of outcomes or the timelines – established at political levels than administrative level. These expectations are often long-term in nature while the policy and political leaders want to align them to their own institutional constraints rather than to the reality of innovation processes. In regard to the outcomes, administrators across all three parks alluded to economic development as the underlying high-level outcome envisioned for their respective innovation park. However, experience suggests that these parks may not be direct or significant contributors to the economic fortunes of the region or the province they are located in. One respondent pointed to the overly-ambitious forecasts, some of which I have highlighted previously, suggesting that these forecasts are "not only misplaced, they are excessively optimistic" (Key Informant no. 14, Personal Communication on SIP, November 9, 2016). The multipliers used to highlight the benefits of the innovation parks significantly overestimate and bias the expected outcomes (Key Informant no. 14, Personal Communication on SIP, November 9, 2016).

Given the cultural differences, there is significant misunderstanding and confusion around innovation and its black box processes, including the commercialization of university research. Much of the commercialization process remains an enigma to the academic entrepreneurs. Administrators at both SIP and MIP acknowledged their struggle with this process. Some argued that it is difficult for researchers to be entrepreneurs, which takes us back to the two cultures arguments. The other aspect of this is the misplaced goals, namely economic development, associated with the innovation park. Many respondents, mostly from SIP and MIP, argued that this is a 'highly misplaced expectation' as innovation parks are incapable of delivering economic growth to justify their existence. They can help "develop next-generation leaders and entrepreneurs, who know how to take risk, develop the experience base by working closely with multinationals and transfer the knowledge to the local community" (Key Informant no. 14, Personal Communication on SIP, November 9, 2016). This, according to the key respondent, is a more achievable and valuable goal than economic growth, which has remained elusive to many of the innovation parks in Canada (Key Informant no. 14, Personal Communication on SIP, November 9, 2016).

Innovation Park administrators can also become risk averse – sometimes in response to political risk aversiveness - tending to avoid excessive risk taking, which drives the transformative innovation. A failed initiative, particularly if it hits the press and garners negative public attention can be considered damaging by the governments that provide financial support to these parks (Key Informant no. 37, Personal Communication on SIP, February 21, 2017). In such cases, there may be a tendency to move towards politically driven pragmatism. This has certainly been the case with MIP and SIP, where park administrators are considered to be forced to shift focus away from companies and start-ups that have the potential to drive transformative innovation towards mostly established companies that can provide demonstrable economic returns in the short to medium term. One respondent argued that while "aspirations are great to have, it is not practical to have consistent failures" (Key Informant no. 3, Personal Communication on MIP, May 16, 2016). Pragmatism is an important consideration, where park administrators want to balance aggressive attitude and creativity with practical considerations of financial viability (Key Informant no. 3, Personal Communication on MIP, May 16, 2016).

While it remains important for innovation parks to be pragmatic in order to 'pay their bills,' this practicality, in the case of SIP and MIP, has been argued to have driven them away from their intended mission. The need to generate revenue has led both SIP and MIP towards the real-estate model, by renting to tenants that are not necessarily aligned with the mission and the original objective of the innovation park. This leads to mission creep, which results in competition with the private sector. For innovation parks to remain mission-driven, either the expectations have to be lowered or the level of support (by governments) has to be increased (Key Informant no. 19, Personal Communication on SIP, November 14, 2016). Part of the 'mission creep' is also the result of political cycles and timelines – when governments start seeking 'quick demonstrable wins' to showcase to their electoral constituencies. This is termed as the "picking winners to demonstrate wins" - whereby innovation park administrators invite those companies as tenants that have more certain commercial futures rather than those that might have promising ideas yet uncertain commercial future (Key Informant no. 19, Personal Communication on SIP, November 14, 2016).

The issue of timing is primarily a function of electoral timing whereby politicians face the prospects of election every four years. In order to get re-elected they want to be able to demonstrate positive policy outcomes. However, the innovation parks take much longer than the four-year period to have demonstrable impact. It takes "many cycles of government and political willingness to see it through" (Key Informant no. 39, Personal Communication on Innovation Parks, March 28, 2016). Innovation parks are thus akin to "long-term investments" which governments should not waste by "pulling the plug" after three or four years (Key Informant no. 39, Personal Communication on Innovation Parks, March 28, 2016). Thus, innovation parks require persistence; however, they run against political cycles, which is a challenge (Key Informant no. 39, Personal Communication on Innovation Parks, March 28, 2016).

7.2. Interests

As argued in chapter 2, innovation parks are an institutional product of triple helix interactions between government, industry and academia. Their development marks the codification of the emergent properties of the innovation system. They are also a manifestation of inter-organizational struggles that arise from the differences between individuals from different institutional spheres. In this process, while certain interests are created, and institutionalized, existing ones are marginalized or reshaped. The outcomes of these struggles and the emergence and relegation of interests are consequential for the development and operations of innovation parks. These struggles also play out in the government decision-making spaces, thus influencing government's support for innovation parks. Government's role from an interests-perspective may be that of a mediator; however, in certain situations, it may also be an interest group on its own. Government bureaucrats particularly – often considered to be driven by self-interested motives of expansionism – can strongly influence the direction of government policy (Cook & Wood, 1989; Doern et al., 2016; Gailmard, 2010).

The governance structures are important institutional design elements that formalize the power dynamics, particularly between government, university and private sector. The composition of board of directors and advisory committees, for instance, provides a glimpse of power dynamics at micro-level. The tensions between university administrators, private sector and park management are well documented in the literature (discussed in chapters 2 and 3) and largely confirmed in this study. Each group, equipped with its power base – universities with intellectual resources, park management and facilitator organizations with social capital, and private industry with financial capital and extensive knowledge of market conditions – often engage to alter the dynamics in their favour and obtain results that are favourable for their respective organizations (Hansson, Husted, & Vestergaard, 2005; Lindelof & Lofsten, 2004).

The public policy and political science literature presents interest group pressure as a manifestation of class struggles arising within a capitalist system – with private sector (firms) holding considerable capital resources (Massey & Wield, 1992b; Winders, 2005). However, in the case of Canadian innovation policy – and particularly innovation parks – we notice that private sector is remarkably weakened or in some cases largely missing. According to Smardon (2014), this can be attributed to the dependent technological growth model, whereby Canadian innovation policy relied heavily on foreign owned – primarily U.S. owned multinationals – that carried R&D activities in the headquarters located outside Canada. Nonetheless, the interest-group discourse is, to a certain extent, influenced by private sector interest groups that seek to influence the innovation policy outcomes.

Exogenous groups that are not directly related to the innovation ecosystem but are negatively affected by a program or instrument, provide the fundamental push against the initiative. As is the case with most policy domains, but particularly economic and innovation policy, there are usually winners and losers – the latter emerging as opponents of the policy. In the case of innovation parks, the real estate lobby acts as a strong opposition. Innovation Parks are viewed by the real estate lobby as a real-estate play – an idea that is accentuated by evidence of innovation park management to expand their infrastructural reach. This tension and opposition by the real-estate industry is particularly noticeable in the case of SIP, where it is seen as government investment crowding out private sector investments and revenues.

Similar pressures have been exerted by the real estate lobby in Hamilton; however, their influence was largely watered down as a result of the 2008-09 recession which led to the exodus of businesses from the Hamilton downtown core. Nonetheless, the real-estate lobby has managed to limit Park's ability to provide direct rent subsidies to start-ups, significantly driving up the rents. In response to these pressures, governments lose the levers available to them and resort to indirect incentives through grants and contributions as well imposing limits on the level of support. This serves to push out start-ups when the government grants run out and relocate at commercial properties in the region or move to a different region where office/laboratory space may be more affordable.

DJRTP on the other hand, has managed the interest group pressures in a somewhat different manner. Instead of acceding to their demands, DJRTP has brought on the real-estate lobby as partners and provided them the opportunity to partake in the development of the innovation park. One of the primary partners of the park is in fact a local real-estate development company, CORA Group Inc., which along with a list of multiple developers contributes to the design and development of the DJRTP. In this case, the commercial real-estate developers have been able to exercise instrumental power and developed a coalition that is necessary to advance their interests. Thus, the DJRTP has built on the "inclusive governance" model that has been the hallmark of Waterloo's regional innovation system (Nelles, 2014)

Going back to the provincial political economy and the historical path dependency of governance structures – crown and corporate ownership – we can find that certain interest groups have a more pronounced influence in shaping these governance decisions due to their historical involvement in the regional economy. Saskatchewan, for instance, has strong civic sector organizations that represent the interests of farmers and labours. It has had a long history of cooperatives that actively lobby government for funding for their constituents. These organizations are also at the forefront of supporting agriculture bio-technology innovation. Their support is critical to many of the start-ups that are located in the SIP. Saskatchewan Canola Development Commission and Saskatchewan Seed Growers Association are both examples of such organizations that have traditionally been associated with lobbying for farmers. With the shift to knowledge-based economy and the increasing importance of innovation in the agriculture-biotechnology, these organizations have also been playing an active role in lobbying provincial and federal government to provide space for innovation activities and to fund start-ups and entrepreneurs in this area. They also help legitimize government involvement in the innovation park by mobilizing their large constituent base. Their presence in SIP as tenants is consequently seen as very important in rallying the support of their constituent organizations for the effective functioning of SIP.

Innovation parks, by the virtue of their design, also give rise to new interest groups – in the form of bridge or facilitator organizations - that come to exert influence. Facilitator organizations, due to their place at the edges of the institutional design, hold significant leverage over production and utilization of Mode 2 knowledge – which lies at the heart of the innovation regimes. Examples of these organizations in the context of innovation parks include Innovation Factory (MIP), Ag-West Bio (SIP), Communitech and Canada's Technology Triangle (DJRTP). These organizations carry out the core functions of communication and knowledge transfer at their respective innovation parks. They are further supported by the Association of University Research Parks (AURP-Canada), which is the national not-for-profit association that advocates and lobbies for the innovation parks. These organizations exercise significant instrumental and structural power to develop alliances and coalitions both within the innovation parks as well as with governments and international stakeholders.

AURP-Canada for instance, actively lobbies the federal and provincial governments. It promotes a certain vision of innovation parks through its global and pan-Canadian networks. According to a former President of the association, AURP's main purpose is to "facilitate connectivity between the networks, facilitate discussion and advance national S&T policy" (Key Informant no. 5, Personal Communication on AURP, June 14, 2016). The association acts as "the united voice of technology parks in Canada to derive and influence national S&T policy" that would have "ripple effects for the innovation parks in Canada" (Key Informant no. 5, Personal Communication on AURP, June 14, 2016). The AURP seeks to "unite the network of innovators" and "act on behalf of the network" to influence the federal policy (Key Informant no. 5, Personal Communication on AURP, June 14, 2016).

AURP representatives meet with legislators and appear regularly in front of House of Commons and Senate Committees to promote their ideas and policies (for example, see testimony by AURP co-founder and managing director (O'Bleins, 2017, 2017) and

Budgets 2017 (Shaw, 2016) and 2018 submissions (Shaw, 2017). A senior AURP representative noted that the association has strongly advocated on behalf of innovation parks for a fund or reserve pool of existing funds be created where it would be possible for each of the innovation parks to access those funds for capital or infrastructure expansion (Key Informant no. 5, Personal Communication on AURP, June 14, 2016). The association also works closely with industry liaison officers, industry groups, manufacturers and exporters – organizations that are in the space having a voice federally for an industry sector to build support for innovation parks that complement that sectoral space. The coalition building activities – through networks, information sharing and "profile building" gives a central bridge role in the otherwise disparate and complex network (Key Informant no. 5, Personal Communication on AURP, June 14, 2016). The centrality of the organization makes it a strong influencer in the development and functioning of innovation parks and more importantly in garnering financial and political support from governments at different levels.

In addition to organized interest groups, innovation parks often find supporters in federal and provincial bureaucracies, many of whom have been at the helm of designing supporting innovation policies and programs. These individuals often exert their influence through their deep-rooted networks spanning bureaucracies, university administrations and private sector. Similarly, university presidents and administrators have been a source of considerable networking and provided "inspirational leadership" to attract innovation park development for their respective universities. Faced with dwindling basic R&D budgets and heavy demand on existing R&D infrastructure, university administrators have found innovation parks to be a strategic source of funding to expand their campus capacity. Innovation parks have also provided them with political visibility with provincial and federal governments of late choosing the sites of innovation parks to make important regional development announcements.

7.3. Ideas

The third dimension of our analysis is the ideational argument which, as noted - draws attention to a wide range of variables, including “world views, cultures, societal scripts, norms, models, and causal beliefs” that drive the development and support of innovation parks (Bleich, 2002). Given the challenges faced by innovation parks - including disparate views, differences in perceived objectives and most importantly the institutional differences across government, academic and private sector organizations, the development and functioning of innovation parks appears to be a policy miracle. While institutional setup, policy inertia and interest group pressure provide plausible policy rationale for innovation parks, these are only bound together by the underlying ideas that provide the frames that help these disparate views to converge.

Economic Development provides one such frame that emerged throughout the key respondent interviews as well as document analysis of innovation parks. Economic development provides the common ground that allows governments, private sector and academia to come together despite the underlying institutional differences. Governments want economic prosperity – companies doing well, employing people, a large individual and corporate tax base to support social programs in the community. The private sector wants to contribute to economic development and reap the profits that would result from business activity. From university's perspective, economic development would mean higher employability for its graduates as well utilization of its research and technology. Thus, the otherwise institutionally disparate legs of the stool – or the triple helix – is woven around the idea of economic development and prosperity. The fundamental belief that by supporting innovation and commercialization, innovation parks will help develop new businesses that will drive net economic growth is fairly consistent across governments regardless of their ideological divide.

The other idea that is frequently invoked is that of knowledge-based economy and that highlights the role of universities and collaborative (applied) research that drives innovation which is in turn necessary for economic development. Thus, the idea that (technological) innovation – which requires extensive involvement of universities to produce applied research and HQP that are equally adept at being entrepreneurs and running their start-ups – is intrinsically linked to economic development. This link underlines the "frame" that is used to legitimize innovation parks and other similar instruments. This frame also drives the keen interest in federal and provincial governments are specifically keen to attract global talent and HQP from other international jurisdictions. In order to achieve that, they have instituted supplementary programs that incentivize the attraction and retention of global scholars and scientists working in technological areas viewed by governments as strategically important. Innovation Parks, and network-based innovation programs, have also been used to nudge the universities towards more applied research and institute an ideational shift in the attitudes of faculty and university administrators. The layering and conversion of academia, under the frame of "knowledge-based economy", has thus been a key motivator for government in supporting the innovation parks.

In this context, innovation parks symbolize vegetative gardens where new trees and flowers develop organically. In the same spirit innovation parks may be seen as spaces where different organizations and individuals come together, share ideas and experiences that lead to the emergence of new ideas, products, and technologies – all of it organically. This symbolism is further extended by the infrastructural features of many of the innovation parks – such as green rooms and ponds and water reservoirs.

Government involvement in innovation parks may thus be influenced by the moral map provided by the concept of knowledge-driven economic development. In this regard, government support acts as a legitimizing signal. Such signals may also need to be aligned with the political ideology of the government – for instance the retrenchment of financial support during Conservative governments at federal and provincial levels. Nonetheless, the economic development frame is strong enough to resonate with all political ideologies. Even where there are contradictory or competing frames, it provides the moral map that drives government support for innovation parks.

The question then arises: how does the concept of innovation parks get so strongly linked to the economic development frame? Policy learning and ideational osmosis provides the answer to the diffusion of global acceptance of innovation parks as a legitimate policy tool employed for economic development. Transnational organizations such as OECD (for example, see OECD, 1996, 2002; OECD & Eurostat, 2005) have been primarily responsible for diffusing the neoliberal ideas of economic growth including new public management, public-private partnerships and more importantly the idea that technological innovation is seen as the primary driver of economic growth has been largely diffused through transnational organizations such as OECD. In the case of innovation parks, the idea that emerged in the United States (Silicon Valley) and the United Kingdom (Cambridge Corridor) has gained significant global recognition and acceptance through organizations such as the Association of the University Research Parks (AURP) and International Association of Science Parks (IASP).

A significant portion of the mandate of these organizations is to disseminate information and build value proposition of innovation parks. By undertaking education programmes, sharing knowledge and identifying best practices that serve as the building blocks for innovation parks in other countries, AURP and IASP provide the necessary convergence in the ideational frame through policy learning and knowledge transfer regarding innovation parks. The network of government officials, industry and academia that are affiliated with these organizations allow for a cross fertilization of ideas and information sharing about their respective jurisdiction. While the global reach of these networks is an important factor, it is further supplemented by the frequent exchange of key personnel. For instance, the former manager of DJRTP now serves as the president of AURP- International and was also the founding member of AURP-Canada chapter. Similarly, the current CEO of MIP served as the president & CEO of SIP (SOCO). Within the parks, there is also significant exchange of personnel between facilitator organizations, start-ups and large national R&D laboratories. In SIP, one finds many instances of individuals who have worked for NRC, SRC, Genome Prairie and

AgWestBio. A close interaction between these individuals and cross-fertilization of ideas helps legitimize innovation parks as a relevant policy tool to advance innovation and knowledge-based economic growth.

While most of these ideas have diffused across international, national and sub-national jurisdictions, most of it has been driven by policy emulation (adoption) rather than policy learning (adaptation) (Benson & Jordan, 2011; Dolowitz & Marsh, 2000; Stone, 1999). As one respondent noted that policy transfer and learning is critically important as one can learn from other jurisdictions; however, this study of the jurisdictions has to be extremely nuanced and thoughtful because these things occur within regional ecosystems and they are always different (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). The respondent drew on some of the conversations that take place within academic circles drawing upon experiences of Israel in establishing innovation parks and highlighting that as “the way to go” (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). They noted that it is “remarkable” how parallels are frequently drawn between Canadian and Israeli organizations in the innovation domain. University administrators often talk about “how brilliantly Israeli universities have managed commercialization and innovation” (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). Canadian policy makers are often “too quick to want to emulate Israeli experience” which, according to the respondent, “would not necessarily be feasible in Canada” (Key Informant no. 2, Personal Communication on MIP, May 9, 2016). The respondent recalled conversations with Israel policy makers who suggested that Israeli model “will not work in the world” because it is based on specific context and institutional designs (Key Informant no. 2, Personal Communication on MIP, May 9, 2016).

Such conversations highlight the significance of global frames and the need for policy adaptation as compared to policy adoption. The later, which is often easier to do as it fits a certain cognitive frame that is globally recognized and accepted, often devoid the policy learning process of agency. In the case of innovation parks, we can find examples where policy makers are driven by such policy emulation whereby desire to be adopting international 'best practices' trumps the need to adapt according to the needs of local socio-economic and political contexts.

In Canada, development of innovation parks – as well as the broader S&T-innovation policy discourse – have largely followed the developments in the United States. As discussed in Chapter 3, Canada's S&T-innovation policy landscape has followed a dependent growth approach, whereby a significant portion of R&D has been conducted by headquarters of multinationals located in the United States; Canada, on the other hand, has been responsible for the branch plant manufacturing. The United States being a dominant trade partners of Canada and an immediate neighbour with significant influence on the global ideational discourse has thus had a strong influence on the development of innovation parks. Much of Canada's innovation park models have been influenced by developments of innovation parks in Silicon Valley and Route 126. Moreover, management of Canadian academia has also come to be influenced by the "lab-to-market" and "commercialization of research" discourse prevalent in the United States.

Finally, political leadership and ‘championing’ by individuals is a critical element that provides valence to the frames linking innovation parks to economic development and knowledge-based economy. In all three cases studied here, we found strong evidence of the need for individual champions – within university, government and private sector. Individual bureaucrats within government departments have been critical in pushing up the ideas regarding the usefulness of innovation parks. These bureaucrats – at the level of Assistant Deputy Ministers and Deputy Ministers - have been at the helm of designing funding programs that support the development of innovation parks. Similarly, DJRTP’s development has been largely ascribed to the leadership of David Johnston – the former Provost of the University of Waterloo who later became the Governor General of Canada. David Johnston’s leadership and keen interest in the innovation policy and framework at the national level legitimized the case for innovation parks at the highest political levels.

It is important to note that these ideas and frames do not work in isolation from the institutional constraints imposed by federal political structures, governance mechanisms and path-dependency. Once institutionalized, the framers of these ideas have found it significantly difficult to alter course due to policy inertia and multiple levels of decision-making. Interest group pressure, both from new and existing groups, have made it difficult for governments to choose different policy instruments. The complex narrative of innovation in a federal country, however, remains ever green. It is often revitalized by certain interest groups that find allies with federal and provincial levels of government after election cycles.

The complex interplay of institutions, interests and ideas drives the development and functioning of innovation parks in Canada. The ontological supremacy of any one "I" may be difficult to discern. However, once we develop a holistic picture, it becomes clear that ideational frameworks – such as "knowledge-based economy", "collaboration" and "economic growth" – assist in the development of specific policies and tools that transcend institutional domains and find support at different levels of government. These frames – in the Canadian case – have largely been adopted from international discourses that have transcended onto Canada through forces of globalization and epistemic communities. These ideational frames operate within the specific political-economic trajectories of national and sub-national governments and are further institutionalized through the interest groups. Some of the interest groups are created by these very instruments – such as the AURP and other Mode-2 knowledge creating organizations. Once formulated, these organizations are institutionalized in the innovation park and become proponents of innovation parks, exercising their power through various channels including lobbying different levels of government. Federalism provides an ideal institution for such pressure group politics because multiple levels of government exacerbate coordination problems and lead to jurisdictional jealousies whereby each level of government desires to be seen as acting on the imperatives of economic growth.

8. Conclusions

The inception of this research project was inspired in part by the popular media coverage of MaRS Innovation Park in Toronto that faced considerable challenges and was criticized heavily for the lack of impact in terms of innovation and private sector interest in locating at the innovation park. The Government of Ontario had to bail out Phase 2 of the MaRS Innovation Park by providing loans of $376 M (CBC News, 2014). I have had multiple opportunities to personally visit SIP and MIP – which further motivated me to consider why governments want to support such infrastructure-based projects.

While economic impact studies sponsored by industry organizations highlight significant economic impacts, the respondents in this study could not corroborate these results. Although cognizant of the broader benefits – in terms of social and learning networks, the respondents were sceptical of the true extent of the economic (in dollar value) benefits of innovation parks. Given the lack of validation for the economic benefits, the continued support of governments at various levels remains enigmatic. Furthermore, as discussed in chapter 7, there are several systemic, institutional, and material challenges that impede the effective functioning these innovation parks. The question thus remained as to why the federal, provincial, and municipal governments support these innovation parks – financially and politically.

Despite the significant interest and investment in the innovation parks by different stripes of governments, industry and academic organizations, there has not been nearly enough academic discussion surrounding these enterprises. This particular study attempts to fill this very void. To solve this puzzle, I have offered a three-pronged analytical framework –termed 3-I framework – that borrows from the innovation policy literature as well as the broader policy literature in the political science field. The 3-I framework builds on three pillars, namely **institutions**, **interests** and **ideas**. I have argued in this study that the development and functioning of innovation parks in Canada has been a function of complex interplay between institutional design, interest group pressures and ideational forces. These three aspects provide a holistic understanding of rationales for the development and support for innovation parks, using specific examples of SIP (Saskatoon and Regina, Saskatchewan), MIP (Hamilton, Ontario) and DJRTP (Waterloo, Ontario).

Innovation Parks are defined by physical collaborative spaces that are associated with post-secondary educational institution, provide services for commercialization and market activity that emerges from applied R&D conducted by academic and industry researchers. They are different from business parks in that they are affiliated or associated with a post-secondary institution and have a central focus to provide co-locating services to academic and industrial researchers. They serve as the incubators that translate academic research into market solutions. A number of characteristics such as location; physical environment; services such as venture capital, legal advice and marketing; and knowledge-based services are used to define innovation parks (UNESCO, 2017).

In this study, using MIP, SIP and DJRTP as empirical cases, I have delineated between the infrastructural elements of the innovation parks from the policy rationales. Indeed, the three parks studied here boast impressive infrastructural facilities – marked by structures and services that are innovative in themselves. Each of these parks are offered as landmarks that are linked to the economic futures of their respective regions.

Governments have several rationales or objectives in supporting innovation parks and actively partaking in their development. While many of these can be competing, most of them are seen as reinforcing. Amongst the multitude of objectives and rationales for innovation, the key rationale – that emerged in the interviews and confirmed in the literature in this field – was the growth of knowledge-based economy and collaborative, network-based applied R&D. Regional economic growth provides the underlying macro-rationale for government investment in innovation parks. However, as the key informants reflected, this rationale is not necessarily justified in that these parks do not provide the anticipated economic growth and job creation that is expected of them.

Canadian Innovation Parks have been a function of Canada's federal-provincial S&T-innovation policy, which evolved from the government-led basic R&D focused approach to market-led applied R&D approach. Over the years, Canadian S&T-innovation discourse shifted from pure research to applied-industrial research – the S&T policy thus became innovation policy and S&T has been subsumed to industrial innovation considerations. With this shift, also came new instrument and approaches, as well as shift in institutional responsibilities – particularly the role of universities has come to be seen in a different light.

Over the years, the shift in S&T-innovation discourse has also brought to fore collaborative, cross-institutional networks and partnerships. The Networks of Centres of

Excellence, which started out in the P.E. Trudeau era (1968-1979) and were formally melded into a federal program during the Mulroney government (1984-1992), were the underlying drivers of innovation parks. The NCE program – formalized the industry-led research paradigm, conducted in universities and public R&D laboratories. As these networks were created and expanded, they highlighted the need for collaborative co-locational spaces where effective exchange of ideas between academics, businesses and governments could take place. Experiences from the United States – where Silicon Valley and Route 128 MIT had clustered around innovation parks - and elsewhere globally brought spotlight to the concept of innovation parks. Early innovation parks in Canada appeared in the late 1970s – SIP was among the first tranche of innovation parks. Significant momentum in innovation park development came in the late 1990s and early 2000s, when the federal government's innovation agenda took central focus along with increased funding for municipalities dedicated towards knowledge-based infrastructure development.

The underlying notion of innovation parks gained traction when the earliest innovation parks were developed in the United States and United Kingdom. The development of these parks was driven largely by the idea that the economic growth is fuelled by innovation which in turn is dependent on various forms of knowledge. The idea of knowledge-based economic growth thus became a reference frame for policy-makers around the world. It found alignment with other concepts of neoliberal economic and political thought such as new public management that promoted ideas of collaborative research and emphasized value-for-money for public research. The global propagation of these concepts was largely undertaken by transnational organizations such as the OECD which have significantly contributed to global convergence around key concepts of innovation. OECD has published several documents such as the Oslo Manual (OECD, 1997; OECD & Eurostat, 2005), Measuring Innovation (OECD, 2010) and "Knowledge Based Economy" (OECD, 1996) that have heavily influenced the S&T-innovation policy discourse around the world. The diffusion of these ideational frames – that build on the notion of economic development and prosperity – driven through collaborative applied R&D – provides the ideational policy cover for innovation parks.

The ideational diffusion has also been exacerbated by the emergence of strong policy networks and interest groups that stand to benefit from investments in innovation parks. The AURP and IASP, as well as other facilitator organizations that occupy the boundary-spanning spaces of Mode 2 knowledge production have acted to develop strong support for innovation parks within the policy circles. Their structural and instrumental power has been further strengthened through the strong inter-connectivity of networks that oversee the innovation parks. There has been strong evidence of cross-fertilization of ideas through the frequent exchange of personnel between innovation parks, government, academic and facilitator organizations as well as companies that are tenants of these innovation parks.

Other organizations, some of which are products of federal and provincial programs to support innovation, also have vested interests in the continued functioning of innovation parks. Organizations such as the Ontario Network of Entrepreneurs (ONE), Genome Prairie (SIP), Ag-West Bio (SIP), Innovation Factory (MIP) and the Accelerator

Centre (DJRTP) – all provide incubation and business information services to the tenants of their respective innovation parks. Their revenue streams thus depend largely on the tenancy rates of the innovation parks. They also enjoy subsidized residency in the innovation parks offered as an incentive for their services. These organizations have developed strong networks and relationships across the public-sector bureaucracies, that develop innovation policies and programs, as well as university administrators and by virtue of their functions, businesses, and financial industry.

In addition to these organization influencing the support for innovation parks, there has been strong interest group pressure exerted through various societal domains. One such pressure point has been exercised by local development lobbies – who have maintained that innovation parks present a subsidized business competition. Their lobbying has particularly been intense in the case of SIP and MIP where there was a perceived divergence from the intended university-led science focus to a more pragmatic real-estate model. The 2008 financial crisis further intensified this pressure as the private sector perceived increased cost pressures due to businesses vacating the premises. Consequently, government support for innovation parks– particularly at the provincial and municipal levels – has become more calculated and strategic.

Another source of pressure comes from individuals – who in their individual capacities vis-à-vis innovation parks continue to exert their positions and networks in support of innovation parks. Of significant importance are the federal, provincial and municipal bureaucrats who design and implement innovation programs and policies. Bureaucrats in federal and provincial departments and ministries of innovation –

including Innovation, Science and Economic Development (ISED), NRC-IRAP, Ontario Ministry of Research, Innovation and Science, and Innovation Saskatchewan – have been central to the promotion of innovation parks as an implementation tool for innovation policy. Similarly, university presidents have been key figures in promoting innovation parks as they were seen as an extension of Universities' research missions and for acquiring additional strategic funding from governments.

The third dimension of the 3-I framework are the institutions – which shape and constrain the individual behaviours and to a certain extent dictate how ideas and interests play out. Governance mechanisms – ownership and management of innovation parks as a trust, Crown Corporation or as an extension of university – largely institutionalize individual and organizational behaviours and expectations. These governance mechanisms are, in turn, a function of Canada's unique federal system whereby provincial political economies have taken different paths in regard to corporate versus crown ownership of enterprises. In Saskatchewan, one finds a stronger tendency towards central government planning and ownership – owing largely to its natural resource dependent economy and presence of strong civic society organizations and cooperatives. Ontario, which has a strong manufacturing base, on the other hand has been driven by the corporate ownership models. While the labour and civic organizations enjoyed significant influence in the province during in earlier periods, these influences have been largely withered away with the emergence of new knowledge-based economy.

Federalism in Canada has also shaped the support for innovation parks – and innovation policy broadly – through the multi-level governance regimes. Given the breadth and depth of S&T-innovation and regional economic development policies and programs that come into play to support innovation programs, it does not come as a surprise that there are significant challenges that preclude a rational and timely evaluation of innovation parks. The multi-level governance paradigm provides coordination challenges as well as incentives to act to secure respective jurisdictional turfs. Innovation policy is primarily a pluri-jurisdictional issue: federal government has the responsibility for industrial policy as well as acts to promote national unity through regional economic development; provinces are responsible for post-secondary education; and municipalities are responsible for local development including infrastructure. Innovation Parks are thus located at the cross-roads of federal-provincial-municipal domains and rely on concurrent, conditional support of each level of government. In these scenarios, rational accountability becomes an issue – as the politicians face competing electoral cycles and therefore require showcasing the "wins" to justify their investments. The blame for losses often gets shifted to other levels of government.

The 3-Is, while on occasion offering opposing dynamics, largely provide a reinforcing narrative to the innovation park development in Canada. Driven by the discourse on "knowledge-based economy," "public-private partnerships," and "networked science," innovation parks were developed in response to changes in the S&T-innovation policy agenda at the federal level. The concept was largely adopted from the United States and internationally, where innovation parks had become the symbol of innovation through collaborative, industry-led marketization of R&D. Canadian federal S&T-innovation policy – which had been historically influenced by the developments in the

United States and followed a dependent growth approach – was influential in setting the concept of innovation parks in motion. Their development was supported by provincial and municipal governments, which wanted to protect their jurisdictional reach as well as maintaining their specific structural and political-economic institutions. Once established, these innovation parks created their constituencies with embedded interests in the continued development of innovation parks.

Thus, we can see that interest, ideas and institutions largely reinforce the rationales for innovation parks in Saskatchewan and Ontario. These 3-I influences are only marginally affected through periodic changes in governments at federal or provincial level or exogenous domestic or global events such as the 2008-09 recession. Most significant evolution of these elements is conducted at an intrinsic level – when competing ideas and interest groups trump those currently in form.

8.1. Policy Implications

This study serves to fill a significant gap in the innovation literature. As noted earlier, the concept of innovation parks received little to no attention in academic circles – particularly in Canada. Moreover, the scant literature that existed did not provide a comparative analytical base to understand the policy rationales for innovation parks. The 3-I framework situates innovation parks within the politico-economic context with special consideration given to institutional, structural and ideational dimensions that range from macro to meso to micro level.

The study and its findings serve as an important benchmark and a learning tool. It could allow the practitioners to focus on areas of innovation park development that could yield most benefits while understanding the reasons underpinning the challenges faced. While focusing on the macro-level dimensions of innovation parks, the study also delves into micro-level challenges that present themselves in the development and operation phases of innovation parks. The study highlights the many pitfalls that are important from an organizational perspective and can assist those involved in the management of each of the parks.

8.2. Limitations of the Study

Given the complexity of innovation policy – the multidimensional nature of innovation and instruments – we could only give marginal attention to the broad aspects of innovation during the course of this study. Focusing on one particular policy instrument – while there are multiple competing policies and instruments that are in place at any given time with similar objectives – means that we only develop a limited appreciation of the elaborate space that is innovation policy.

During this study, a number of competing policies and instruments have emerged. There has also been a marked shift in political ideology at the federal level – and to a certain extent that has trickled down to provincial levels. Governments have moved to experiment with other instruments – such as superclusters, infrastructure bank – that are still in development. The constantly and rapidly evolving nature of innovation policy space – that is truly impacted by the very technological progress that it aims to tackle. As a junior scholar interested in this field, I continue to grapple with this dynamism and this may also be reflected in this study.

The study has undoubtedly its limitations – largely due to the limited number of cases that were studied, the inductive methodology employed and the resulting generalizability of the results. As I have noted throughout, the qualitative nature of the study precluded the quantitative verification of economic impact studies. The limited number of provincial jurisdictions – Ontario and Saskatchewan – renders in-depth analysis of innovation parks vis-à-vis Canadian federalism rather limited. Moreover, only a limited number of individuals belonging to pre-determined organizational spheres were interviewed – that may have biased the results of the study.

Nonetheless, the study serves an important milestone in developing a comprehensive understanding of innovation parks in Canada. The theoretical framework – as demonstrated here – can be extended to develop a holistic analysis of innovation policy and its instruments. The study opens the doors to further investigation and dialogue between academics, policy practitioners and government officials. It provides an opportunity to challenge some neo-economic conceptions of innovation parks and similar instruments and develop an appreciation of the institutional, structural and ideational influences that reinforce support for such instruments.

REFERENCES

Ag-West Bio. (2017). Ag-West Bio. Retrieved from http://www.agwest.sk.ca/about.html

Amenta, E. (2003). What we know about the development of social policy. In J. Mahoney & D. Rueschemeyer (Eds.), *Comparative historical analysis in the social sciences* (pp. 91–130). Cambridge: Cambridge University Press.

Archibugi, Daniele, & Immarino, S. (2002). The globalization of technological innovation: definition and evidence. *Review of International Political Economy*, *9*(1), 98–122.

Archibugi, Danniele, & Michie, J. (1995). The globalisation of technology: a new taxonomy. *Cambridge Journal of Economics*, *19*(1), 121–140.

Arrow, K. (1962). The Economic Implications of Learning by Doing. *Review of Economic Studies*, *29*(June), 155–173.

Asheim, B., & Gertler, M. C. (2005). The Geography of Innovation: Regional Innovation Systems. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation*. New York: Oxford University Press.

Association of Municipalities Ontario. (2018). Ontario Municipalities - Regions [Government]. Retrieved from http://www.amo.on.ca/AMO-Content/Municipal-101/Ontario-Municipalities.aspx

Association of University of Research Parks. (2013). *Association of University Research Parks - National Economic Impact Study* (Economic Impact Analysis) (pp. 1–49).

Association of University Research Parks Canada. (2013). *National Economic Impact Study* (Impact Study) (pp. 1–49). Canada: Association of University of Research Parks.

Atkinson-Grosjean, J. (2006). *Public Science, Private Interests: Culture and Commerce in Canada's Networks of Centres of Excellence*. Toronto: University of Toronto Press.

AUCC. (2008). *Momentum: The 2008 report on University Research and Knowledge Mobilization*. Ottawa, Canada: Association of Universities and Colleges of Canada.

AURP. (2013). *Driving Regional Innovation and Growth - The 2012 Survey of North American University Research Parks* (pp. 1–44). Association of University Research Parks (AURP).

AURP. (2018). What is a Research Park? Retrieved May 20, 2018, from http://www.aurp.net/what-is-a-research-park

Babbie, E., & Benaquisto, L. (2010). *Fundamentals of Social Research*. Toronto: Nelson.

Bathelt, H., & Hecht, A. (1990). Key Technology Industries in the Waterloo Region: Canada's Technology Triangle (CTT). *The Canadian Geographer/Le Géographe Canadien*, *34*(3), 225–234.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, *28*(1), 31–56.

Bennett, C. J. (1991). What is Policy Convergence and What Causes it? *British Journal of Political Science*, *21*, 215–233.

Bennett, C. J., & Howlett, M. (1992). The lessons of learning: Reconciling theories of policy learning and policy change. *Policy Sciences*, *25*, 275–294.

Benson, D., & Jordan, A. (2011). What have we learned from Policy Transfer Research? Dolowitz and Marsh Revisited. *Political Studies Review*, *9*, 366–378.

Blais, Andre. (1986). The Political Economy of Public Susbsidies. *Comparative Political Studies*, *19*(2), 201–216.

Blais, André, & Dion, S. (1990). Are bureaucrats budget maximizers? The Niskanen model & its critics. *Polity*, *22*(4), 655–674.

Bleich, E. (2002). Integrating Ideas into policy-making analysis: Frames and race policies in Britain and France. *Comparative Political Studies*, *35*(9), 1054–1076.

Bonaccorsi, A., & Piccaluga, A. (1994). A theoretical framework for the evaluation of university-industry relationships. *R&D Management*, *24*(3), 229–247.

Bradford, N., & Bramwell, A. (2014). Governing Urban Economies: Innovation and Inclusion in Canadian City-Region. In N. Bradford & A. Bramwell (Eds.), *Governing Urban Economies - Innovation and Inclusion in Canadian City-Regions* (pp. 3–33). Toronto: University of Toronto Press.

Bramwell, A. (2014). The Politics of Coalition Building in a Deindustrializing City: Linkages, Leadership, and Agendas in Hamilton. In N. Bradford & A. Bramwell (Eds.), *Governing Urban Economies - Innovation and Inclusion in Canadian City-Regions* (pp. 110–136). Toronto: University of Toronto Press.

Bruhat, T. (1990). *Vingt technopoles, um premier bilan: étude à l'attention de la DATAR* (La Documentation Française). France.

Bryden, P. E. (2013). Ontario's Exceptionalism: Old Ideas in the New Ontario. In M. Mendelsohn, J. Hjartarson, & J. Pearce (Eds.), *Shifting Power - The New Ontario and What it Means for Canada* (pp. 33–48). Montreal: McGill-Queen's University Press.

Campbell, J. L. (1998). Institutional Analysis and the Role of Ideas in Political Economy. *Theory and Society*, *27*(3), 377–409.

CBC. (2017, March 31). Feds announce $752M for Toronto-Waterloo GO line. Retrieved from http://www.cbc.ca/news/canada/kitchener-waterloo/toronto-waterloo-innovation-corridor-federal-funding-1.4049446

CBC News. (2014). Ontario to pump additional $86M loan into MaRS Phase 2. Retrieved from http://www.cbc.ca/news/canada/toronto/ontario-to-pump-additional-86m-loan-into-mars-phase-2-1.2868893

Chaminade, C., & Edquist, C. (2010). Rationales for Public Policy Intervention in the Innovation Process: Systems of Innovation Approach. In R. E. Smits, S. Kuhlmann, & P. Shapira (Eds.), *The Theory and Practice of Innovation Policy - An International Research Handbook* (pp. 95–114). Massachusetts: Edward Elgar Publishing Inc.

Chiose, S. (2016). Ontario gave $18.3-million to U of T for MaRS biotech collaboration. Retrieved from https://www.theglobeandmail.com/news/national/education/ontario-gave-university-funds-for-mars-collaboration-documents-show/article27989548/

City of Hamilton. (2017). Hamilton - The Ambitious City. City of Hamilton.

Communitech Corporation. (2017). About Communitech. Retrieved from https://www.communitech.ca/who-we-are/

Cook, B. J., & Wood, B. D. (1989). Principal-agent models of political control of bureaucracy. *American Political Science Review*, *83*(3), 965–978.

Cooke, Phil. (2005). Regionally asymmetric knowledge capabilities and open innovation: Exploring 'Globalisation 2'—A new model of industry organisation. *Research Policy*, *34*(8), 1128–1149.

Cooke, Philip. (2001). Regional Innovation Systems, Clusters, and the Knowledge Economy. *Industrial and Corporate Change*, *10*(4), 945–974.

Cooke, Philip, & Morgan, K. (1998). *The Associational Economy*. Oxford: Oxford University Press.

Courchene, T. J. (1995). Glocalization: The regional/international interface. *Canadian Journal of Regional Science*, *18*(1), 1–20.

Courchene, T. J. (2004). Citistates and the States of Cities: Political-Economy and Fiscal-Federalism Dimensions. In R. Young (Ed.), *Municipal-Federal-Provincial Relations in Canada* (pp. 83–118). Montreal & Kingston: McGill-Queen's University Press.

Creutzberg, T. (2013). Canada's Innovation Underperformance: Whose Policy Problem Is It? In M. Mendelsohn, J. Hjartarson, & J. Pearce (Eds.), *Shifting Power- The New*

Ontario and What it Means for Canada (pp. 103–124). Montreal: McGill-Queen's University Press.

Dabrowska, J. (2016). Measuring the success of science parks: Performance monitoring and evaluation. Presented at the XXVIII IASP World Conference on Science and Technology Parks.

Doern, G. B., Castle, D., & Phillips, P. W. B. (2016). *Canadian Science, Technology and Innovation Policy - The Innovation Economy and Society Nexus*. Montreal: McGill-Queen's University Press.

Dolowitz, D., & Marsh, D. (2000). Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making. *Governance: An International Journal of Policy and Administration*, *13*(1), 5–24.

Dunn, C. J. (2010). The Federal Spending Power. In C. J. Dunn (Ed.), *The handbook of Canadian public administration*. Toronto: Oxford University Press.

Edquist, C. (2001). The Systems of Innovation Approach and Innovation Policy: An Account of the State of the Art. Presented at the DRUID Conference, Aalborg.

Edquist, C. (2005). Systems of Innovation: Perspectives and Challenges. In J. Faberberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 181–208). New York: Oxford University Press.

Etzkowitz, H., & Leydesdorff, L. (1999). The Future Location of Research and Technology Transfer. *Journal of Technology Transfer*, *24*, 111–123.

Etzkowitz, H., & Leydesdorff, L. (2000). The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University-Industry-Government Relations. *Research Policy*, *29*, 109–123.

Fagerberg, J. (2005). Innovation: A Guide to the Literature. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 1–27). New York: Oxford University Press.

Feldman, M. P. (2001). Where Science Comes to Life: University Bioscience, Commercial Spin-Offs and Regional Economic Development. *Journal of Comparative Policy Analysis: Research and Practice*, *2*, 345–361.

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan*. New York: SPRU/Printer Publishers.

Gailmard, S. (2010). Politics, principal–agent problems, and public service motivation. *International Public Management Journal*, *13*(1), 35–45.

Garcea, J., & Pontikes, K. (2004). Federal-Municipal-Provincial Relations in Saskatchewan: Provincial Roles, Approaches and Mechanisms. In R. Young & C. Leuprecht (Eds.), *Municipal-Federal-Provincial Relations in Canada* (pp. 333–370). Montreal & Kingston: McGill-Queen's University Press.

Geddes, B. (2003). *Paradigms and Sand Castles: Theory Building and Research Design in Comparative Politics*. University of Michigan Press.

Genome Prairie. (2014). Genome Prairie. Retrieved from http://www.genomeprairie.ca/about/about-us/

Gibbons, M., Limoges, C., Nowtony, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: SAGE Publications Limited.

Goldstein, H. A., & Luger, M. I. (1992). University-based research parks as a rural development strategy. *Policy Studies Journal*, *20*(2), 249–263.

Good, D. A. (2007). *The Politics of Public Money - Spenders, Guardians, Priority Setters and Financial Watchdogs inside the Canadian Government*. Toronto: University of Toronto Press.

Goode, W. J., & Hatt, P. K. (1952). *Methods in Social Research*. Toronto: McGraw-Hill.

Government of Canada. (2007). CanmetMATERIALS. Retrieved from https://www.nrcan.gc.ca/mining-materials/materials-technology/8234

Government of Canada. (2013). Government of Canada Supports Innovative Entrepreneurs in Southern Ontario. Retrieved from http://www.feddevontario.gc.ca/eic/site/723.nsf/eng/01707.html?OpenDocument

Government of Canada. (2016, September 6). Canada's Science Minister announces significant funding for landmark initiatives through the Canada First Research Excellence Fund. Retrieved from http://www.cfref-apogee.gc.ca/news_room-salle_de_presse/press_releases-communiques/2016/University_of_Waterloo-eng.aspx

Government of Canada. (2017a). The constitutional distribution of legislative powers. Retrieved from https://www.canada.ca/en/intergovernmental-affairs/services/federation/distribution-legislative-powers.html

Government of Canada. (2017b, February 2). NRC Industrial Research Assistance Program. Retrieved from http://www.nrc-cnrc.gc.ca/eng/irap/about/index.html

Government of Saskatchewan. (2017a). About SOCO [Information]. Retrieved from http://www.innovationplace.com/about/aboutsoco.php

Government of Saskatchewan. (2017b). Crown Investments Corporation of Saskatcehwan. Retrieved from http://www.cicorp.sk.ca/about_us

Government of Saskatchewan. (2017c). Government of Saskatchewan. Retrieved from http://www.saskatchewan.ca

Government of Saskatchewan. (2017d). Innovation Saskatchewan. Retrieved from http://innovationsask.ca/about-us

Graham, G., & Douglas, Z. (2014). *McMaster Innovation Park - Annual Report - 2014* (Annual Report). Hamilton, Ontario: McMaster Innovation Park.

Haas, P. (1992). Introduction: Epistemic Communities and International Policy Coordination. *International Organization*, *46*(1), 1–35.

Hall, P. A. (1993). Policy Paradigms, Social Learning and the State: The Case of Economic Policymaking in Britain. *Comparative Politics*, 275–296.

Hansson, F., Husted, K., & Vestergaard, J. (2005). Second generation science parks: From structural holes jockeys to social capital catalysts of the knowledge society. *Technovation*, *25*(9), 1039–1049.

Harris, R. I. D. (1988). Technological Change and Regional Development in the UK: evidence from the SPRU database on innovations. *Regional Studies*, *22*(5), 361–374.

Harvey, D. (2007). Neoliberalism as creative destruction. *The Annals of the American Academy of Political and Social Sciecne*, *610*(1), 21–44.

Hjartarson, J. (2013). Old Habits Die Hard: “New” Ontario and the “Old” Laurentian Consensus. In M. Mendelsohn, J. Hjartarshon, & J. Pearce (Eds.), *Shifting Power- The New Ontario and What it Means for Canada* (pp. 49–60). Montreal: McGill-Queen’s University Press.

Hobbs, K. G., Link, A. N., & Scott, J. T. (2016). Science and Technology Parks: An Annotated and Analytical Literature Review. *Journal of Technology Transfer*, 1–20.

Hotz-Hart, B. (2003). Innovation networks, regions and globalization. In G. L. Clark, M. S. Gertler, M. P. Feldman, & K. Williams (Eds.), *The Oxford Handbook of Economic Geography*. London: Oxford University Press.

IASP. (2012). *IASP General Survey 2012 - Science and technology parks throughout the world* (Survey Analysis) (pp. 1–71). International Association of Science Parks and Areas of Innovation (IASP).

Insightrix Research Services. (2006). *Economic Impact Studies Summaries* (Economic Impact Study). Saskatchewan: Innovation Place.

Insightrix Research Services. (2008). *Economic Impact Studies Summaries* (Economic Impact Study). Saskatchewan: Innovation Place.

Johnson, B. (1992). Instituional Learning. In B.-A. Lundvall (Ed.), *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning* (pp. 21–46). New York: Anthem Press.

Joseph, R. A. (1994). New ways to make technology parks more relevant. *Prometheus*, *12*(1), 46–61.

Kahneman, D., & Tversky, A. (1986). Rational Choice and the Framing of Decisions. *The Journal of Business*, *59*(4), 251–278.

Kharabsheh, R. (2012). Critical success factors of technology parks in Australia. *International Journal of Economics and Finance, 4*(7), 57–66.

King, D., & Wood, S. (1999). King, Desmond, and Stewart Wood. "The political economy of neoliberalism: Britain and the United States in the 1980s. In H. Kitschelt, P. Lange, G. Marks, & J. D. Stephens (Eds.), *Continuity and Change in Contemporary Capitalism*. Cambridge: Cambridge University Press.

King, G., Keohane, R. O., & Verba, S. (1994). *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton University Press.

Lacave, M. (1995). *Délégation à l'aménagement du territoire et à l'action régionale.* (Parcs scientifiques et technopoles dans le monde: guide méthodologique.).

Lam, A. (2000). Tacit Knowledge, Organizational Learning, Societal Institutions: An Integrated Framework. *Organization Studies*, *21*(3), 487–513.

Lazar, H. (2006). The intergovernmental dimensions of the social union. *Canadian Public Administration*, *49*(1), 23–45.

Legard, R., Keegan, J., & Ward, K. (2003). In-depth Interviews. In J. Ritchie & J. Lewis (Eds.), *Qualitative Research Practice – A Guide for Social Science Students and Researchers*. London: Sage Publications.

Lijphart, A. (1971). Comparative Politics and the Comparative Method. *American Political Science Review*, *65*(3), 682–693.

Lindelof, P., & Lofsten, H. (2003). Science park location and new technology-based firms in Sweden: Implications for strategy and performance. *Small Business Economics*, *20*(3), 245–258.

Lindelof, P., & Lofsten, H. (2004). Proximity as a resource base for competitive advantage: University– industry links for technology transfer. *The Journal of Technology Transfer*, *29*(3), 311–326.

Link, A. N., & Scott, J. T. (2006). U. S. university research parks. *Journal of Productivity Analysis*, *25*(1), 43–55.

Link, A. N., & Scott, J. T. (2007). The economics of university research parks. *Oxford Review of Economic Policy*, *23*(4), 661–674.

Longhi, C., & Quéré, M. (1993). Innovative networks and the technopolis phenomenon: the case of Sophia-Antipolis. *Environment and Planning C: Government and Policy*, *11*(3), 317–330.

Lundvall, B.-A. (1992). *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning.* New York: Anthem Press.

Lundvall, B.-A. (1999). National Business Systems and National Systems of Innovation. *International Studies of Management and Organization*, *29*(2), 60–77.

Lundvall, B.-A. (2007). National Innovation Systems - Analytical Concept and Development Tool. *Industry and Innovation*, *14*(1), 95–119.

Lundvall, B.-A., & Borras, S. (2005). Science, Technology and Innovation Policy. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 599–631). New York: Oxford University Press.

MacKinnon, J. (2003). *Minding the Public Purse - The Fiscal Crisis, Political Trade-Offs, and Canada's Future*. Montreal & Kingston: McGill-Queen's Unviersity Press.

Malecki, E. (1997). *Technology and Economic Development: The Dynamics of Local, Regional and National Competitiveness*. Toronto, Ontario: Longman.

Malerba, F. (2002). Sectoral Systems of Innovation and Production. *Research Policy, 31*, 247–264.

Martin, B. R. (2010). Inside the Public Scientific System: Changing Modes of Knowledge Production. In R. E. Smits, S. Kuhlmann, & P. Shapira (Eds.), *The Theory and Practice of Innovation Policy* (pp. 25–50). Northampton, MA: Edward Elgar.

Massey, D., & Wield, D. (1992a). Evaluating science parks. *Local Economy*, *7*(1), 10–25.

Massey, D., & Wield, D. (1992b). *High Tech Fantasies - Science Parks in Society, Science and Space*. London: Routledge.

Massey, D., Wield, D., & Qunitas, P. (2003). *High-tech fantasies: Science parks in society, science and space*. New York: Routledge.

McBride, S., & McNutt, K. (2007). Devolution and Neoliberalism in the Canadian Welfare State: Ideology, national and international conditioning frameworks and policy change in British Columbia. *Global Social Policy*, *7*(2), 177–201.

McBride, S., McNutt, K., & Williams, R. (2007). Tracking Neo-Liberalism: Labour Market Policies in the OECD Area. In S. Lee & S. McBride (Eds.), *Neo-Liberalism, State Power and Global Governance*. Netherlands: Springer.

McMaster Innovation Park. (2014a). *2013 Economic Impact Report* (Annual Report). Hamilton, Ontario.

McMaster Innovation Park. (2014b). *FY 2013 McMaster Innovation Park Sustainability Report* (Analytical). Hamilton, Ontario.

McMaster Innovation Park. (2017a). CanmetMATERIALS. Retrieved from https://mcmasterinnovationpark.ca/canmet-mtl

McMaster Innovation Park. (2017b). MARC. Retrieved from https://mcmasterinnovationpark.ca/marc

McMaster Innovation Park. (2017c). McMaster Innovation Park. Retrieved from https://mcmasterinnovationpark.ca/about-us

McMaster University. (2018). Overview of BEAM. Retrieved from https://www.research.mcmaster.ca/beam

McMillan, M. L. (2004). Municipal Relations with the Federal and Provincial Governments: A Fiscal Perspective. In R. Young & C. Leuprecht (Eds.), *Municipal-Federal-Provincial Relations in Canada* (pp. 45–82). Montreal & Kingston: McGill-Queen's University Press.

McPhee-Knowles, S., & Boland, W. (2016). The Policy Shop: Innovation, Partnerships and Capacity-building. *Social Change*, *46*(1), 124–134.

Moe, T. M. (2005). Power and Political Institutions. *Perspectives on Politics*, *3*(2), 215–233.

Monck, C. (2010). Performance monitoring and evaluation. Presented at the UKSPA Conference.

Monck, C. S. P., Porter, R. B., Quintas, P. R., Storey, D. J., & Wynarczyk, P. (1988). *Science Parks and the Growth of High Technology Firms*. London: Croom Helm.

Morgan, K. (1997). The Learning Region: Institutions, Innovation and Regional Renewal. *Regional Studies*, *31*, 491–504.

Munim, A. (2011). *An exploration of an institutional and behavioural analytic framework for technology transfer and commercialization partnerships* (Masters Thesis). University of Saskatchewan, Saskatoon.

Munro, A., & Bathelt, H. (2014). Innovation Linkages in New- and Old-Economy Sectors in Cambridge-Guelph-Kitchener-Waterloo (Ontario). In D. A. Wolfe (Ed.), *Innovating in Urban Economies: Economic Transformation in Canadian-City Regions* (pp. 219–244). Toronto: University of Toronto Press.

Narula, R. (2014). *Globalization and Technology: Interdependence, Innovation Systems and Industrial Policy*. John Wiley & Sons.

Nelles, J. (2014). Myth Making and the “Waterloo Way”: Exploring Associative Governance in Kitchener-Waterloo. In N. Bradford & A. Bramwell (Eds.), *Governing Urban Economies - Innovation and Inclusion in Canadian City-Regions* (pp. 88–109). Toronto: University of Toronto Press.

Nelson, R. R., & Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

North, D. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

North, D. (1991). Institutions. *Journal of Economic Perspectives*, *5*, 91–112.

O'Bleins, L. Evidence - September 26, 2017, Pub. L. No. FINA-107, § Standing Committee on Finance (2017). Ottawa: Government of Canada. Retrieved from https://www.ourcommons.ca/DocumentViewer/en/42-1/FINA/meeting-107/evidence

OECD. (1996). *The Knowledge Based Economy*. Paris: OECD.

OECD. (1997). *Oslo Manual. 2nd ed.* Paris: OECD.

OECD. (2002). *Canada - Maintaining Leadership through Innovation* (OECD Reviews of Regulatory Reform) (pp. 1–132). Paris: OECD.

OECD. (2010). *Measuring Innovation - A New Perspective*. Paris: OECD.

OECD, & Eurostat. (2005). *Oslo Manual 3rd Edition - Guidelines for Collecting and Interpreting Innovation Data* (pp. 1–166). Paris: OECD.

Ontario Centres of Excellence. (2017). Ontario Centres of Excellence. Retrieved from http://www.oce-ontario.org/about-us

Patthirasinsiri, N., & Wiboonrat, M. (2017). Measuring intellectual capital of science park performance for newly established science parks in Thailand. *Kasetsart Journal of Social Sciences*, *xxx*, 1–9.

Phillips, P. W. B. (2007). *Governing Transformative Technological Innovation: Who's in Charge?* Northampton, MA: Edward Elgar Publishing Limited.

Phillips, P. W. B., Boland, W. P., & Ryan, C. (2013). *Public-Private-Producer Partnerships (P4s) in Canada* (Report Submitted to Agriculture and Agri-Food Canada).

Phillips, P. W. B., & Castle, D. (2010). Science and Technology Spending: Still no Viable Federal Innovation Agend. In C. Stoney & B. G. Doern (Eds.), *How Ottawa Spends 2010-2011*. MOntreal: McGill-Queen's Unviersity Press.

Phillips, P. W. B., & Webb, G. (2014). Social Dynamics, Diversity, and Physical Infrastructure in Creative, Innovative Communities: The Saskatoon Case. In D. A. Wolfe (Ed.), *Innovating in Urban Economies: Economic Transformation in Canadian-City Regions* (pp. 269–291). Toronto: University of Toronto Press.

Pierson, P. (2000). Increasing Returns, Path Dependence, and the Study of Politics. *American Political Science Review*, *94*(2), 251–267.

Pontusson, J. (1995). From Comparative Public Policy to Political Economy: Putting Political Institutions in their place and taking interests seriously. *Comparative Political Studies*, *28*(1), 117–147.

Porter, M. (1990). *The Competitive Advantage of Nations.* New York: Basic Books.

Porter, M. (1998). Clusters and the New Economics of Competition. *Harvard Business Review*, 77–90.

Quintas, P., Wield, D., & Massey, D. (1992). Academic-industry link and innovation: Questioning the science park model. *Technovation*, *12*(3), 161–175.

Ragin, C. (1987). *The Comparative Method: Moving Beyond Qualitative and Quantitative Methods*. Berkley: University of California.

Region of Waterloo. (2017). Region of Waterloo. Retrieved from http://www.regionofwaterloo.ca/en/index.asp

Rhodes, R. A. W., & Marsh, D. (1992). New Directions in the Study of Policy Networks. *European Journal of Political Research*, *21*, 181–205.

Rice, M. D., & Lavoie, D. C. (2005). Crown Corporations and co-operatives as coping mechanisms in regional economic development. *The Canadian Geographer/Le Géographe Canadien*, *49*(4), 367–383.

Sabatier, P. (1987). Knowledge, Policy Oriented Learning and Policy Change: An Advocacy Coalition Framework. *Knowledge: Creation, Diffusion, Utilization*, *8*(4), 649–692.

Salazar, M., & Holbrook, A. (2007). Canadian Science, Technology and Innovation Policy: The Product of Regional Networking? *Regional Studies*, *41*(8), 1129–1141.

Sancton, A., & Dunn, C. J. (2010). Provincial and Local Public Administration. In *The Handbook of Canadian Public Administration*. Toronto: Oxford University Press.

Sarpong, D., AbdRazaka, A., Alexandera, E., & Meissnerb, D. (2017). Organizing practices of university, industry, and government that facilitate (or impede) the transition to a hybrid triple helix model of innovation. *Technological Forecasting and Social Change*, *123*, 142–152.

Sassen, S. (2000). The Global City: Strategic Site/New Frontier. *American Studies, 41*(2/3), 79–95.

Savoie, D. J. (1999). *Governing from the Centre: The Concentration of power in Canadian Politics* (Vol. 2003). Toronto: University of Toronto Press.

Scott, A. J. (2001). Capitalism, Cities, and the production of symbolic forms. *Transactions of the Institute of British Geographers*, *26*(1), 11–23.

Seawright, J., & Gerring, J. (2008). Case selection techniques in case study research: A menu of qualitative and quantitative options. *Political Research Quarterly*, *61*(2), 294–308.

Shaw, L. (2016). *The Innovation Agenda and Canada's R&T Parks* (Budget Submission 2017) (pp. 1–27). Ottawa: Association of University Research Parks.

Shaw, L. (2017). *Linking Industry and Academia Collaboration through Ecosystem Coordination, Intellectual Property and International Trade* (Budget Submission 2018) (pp. 1–19). Ottawa: Association of University Research Parks.

Shearmur, R., & Doloreux, D. (2000). Science parks: Actors or reactors? Canadian science parks in their urban context. *Environment and Planning*, *32*(6), 1065–1082.

Shinn, T. (2002). The triple helix and new production of knowledge pre-packaged on science and technology. *Social Studies of Science*, *32*(4), 599–614.

Siegel, D. (2004). Recent Changes in Provincial-Municipal Relations in Ontario: A New Era or a Missed Opportunity? In R. Young & C. Leuprecht (Eds.), *Municipal-*

Federal-Provincial Relations in Canada. Montreal & Kingston: McGill-Queen's University Press.

Siegel, D. S., Veugelers, R., & Wright, M. (2007). Technology Transfer Offices and Commercialization of University Intellectual Property: Performance and Policy Implications. *Oxford Review of Economic Policy*, *23*(4), 640–660.

Siegel, D. S., Westhead, P., & Wright, M. (2003). Assessing the impact of science parks on research productivity: Exploratory firm-level evidence from the United Kingdom. *International Journal of Industrial Organization*, *21*(9), 1357–1369.

Simeon, R. (1976). Studying Public Policy. *Canadian Journal of Political Science*, *9*(4), 548–580.

Skelton, C., & Isman, S. P. V. (2013). *Saskatchewan Opportunities Corporation - Annual Report - 2013* (Annual Report). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Skelton, C., & Isman, S. P. V. (2014). *Saskatchewan Opportunities Corporation - Annual Report - 2014* (Annual Report) (pp. 1–84). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Skelton, C., & Isman, S. P. V. (2016). *Saskatchewan Opportunities Corporation - Annual Report 2015/16* (Annual Report) (pp. 1–88). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Skocpol, T. (2003). The Promise of Comparative Historical Analysis. In J. Mahoney & D. Rueschemeyer (Eds.), *Comparative Historical Analysis* (pp. 407–428). Cambridge University Press.

Smardon, B. (2014). *Asleep at the Switch: The Political Economy of Federal Research and Development Policy since 1990*. Montreal & Kingstron: McGill-Queen's University Press.

Sommer, B., & Sommer, R. (1991). *A Practical Guide to Behavioural Research – Tools and Techniques*. New York: Oxford University Press.

Squiccaiarini, M. (2009). *Science parks, knowledge spillovers, and firms' innovative performance: Evidence from Finland* (Discussion Paper No. 2009–32) (pp. 1–28).

Stone, D. (1999). Learning Lessons and Transferring Policy across Time, Space and Disciplines. *Politics*, *19*(1), 51–59.

Streeck, W., & Thelen, K. A. (Eds.). (2005). *Beyond Continuity: Institutional Change in Advanced Political Economies*. London: Oxford University Press.

Swann, P. G. M. (2009). *The Economics of Innovation: An Introduction*. Northampton, MA: Edward Elgar Publishing Limited.

Tarrow, S. (1995). Review: Bridging the Quantitative-Qualitative Divide in Political Science: Designing Social Inquiry: Scientific Inference in Qualitative Research by Gary King; Robert O. Keohane; Sidney Verba. *American Political Science Review*, *89*(2), 471–474.

Teune, H., & Przeworski, A. (1970). *The Logic of Comparative Social Inquiry*. New York: Wiley-Interscience.

UKSPA. (2018). United Kingdom Science Park Association. Retrieved from http://www.ukspa.org.uk/

UNESCO. (2017). Science and Technology Park - Concept and Definition. Retrieved from http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-and-technology-park-governance/concept-and-definition/

University of Waterloo. (2001). UW Research and Technology Park business case receives Waterloo Regional council approval. Retrieved from http://www.adm.uwaterloo.ca/infonews/release/2001/097%20UW%20Research%20and%20Technology%20Park%20given%20regional%20OK,%20May%2017,%202001.html

University of Waterloo. (2003). Guidance Document for Development of UW Lands. University of Waterloo.

University of Waterloo. (2017a). Accelerator Centre. Retrieved from https://uwaterloo.ca/research-technology-park/real-estate/accelerator-centre

University of Waterloo. (2017b). OpenText comes home to the David Johnston Research + Technology Park. Retrieved from https://uwaterloo.ca/research-technology-park/about/information/case-study

University of Waterloo. (2017c). Real Estate. Retrieved from https://uwaterloo.ca/research-technology-park/real-estate

University of Waterloo. (2017d). Timeline. Retrieved from https://uwaterloo.ca/research-technology-park/about/information/timeline

Warrian, P. (2014). Biotech and Lunch Buckets: The Curious Knowledge Networks of Steel Town. In D. A. Wolfe (Ed.), *Innovating in Urban Economies: Economic*

Transformation in Canadian-City Regions (pp. 197–218). Toronto: University of Toronto Press.

Warrian, P., & Mulhern, C. (2003). Learning in Steel: Agents and Deficits. In D. A. Wolfe (Ed.), *Clusters Old and New - The Transition to a Knowledge Economy in Canada's Regions* (pp. 37–62). Montreal & Kingstron: McGill-Queen's University Press.

Watts, R. L. (1998). Federalism, Federal Political Systems, and Federations. *Annual Review of Political Science*, *1*(1), 117–137.

Wettenhall, R. (2003). The rhetoric and reality of public-private partnerships. *Public Organization Review*, *3*, 77–107.

Wiks, A., & Tastad, D. (2008). *Saskatchewan Opportunities Corporation - Annual Report - 2008* (Annual Report) (pp. 1–40). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Wiks, A., & Tastad, D. (2009). *Saskatchewan Opportunities Corporation - Annual Report - 2009* (Annual Report) (pp. 1–56). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Wiks, A., & Tastad, D. (2010). *Saskatchewan Opportunities Corporation - Annual Report - 2010* (Annual Report) (pp. 1–48). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Wiks, A., & Tastad, D. (2011). *Saskatchewan Opportunities Corporation - Annual Report - 2011* (Annual Report) (pp. 1–60). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Wiks, A., & Tastad, D. (2012). *Saskatchewan Opportunities Corporation - Annual Report - 2012* (Annual Report) (pp. 1–56). Saskatchewan: Saskatchewan Opportunities Corporation - Saskatchewan Innovation Place.

Winders, B. (2005). Maintaining the coalition: Class Coalitions and Policy Trajectories. *Politics & Society*, *33*(3), 387–423.

Wolfe, D. A. (2009). *21st Century Cities in Canada - The Geography of Innovation* (Lecture) (pp. 1–222). Ottawa, ON: The Conference Board of Canada.

Wolfe, D. A. (2014). *Innovating in Urban Economies: Economic Transformation in Canadian City-Regions*. Toronto: University of Toronto Press.

Wolfe, D. A., & Gertler, M. (2003). Lessons from the ISRN study of cluster development. In *Clusters Old and New*. Montreal: McGill-Queen's University Press.

Wolfe, D. A., & Gertler, M. S. (2004). Clusters from the Inside and Out: Local Dynamics and Global Linkages. *Urban Studies*, *41*(5/6), 1071–1093.

Yescombe, E. R. (2011). *Public-private partnerships: principles of policy and finance*. Butterworth-Heinemann.

Young, R. (2013). Multilevel Governance and Public Policy in Canadian Municipalities: Reflections on Research Results. In *The Politics of Multilevel Governance*. Victoria, BC.

Young, R., & Leuprecht, C. (2004). Introduction: New Work, Background Themes and Future Research about Municipal-Federal-Provincial Relations in Canada. In R. Young & C. Leurprecht (Eds.), *Municipal-Federal-Provincial Relations in Canada* (pp. 3–24). Montreal & Kingston: McGill-Queen's University Press.

Zussman, D. (2002). Alternative service delivery. In *The handbook of Canadian public administration* (pp. 53–73).

ANNEXES

Annex 1: Interview Questions with Detailed Prompts – Innovation Park Administrators/Boards of Director

1. Can you briefly describe the functions of (*Insert Name*) Innovation/Research Park?
   - (Optional) Can you provide a brief history of the (*insert name*) Innovation/Research Park?
   - What are the intended outcomes of the innovation park? Have these been achieved?
   - Is there an emphasis on particular types of technologies or a particular sector of the economy?
2. What is your role in the functioning of this park?
   - Are you affiliated with another organization that is a member of this innovation park?
   - If so, what is the role and contribution of that organization in the functioning of this innovation park?
3. Can you elaborate on the role of innovation parks, in particular this park, in promoting innovation in regional and Canadian economy?
   - Ideas?
   - Products?
   - Commercialization?
   - Economy and Jobs?
4. What are the factors that are important in the effective functioning of such parks?
   - Collaboration?
   - Common understanding of the role of innovation parks? Common expectations?
   - Critical mass?
   - Widespread understanding and acceptance of the role of innovation parks?
   - Resources (financial, organizational, management)
5. How do power dynamics factor into the effective functioning of innovation parks?
   - Is power generally equally distributed across organizations from different spheres (universities, government and private sector)?
   - If not, who exerts more significant influence?
   - How does this affect the functioning of the innovation park?

6. To what extent do experiences of other jurisdictions and policy lessons from those impact policy decisions regarding the development and functioning of innovation parks?
    a. How have experiences in the United States, European Union impacted the development and execution of innovation parks in Canada?
    b. How do the experiences of other Canadian provinces impact the decisions around this innovation park?
    c. To what extent do networks affect such learning?
7. What is and has been the role of different levels of governments (municipal and provincial in particular) in the development and functioning of innovation parks, in particular this innovation park?
    - What is the primary motivation of governments to use innovation parks as a policy tool?
    - Have the governments been more actively involved before, during or after the development of innovation parks?
    - What are the mechanisms (tax breaks, management, direct participation of government researchers etc.) through which governments participate in the development and functioning of this innovation park?
    - Which of these mechanisms are more important and more effective?
8. Which level of government is more important to the functioning of this innovation park?
    - Can you elaborate why that is the case?

9. Should government(s) be more actively involved during and after the development of innovation parks?
    - Can you elaborate why that should be the case?
10. To what extent should innovation parks be used as a policy tool by governments? Why?
    - Are innovation parks an effective and efficient public policy tool?

Annex 2: Interview Questions for Tenants of Innovation Parks

Background Questions:

1. Can you please briefly describe the functions of your organization and some key products/services provided?
2. What is your role in the organization?
3. How many individuals are employed in the organization?

Policy Questions:

1. When did you (re)locate to the [Insert name of the Innovation Park]?
2. Why was the decision to locate at [Insert name of the Innovation Park] made? Who were the individuals in your organization involved in that decision?
3. What are some benefits of being situated in the [Insert name of the Innovation Park]?
4. Can you reflect on any partnerships/networks/associations that you have developed with other organizations within/around [Insert name of the Innovation Park]?
5. Do you receive any direct/indirect financial benefits through [Insert name of the Innovation Park]?
6. Do you receive any direct/indirect funding or other support by any level (federal, provincial, municipal) of government?
7. What are some challenges of being situated in the [Insert name of the Innovation Park]?
8. Do you think it is prudent/necessary for governments to support Innovation Parks such as [Insert name of the Innovation Park]?
9. Why should/should not the governments provide support to innovation parks?
10. What are some lessons learnt – What needs to be done to improve organizational and institutional experience at the [Insert name of the Innovation Park]

Annex 3: Interview Questions for Policy Practitioners

Background Questions:

1. Can you briefly describe the functions of your organization?
2. What is your role within your organization?
3. What are some of the programs that support partnerships between academia, industry and government to promote innovation?

Research Questions:

1. Can you elaborate on the role of innovation parks in promoting innovation in regional and Canadian economy?
2. **What role does government play in promoting innovation and what are some rationales for governments to support instruments such as innovation parks?**
3. What are the factors that are important in the effective functioning of such parks?
4. How do power dynamics factor into the effective functioning of innovation parks?
5. To what extent do experiences of other jurisdictions and policy lessons from those impact policy decisions regarding the development and functioning of innovation parks?
6. What is and has been the role of different levels of governments (municipal and provincial in particular) in the development and functioning of innovation parks, in particular this innovation park?
7. Which level of government is more important to the functioning of this innovation park?
8. Should government(s) be more actively involved during and after the development of innovation parks?
9. To what extent should innovation parks be used as a policy tool by governments? Why?

Annex 4: Email Recruitment Script

Ata-Ul Munim
Department of Political Science
McMaster University
Hamilton, Ontario, Canada
McMaster University
(613) 862-0490
E-mail: munima@mcmaster.ca

Dr. Stephen McBride
Professor,
Department of Political Science,
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140, 23707
E-mail: mcbride@mcmaster.ca

Innovation Parks in Canada – Policy rationale in comparative provincial context

E-mail Subject line: Innovation Parks in Canada – Policy Rationale in Comparative Provincial Context

Your name has been identified as a subject matter expert on the Saskatchewan Innovation Park/McMaster Innovation Park/David Johnston Research Technology Park. I invite you to participate in a study on innovation parks in Canada. The study is being conducted by Ata-ul Munim at McMaster University under the supervision of Dr. Stephen McBride in the Department of Political Science. This study will help us understand the policy rationales for the development of innovation parks in Canada and the impact of policy learning and power dynamics on the functioning of these organizations.

As part of the study, I would like to interview you, over the phone or face-to-face, in your office or through video-conference, that will take about 45-60 minutes. The interview will primarily deal with questions pertaining to the organizational and institutional aspects of the *[insert name]* innovation park and your views on the policy rationale of innovation parks. A brief interview guide is attached herewith for your review.

The study may pose some social and psychological risks, that of loss of privacy and confidentiality. Your participation in this study is completely voluntary. Moreover, your decision to participate (or not to participate) as well as other identifiable information will not be disclosed to others. I have attached a copy of a letter of information and consent form that gives you full details about the study. This study has been reviewed and cleared by the McMaster Research Ethics Board. If you any have concerns or questions about your rights as a participant or about the way the study is being conducted, you can contact:

The McMaster Research Ethics Board Secretariat
Telephone: (905) 525-9140 ext. 23142
C/o Research Office for Administration, Development and Support (ROADS)
E-mail: ethicsoffice@mcmaster.ca

If you agree to participate in this study, I would like to setup a time for the interview. I am hoping to get your interview done within the next two weeks. If you could kindly provide a time that works best for you, that would be much appreciated. You can also suggest a mode, telephone or face-to-face, that you prefer. I thank you for your time and support.

Ata-Ul Munim
Department of Political Science
McMaster University
Hamilton, Ontario, Canada
(613) 862-0490

Annex 5: Letter of Information and Consent

McMaster University
Inspiring Innovation and Discovery

DATE: September 18, 2018

LETTER OF INFORMATION / CONSENT

Innovation Parks in Canada – Policy Rationale in comparative provincial context

Student Investigator:
Ata-Ul Munim

Department of Political Science
McMaster University
Hamilton, Ontario, Canada
(613) 862-0490
E-mail : munima@mcmaster.ca

Faculty Supervisor:
Dr. Stephen McBride
Professor,
Department of Political Science,
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140, 23707
E-mail: mcbride@mcmaster.ca

Purpose of the Study
You are invited to take part in this study on innovation parks in Canada. This case study will allow me to gain significant insights into the policy rationale and functioning of innovation parks. Through this study, I seek to expand the understanding of innovation policy in Canada using theoretical lenses of policy learning and power resources. I am interested to learn about the interplay of various organizations, in particular public-sector organizations that influence the outcomes of innovation parks.

Procedures involved in the Research
If you choose to participate in this study, I would like to conduct an interview with you that can yield insights on different aspects of innovation parks. The interview will primarily deal with questions pertaining to the organizational and institutional aspects of innovation parks; however, some technical aspects may also be discussed. A brief interview guide is attached herewith for your review.

The interview will be conducted by the student researcher, Ata-ul Munim. The interview will span 45-60 minutes and will be conducted by phone or in person. With your permission, the interview will be recorded. You may request that the recording device be turned off at any point in the interview.

Potential Harms, Risks or Discomforts
The study may pose some social and psychological risks. I anticipate these risks to be minimal. You may feel that answering certain questions may lead to a loss of privacy and confidentiality or may jeopardize your position within the group. I describe below the steps I am taking to protect your privacy.

Potential Benefits

The research will not benefit you directly. I hope to learn more about the dynamics of collaborative activities through innovation parks. The key benefit of this project is that it will expand the empirical and theoretical knowledge of innovation parks – particularly the policy rationales of developing innovation parks in Canada. Moreover, it will also extend an understanding of the impact of power dynamics and government support, or lack thereof, on the functioning of these innovation parks.

Confidentiality and Privacy
You are participating in this study confidentially. I will not use your name or any information that would allow you to be identified, unless you grant me permission to do so. Even though your name may have been suggested by another participant, no other individual will not know whether you participated or not. Only the student investigator, Ata-ul Munim, and the research supervisor, Dr. Stephen McBride, will know about your decision to participate unless you choose to tell others.

However, since your group is small, others may be able to identify you on the basis of references you make or stories you tell. Please keep this in mind in deciding what information to share.
You do not need to answer questions that you do not want to answer or that make you feel uncomfortable. You can also speak off-the-record (without being recorded) at some points, if you so wish. And you can withdraw (stop taking part) at any time.

The information/data you provide will be stored on a computer hard drive and online storage facility that will be protected by a password. Only the principal investigator and research assistant will have access to these records.

Once the study is complete, an archive of the data, without identifying information, will be maintained for a period of ten (10) years.

Participation and Withdrawal
Your participation in this study is voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can stop (withdraw), from the interview for whatever reason, even after signing the consent form or part-way through the study or up until approximately ***31st August 2017,*** when I expect to finalize the data analysis for the final report.

If you decide to withdraw, there will be no consequences to you. In cases of withdrawal, any data you have provided will be destroyed unless you indicate otherwise. If you do not want to answer some of the questions you do not have to, but you can still be in the study.

Information about the Study Results
I expect to have this study completed by approximately September 2018. The study will culminate in a final thesis for the doctoral program and may also be published in other forums. If you would like a brief summary of the results, please let me know how you would like it sent to you.

Questions about the Study
If you have questions or need more 613-862-0490.

This study has been reviewed by the McMaster University Research Ethics Board and received ethics clearance.
If you have concerns or questions about your rights as a participant or about the way the study is conducted, please contact:

McMaster Research Ethics Secretariat
Telephone: (905) 525-9140 ext. 23142
C/o Research Office for Administrative Development and Support
E-mail: ethicsoffice@mcmaster.ca

CONSENT

- I have read the information presented in the information letter about a study being conducted by Ata-ul Munim of McMaster University.
- I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.
- I understand that if I agree to participate in this study, I may withdraw from the study at any time or up until ***31st August 2017*.**
- I have been given a copy of this form.
- I agree to participate in the study.

Signature: ______________________________________

Name of Participant (Printed) ___________________________________

1. I agree that the interview can be audio recorded.

_____ Yes.

_____ No.

2. I authorize the researchers to publish my name, and/or other identifiable information including direct quotations in the final publication.

_____ Yes

_____ No

3. _____ Yes, I would like to receive a copy of the study's results.
Please send them to this email address ____
Or to this mailing address: ____
____
____

_____ No, I do not want to receive a summary of the study's results.

4. I agree to be contacted about a follow-up interview and understand that I can always decline the request.

_____ Yes. Please contact me at: ____

_____ No

Annex 6: Oral Consent Form

Innovation Parks in Canada – Policy Rational in Comparative Provincial Context

Ata-ul Munim

Oral Consent Script

Prior to conducting the interview, I would like to document your consent. I will be recording your consent using an audio recorder. We provided you earlier with the letter of information stating the objectives of this study and the steps involved.

- Do you have any questions or would like any additional details?
- Do you agree to participate in this study knowing that you can withdraw at any point with no consequences to you?
- Do you authorize us to publish your name, and/or other identifiable information including direct quotations in the final publication? If you do not agree to this, the information you provide will be used without being directly attributed to you.
- Do you agree that the interview be audio recorded?
- Would you like to receive a copy of the study's results? If so, can you provide the email or postal address?
- Can we contact you for a follow-up interview? You can always decline the request.

Annex 7: List of Interviews – Case Study and Dates

Key Informant No.	Case Study	Date Interviewed
Key Informant no. 1	MIP	April 26, 2016

Key Informant no. 2	MIP	May 9, 2016
Key Informant no. 3	MIP	May 16, 2016
Key Informant no. 4	DJRTP	June 6, 2016
Key Informant no. 5	AURP	June 14, 2016
Key Informant no. 6	MIP	July 22, 2016
Key Informant no. 7	DJRP	July 26, 2016
Key Informant no. 8	SIP	August 7, 2016
Key Informant no. 9	MIP	October 21, 2016
Key Informant no. 10	SIP	October 21, 2016
Key Informant no. 11	SIP	November 2, 2016
Key Informant no. 12	MIP	November 4, 2016
Key Informant no. 13	SIP	November 7, 2016
Key Informant no. 14	SIP	November 9, 2016
Key Informant no. 15	SIP	November 10, 2016
Key Informant no. 16	SIP	November 11, 2016
Key Informant no. 17	SIP	November 11, 2016
Key Informant no. 18	MIP	November 11, 2016
Key Informant no. 19	SIP	November 14, 2016
Key Informant no. 20	SIP	November 14, 2016
Key Informant no. 21	SIP	November 21, 2016
Key Informant no. 22	SIP	November 23, 2016
Key Informant no. 23	SIP	November 24, 2016
Key Informant no. 24	SIP	November 25, 2016
Key Informant no. 25	MIP	November 29, 2016
Key Informant no. 26	SIP	November 30, 2016
Key Informant no. 27	SIP	November 30, 2016
Key Informant no. 28	MIP	December 2, 2016
Key Informant no. 29	SIP	December 2, 2016
Key Informant no. 30	SIP	December 3, 2016
Key Informant no. 31	MIP	December 3, 2016
Key Informant no. 32	SIP	December 10, 2016
Key Informant no. 33	MIP	December 14, 2016
Key Informant no. 34	MIP	December 29, 2016
Key Informant no. 35	SIP	January 12, 2017
Key Informant no. 36	SIP	January 25, 2017
Key Informant no. 37	MIP	February 21, 2017
Key Informant no. 38	MIP	March 2, 2017
Key Informant no. 39	QIP	March 28, 2017

Key Informant no. 40	SIP	March 29, 2017