Development Dynamics of a Startup Innovation Cluster Ten Years Later: An Analysis of the New Brunswick ICT Industry

by

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ABSTRACT

Economic geographers have long been interested in the processes that shape industrial districts and specialized geographic concentrations of economic activity. However, little scholarly attention has been given to case studies located in smaller cities and peripheral regions, resulting in a lack of nuanced theoretical understanding concerning development dynamics at play in industrial districts outside of the core. This thesis aims to help fill this gap by investigating the growth and trajectory of the New Brunswick information and communications technology (ICT) industry over the past 20 years. Quantitative and qualitative methods are employed to provide an updated statistical and geospatial snapshot of the sector, and to take an in-depth look at the emerging ICT startup community in the region. The theoretical framework developed herein, which focuses on 'hard' and 'soft' factors grounded in path dependency that enable and/or challenge local firms, holds great promise for future studies of place-based economic development.

"I always figured I'd get out of this town.

When I was in college, late one night, I was telling an older friend how I'd probably work a few years in Saint John and then go to Toronto or Silicon Valley.

He almost cried. He grabbed my hand and begged me 'Go now, as soon as you graduate, or you'll die sitting in that chair right there.'

I just smiled and promised that wouldn't happen, smug in the surety of youth.

But here I am, more than a decade later, still sitting in the same chair more or less."

– Dan Culberson, 'My Industrial Town' (April 2014)

"...we should be able to market this region as one of the strongest – where to go to start your business and be successful, even though on the surface our history doesn't have a big track record yet. On that point some people would argue 'it's over'. They would say, 'Silicon Valley won: Boston give up, Dallas give up, Calgary give up, Waterloo give up, it's over'. It's never over. It's always changing. There's a next gen to everything. So I think you have to look at this and say we've got the next gen and be optimistic about that. But you've got to believe in yourself first, right? We can't import success. Import people but maybe not success."

– Gerry Pond, interview with author (September 2013)

Chapter 1 – Introduction

1.1: Background

The disciplines of urban geography and economic geography have long overlapped: though largely formalized by the work of Jane Jacobs in the 1960s, the role of cities has been recognized as important for centuries by scholars looking at issues of economic growth and change, whether directly or indirectly. Perhaps not surprisingly then, *The Atlantic Cities*, an online urban affairs publication co-founded by Richard Florida, frequently publishes material on economic issues in addition to its core urbanism beat. In April 2014 they posted one such op-ed, written by senior editor Derek Thompson and entitled "Why 'the Next Silicon Valley' Is Always Silicon Valley".

The article, planted firmly within Florida's 'creative cities' framework of highly mobile skilled labour, argues that skilled individuals are attracted above all else to the best and brightest in their field: the so-called 'Matthew Effect'[1] (all the other things that the creative class is said to be attracted to are now apparently less important). So in the case of the high-tech sector, since the most high-profile individuals in the industry are currently operating in the San Francisco Bay Area, it must be futile, or at least extremely difficult, to emulate even a small amount of Silicon Valley's success elsewhere (Thompson, 2014).

Thompson makes an excellent point—most of the time, it is indeed counter-productive for a city-region to put too many resources into attempting to be something it is not—but the article may be asking the wrong question and certainly does not provide much constructive advice for the

[1] From Thompson (2014): "In sociology, there is a term called the Matthew Effect, which is the idea that most talented people get access to best resources (while the least talented people get the worst), so that what began as a small [advantage] over time becomes an enormous advantage. This is familiar [in the United States'] education system: Many of the high schools and colleges that have the potential to make the biggest outcome in student achievement get the best students anyway."

Not-Silicon-Valleys of the world who might still wish to nurture a local collection of high-tech firms. More fundamentally, the article's defeatist approach discounts the contribution of secondary and tertiary industrial agglomerations to their respective local economies, ultimately turning the bidirectional—and often political—complexities of modern capitalism and uneven regional development into nothing more than a single-dimensional, zero sum game.

The Atlantic Cities is certainly not alone in its privileging of the economic core. Theories of economic geography have more often than not been grounded in the world's economic superstars, from New York/London/Tokyo, to Hollywood, to Emilia-Romagna—and yes, to Silicon Valley as well. While all of these examples are important ones to study, the theories gleaned from them will most assuredly miss some of the more nuanced processes at work in secondary industrial centres, small cities and peripheral regions (Bell and Jayne, 2009). Unfortunately, there is evidence that this academic 'Matthew Effect' is having major geographic ramifications on public policy and private decisions in Canada, with regions such as the Prairies and Atlantic Canada receiving a far lower share of venture capital investment than their share of population (Figure 1.1).

In spite of the views of scholars and venture capitalists in New York, Toronto, and California, things are in fact happening in the high-tech industry outside of Silicon Valley, and even outside of well-known secondary hubs such as Ottawa, Ontario or Route 128, Massachusetts. In 2011, the Maritime province of New Brunswick turned heads with the announcement of two major exit deals for tech startups that were founded in Fredericton, the province's sleepy capital city and university town. Social media monitoring company Radian6, founded just five years earlier by University of New Brunswick dropout Chris Newton, was acquired by Salesforce.com for $276 million in cash and $50 million in stock; and cyber security firm Q1 Labs accepted a buyout

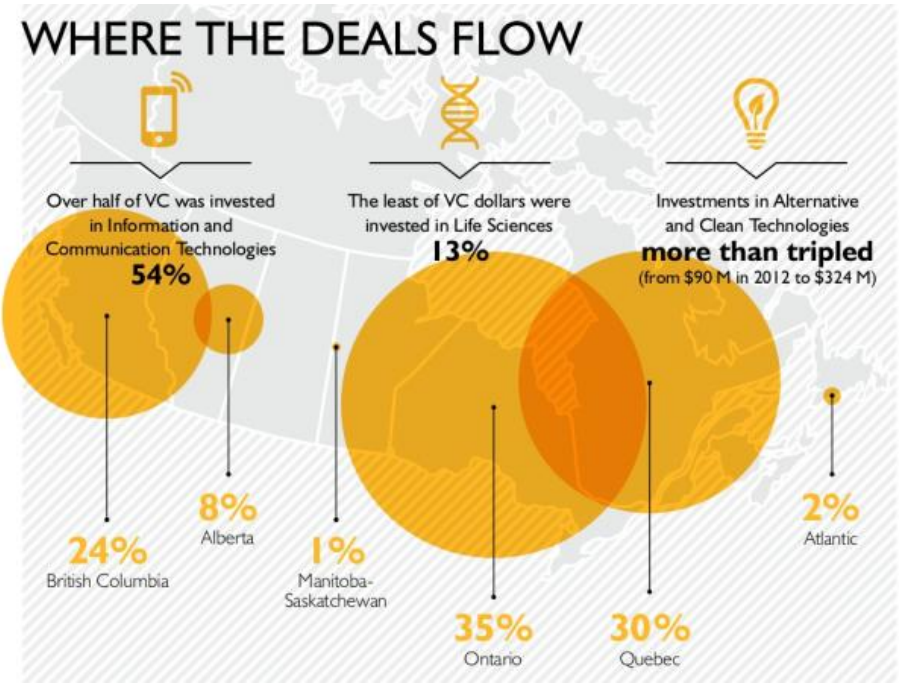


Figure 1.1: Spatial distribution of venture capital recipients in Canada, circa 2013. *Source: infographic, BDC website (February 2014). Retreived from http://www.bdc.ca/EN/solutions/venture_capital/newsroom/Pages/impact_vc_on_businesses.aspx on April 10, 2014.*

from IBM for an even larger undisclosed sum (Pitts, 2011). A mere ten years prior, in the shadow of the dot-com crash and the significant restructuring of Atlantic Canada's telecom utilities, it would have been difficult for an observer (and moreso for a remote pundit) to predict that even one of those deals would one day be possible in what is viewed as the perennially tumultuous Maritime economy.

It is well recognized that place-based economic success stories the likes of Apple or Radian6 do not simply happen overnight: invariably they are years, even decades, in the making. This gets at the adage of cumulative causation or path dependency, summed up succinctly by Storper and Scott's (2009) reminder that the case studies documented by economic geographers "[need] to be treated with all due respect to [their] historical, geographical and sectoral specificity" (164). Economic geography has a very thorough understanding of the paths that the Silicon Valleys of

the world have taken to arrive at their dominant position today, but far less is understood about pasts, presents and possible futures of the New Brunswicks of the world. What are the "historical, geographical and sectoral specificit[ies]" that allowed New Brunswick to produce such highly valued startups? For that matter, what is going on—period—with high-tech startups and other information technology-based companies in the province? The last detailed empirical study of the sector was published over a decade ago (Davis and Schaefer, 2003), and as economic geographers, we ignore these more marginal regional case studies at our own peril.

1.2: Research Agenda

The aim of this thesis is to understand the growth and trajectory of the information and communications technology (ICT) industry in the Canadian province of New Brunswick from the mid-1990s to the present. To that end, I pose three major research questions:

1. What are the key characteristics of the ICT industry in New Brunswick? Specifically, I am interested in the origin and growth patterns of the industry, the number and size of firms, the level of clustering provincially, how the industry in the province compares to the national ICT industry, the nature of local and global linkages, and the industry's contribution to the provincial economy.

2. What type(s) of industrial agglomeration does the New Brunswick ICT industry in most closely resemble, and how has the industry changed since Davis and Schaefer's 2003 empirical study?

3. Why have startup ICT firms established themselves in New Brunswick's cities? What are the enabling local and regional factors that allow them to operate in an economically peripheral, small-city context, and what are the key challenges faced by local firms?

The next two chapters of this thesis are devoted to setting the scene for answering the above questions. In Chapter 2, I present a variety of theoretical approaches in economic geography and regional studies to understanding local and regional economic dynamics, and then propose a synthesized conceptual framework for the study that takes the three themes of 'hard' factors, 'soft' factors and path dependency into account. Chapter 3 establishes the context of the study, defining what is meant by the ICT sector, reporting the history of the New Brunswick ICT industry from the 1990s to 2003, and looking at more recent empirical work on portions of the section. Then in Chapter 4, I outline the quantitative and qualitative data and methods employed in the rest of the study.

Chapter 5 contains the more quantitative research results of the study, reporting the major findings of an unpublished consultant's report on the state of the New Brunswick ICT industry in 2011, and mapping a sample of the province's ICT firms. Next, Chapter 6 presents the more qualitative findings of the study, reporting the results of six interviews I conducted with ICT entrepreneurs and leaders in Saint John and Fredericton between summer 2013 and winter 2014 and interpreting them through the theoretical framework constructed in Chapter 2. Finally, in Chapter 7, I summarize the key findings of the study and propose a few concluding thoughts and possible paths for future research.

Chapter 2 – Literature Review and Theoretical Framework

This chapter reviews and attempts to synthesize several bodies of literature that present different approaches to examining questions of regional economic growth and change, particularly in the North American and European contexts. Section 2.1 tracks the development of New Industrial Spaces literature and related theorizations of industrial district typologies. Section 2.2 reviews literature on knowledge, untraded interdependencies and the alternative industrial district typology of 'Local Buzz and Global Pipelines'. Section 2.3 examines a couple different frameworks of the role of individuals in regional industrial agglomerations. Finally, Section 2.4 attempts to bring together these various theoretical positions to create a conceptual framework that encompasses the three frequently touched upon themes of analysis: 'hard' factors, 'soft' factors, and the place-based path dependency that underlies and endows both.

2.1: New Industrial Spaces and Formalized Agglomerations

In the 1980s, social scientists' interest in the region as a unit of analysis for questions of economic growth and change was reignited (Storper, 1997). This renewed curiosity stemmed largely from the sweeping structural changes to western economies that were taking place in response to the crisis of Fordism and the transition to what the Regulation School calls a new regime of accumulation and mode of social regulation. The Fordist paradigm of large, vertically integrated firms and relatively inflexible mass production processes was gradually replaced by one that favoured a greater social division of labour and networks of firms that are smaller, more specialized, more flexible and more attuned to product customization and differentiation (Scott, 1988a).

Early work in the flexible specialization literature focused on establishing basic principles for this emerging paradigm through case studies. Particularly influential was the theoretical and empirical work of Italian economic geographers on the nature of small, artisanal manufacturing firms in the Third Italy, popularized in anglo-saxon academic circles by Piore and Sabel's *The second industrial divide* (1984). They found similarities between the characteristics of firms in the Third Italy and Marshall's 19th-century concept of the 'industrial district', and created a theoretical framework that integrated his ideas about externalities, the division of labour and productivity-increasing inter-firm interactions supported by local social characteristics. Their work also conceptually solidified flexibility and specialization as the key alternatives to mass production, and emphasized place-based specificities as important drivers of economic outcomes. However, the work of the Italian school was critiqued for focusing on the Third Italy's "extreme case of localization", and offering too few analytical tools to fully characterize the locational influences placed on firms by technological and economic change (Storper, 1997: 8).

Using the decline of industry in the North American manufacturing belt, the concurrent growth of production in the US Sunbelt, and the emergence of technologically advanced industrial complexes such as Silicon Valley as a starting point, the California school, led by the work of Scott (1988b), also began to theorize on the forces of vertical disintegration, agglomeration and dispersal. This New Industrial Spaces literature placed its theoretical foundation in the microeconomics of industrial organization, demonstrating that a firm's decision on whether or not to externalize moments of production depends on the relative costs of performing those tasks together versus performing them separately with additional transaction costs. If the latter case is less costly than the former, external economies of scope exist and the firm will tend to vertically

disintegrate those tasks. The crux of Scott's argument is that when there is high roundaboutness (a high degree of technical division of labour) in a given production process coupled with great uncertainty in final markets such as unstable demand, it is less risky and more viable for firms to disintegrate, both vertically (different firms for different production tasks) and horizontally (multiple, smaller firms per production task): in other words, the result is an increase in the social division of labour. This was precisely the situation that many North American Fordist firms found themselves in during the crisis of the 1970s.

As vertical and horizontal disintegration in a given industry becomes more and more pronounced, the amount of externalized transactional activity also increases. Consequently, the minimization of transaction costs becomes an important driver of firms' decision-making. This is the key geographic connection in Scott's (1988b) theory: that the proliferation of external transactions among a number of specialized firms exerts a force of agglomeration, influencing such firms to locate spatially close to one another in order to increase the efficiency of those inter-firm linkages. In addition to the external transactional economies realized by agglomeration, firms also benefit by being able to tap into a deeper, more specialized local labour pool that forms around the industrial complex, as well as production efficiencies associated with the rise of subcontracting.

New Industrial Spaces theory has an important implication for regional development. For a period of time during the formative stages of a new industry, or an existing one undergoing major structural changes, a 'window of locational opportunity' is said to open where firms are not yet tied to the external economies of a given location. This is the moment when it is possible for completely new industrial complexes to emerge in different places. However, once a few

agglomerations and their associated external economies have become established in the sector, the window closes once again (Storper, 1997).

One major shortcoming of both New Industrial Spaces and the Italian school is their focus on only one type of industrial complex: the Marshallian industrial district, characterized by a single upstream-to-downstream production process with a large number of small firms, none of which are particularly dominant, engaging in transactions with one another (Figure 2.1A). Based on observations derived from her own empirical work, Markusen (1996) proposes 3 additional types of industrial districts that have shown success in being 'sticky places' for the agglomeration of economic activity: Hub-and-Spoke Districts, Satellite Platforms, and State-Centred Districts.

In the Hub-and-Spoke model (Figure 2.1B), there is one large, dominant local firm that buys from both local and nonlocal suppliers, and sells its products primarily outside the region. It differs from the Marshallian case in that economies of scale remain very important to the anchor firm, and that generally, local suppliers are transactionally linked only to the anchor, and not one another. Prominent examples of the Hub-and-Spoke District include Toyota City in Japan, and the aerospace industry centred on Boeing in Seattle.

Satellite Platforms (Figure 2.1C) are characterized by a collection of branch plants controlled by nonlocal, multi-plant firms, which comprise moments in each respective firm's production process but do not interact with one another within the district. Here, the only transactional linkages that exist are to and from each firm's upstream and downstream plants outside of the region. The North Carolina Research Triangle could be characterized as a satellite platform, as could any number of export processing zones located around the world.

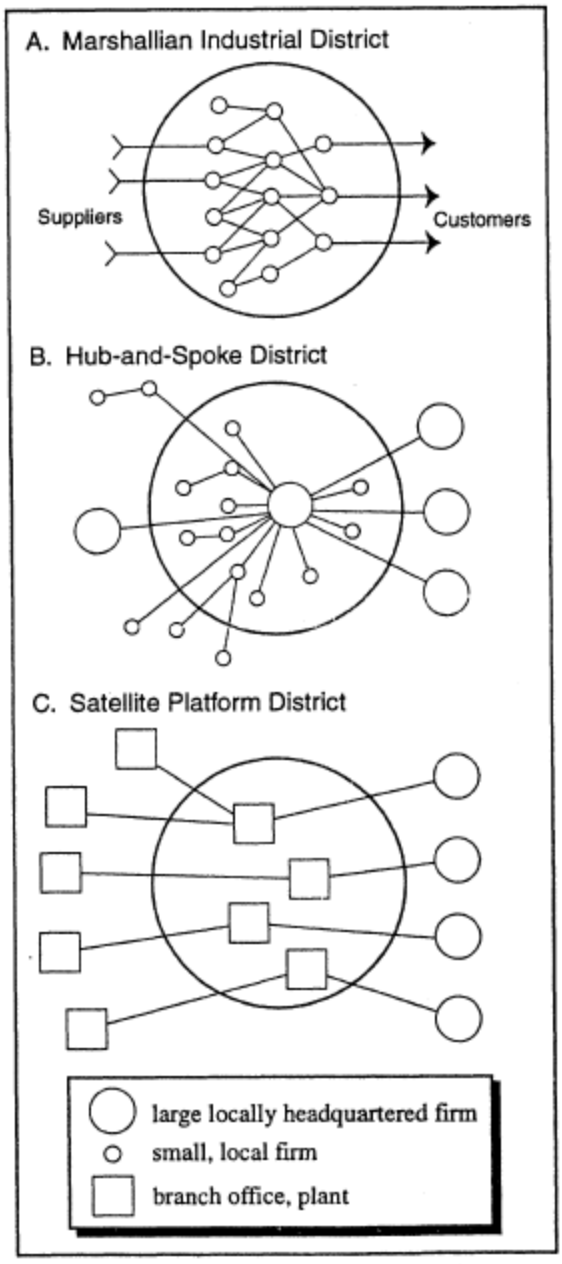


Figure 2.1: Three possible 'sticky place' models. *Source: Markusen (1996: 297)*

Finally, a State-Centred District exists where a public or nonprofit entity comprises the anchor of an industrial district. It is much more difficult to conceptualize than the previous types, because the characteristics of each State-Centred district will inevitably be influenced by the nature of the entity at its core; for example, a university versus a military base versus a military-industrial

complex versus a capital city. The long-term success of such a district depends on both the fate of the institution at its core, as well as its ability to generate local economic growth through spinoff firms or local skilled labour.

A couple key points underscore Markusen's (1996) expanded industrial district typology. First, these typologies are not rigid or mutually exclusive: it is possible for hybridized districts to exist, and it is also possible for a number of different districts to exist side-by-side in a single city-region. Second, the possibility exists for an industrial district to convert from one type to another over time. This has important analytical implications for researchers looking into the long-term fate of regions undergoing industrial transition.

2.2: Knowledge, Buzz, and Untraded Interdependencies

Besides the focus on only Marshallian industrial districts, the New Industrial Spaces literature was also critiqued for its emphasis of transactional linkages as the primary driver of agglomeration economies (Bathelt et al, 2004): although consideration of untraded interdependencies (Marshall's 3rd force of agglomeration) is acknowledged, it does not sit at the core of the theory. In particular, processes concerning knowledge and innovation are not well theorized. The Regional Innovation Systems literature attempts to fill in this gap, by noting that innovation is an interactive and cumulative process of research and development with many locally specific properties. Learning takes place through economic and social interactions between agents embedded in the region, and these interactions are governed by local institutions, culture and social capital (Moularet and Sekia, 2003; Asheim et al, 2011). Work on Regional Innovation Systems is a reminder of the value of knowledge to the continued growth and competitiveness in a given industrial district.

When dealing with knowledge, it is important to distinguish between explicit or codified knowledge, which is easily communicated and understood, and tacit knowledge, which comprises understandings that are difficult or impossible to articulate. Developed through either learning by doing or learning by interacting, tacit knowledge is viewed as a crucial resource for businesses to harness in an interconnected world where codified knowledge is relatively easy to access. The inquiry into how tacit knowledge can be produced, appropriated and shared has spawned an entire 'knowledge management' field of research. Gertler (2003) claims that the most important characteristic of tacit knowledge is that it is embedded in a certain context of shared understandings and rules: this can be a local or regional geographic context, but may also be an organizational or institutional one. For geographers, tacit knowledge suggests a reason why spatial proximity and agglomeration remains powerful for innovation in an increasingly globalized world.

Another important consequence of spatial agglomeration is the maximization of opportunities for face-to-face contact. Storper and Venables (2004) argue that face-to-face contact is a driver at the foundation of all three of Marshall's forces of agglomeration: backward and forward transactional linkages are facilitated by deal-making and negotiation in person, thick labour markets are made more efficient by signalling and screening in a face-to-face context, and knowledge spillovers are proliferated through personal interaction. According to Storper and Venables, the advantages of face-to-face contact include being the most effective interpersonal communication method by incorporating rapid feedback and nonverbal cues; building trust in relationships; allowing for personal screening and socialization; and being a motivating factor for quality of work. The combined effects of face-to-face contact are said to create a 'local buzz' that has positive economic ramifications in a given urban area, as thick networks of interpersonal

interaction disseminate and filter information, as well as promote cross-fertilization of ideas between different industrial sectors.

While local buzz and tacit knowledge transfer among communities of practice are vital to agglomeration economies, Bathelt et al (2004) caution that extra-local linkages are equally important to the district. In their model of 'local buzz and global pipelines' (Figure 2.2) firms in the region are linked to customers and colleagues elsewhere in the world, creating network pipelines through which knowledge enters the district. The knowledge is then distributed throughout the region through its networks of buzz, which is also producing and refining new local knowledge. Unlike the informal, automatic nature of local buzz, global pipelines tend to be set up formally and intentionally through transactional linkages or otherwise. This model presents an important alternative to the industrial district typologies associated with New Industrial Spaces: in local buzz and global pipelines, the most important transactions are the

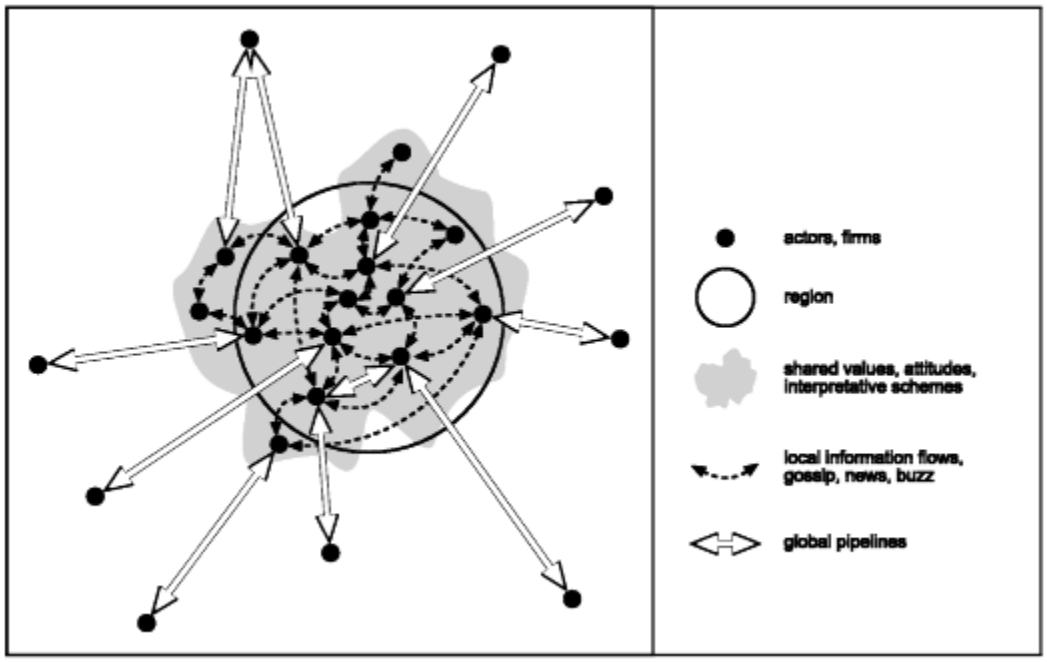


Figure 2.2: Structure and dynamics of 'local buzz and global pipelines'. *Source: Bathelt et al (2004: 46)*

extra-local ones, while within the region, untraded interdependencies are the key drivers of agglomeration.

Onsager at al (2007) use the model of local buzz and global pipelines as a point of departure in their case studies of four small Norwegian cities that had successfully transitioned their economies from state-centred, hub-and-spoke districts in traditional manufacturing industries into high-tech industrial agglomerations. The authors make several key findings based on the four cases. First, they note the importance of path dependency, with anchor or pioneer firms, as well as public and semi-public actors, playing a key role in setting the stage for the district's reinvention, often long before the transition begins. They also highlight the re-adaptation of pre-transition skilled labour pools into the new industry as a contributing factor to each transition's success. Finally, Onsager et al discuss the relative importance of local and global factors in each district, finding that global linkages of knowledge and resources are particularly valuable in the early stages, while regional agglomeration factors become more pronounced as the clusters mature.

Yet another theoretical viewpoint on agglomeration economies comes from Porter (1998), whose work on 'cluster theory' has served to popularize Marshallian themes among economists and policy-makers. He employs a highly generic definition of what comprises a cluster, stating simply that it is the co-location of firms in a similar industry, without a firm specification of scale or factor conditions. Porter argues that the primary force behind cluster formation is intense competition between firms, in a bid to achieve 'competitive advantage', or a more productive use of given inputs, and that this is driven by (1) factor input conditions, (2) demand conditions, (3) firm strategy and rivalry, and (4) related and supporting industries. All four drivers of Porter's 'competitive diamond', he contends, are made more effective with a

supportive local context. Porterian cluster theory also suggests easy policy interventions that can encourage cluster development in a given locality, which helps to partially explain the model's popularity.

In the backdrop of the wide influence of Porter's cluster concept in academic, business and policy contexts, Martin and Sunley (2003) attempt to unpack the idea in order to both gain a more nuanced theoretical understanding of it, and critique its careless application by researchers and policymakers. They attribute the fast popularization of Porter's theory to the ambiguities and flexibilities inherent in his model, and while this means it is readily applicable to all sorts of industries and economic contexts, it is argued that this also makes Porterian cluster theory a problematic, 'chaotic concept' that conflates many more nuanced localization processes.

According to Martin and Sunley, advocates of cluster theory have done a poor job in clarifying and consistently applying the concept, and have also done a poor job of undertaking empirical analysis. In addition, the push for cluster-enabling policy tends to crowd out a holistic view of regional economic development, while ignoring the fact that clusters have costs as well as benefits, including labour, land and housing cost inflation; industrial and institutional lock-in; and widening income inequality. Thus, the Porterian cluster concept needs to be used with caution.

2.3: The Role of Individuals in Regional Economies

Another area where caution is warranted is in studying the role of individuals in the formation and resilience of an industrial district. Richard Florida and Ed Glaeser's theoretical views on the location decisions of 'creative' or skilled workers have become a popular way of explaining urban economic growth. These theories prioritize individual locational choice based on the

preferences for certain amenities in urban areas: the thinking holds that creative, skilled and/or productive individuals follow amenities and that jobs and economic growth will subsequently follow these people (Storper and Scott, 2009) .

Storper and Scott (2009) level several critiques of this line of thinking. First, there is no consideration of historical context—the genesis and early growth of cities in question—which leads to a conceptualization that has difficulty getting at core processes and dynamics. Second, these theories make assumptions about individuals' preferences motivating locational choice based only on observable characteristics of places: there is no consideration of possible constraints on individual locational choice such as job opportunities—it is likelier that people follow jobs and not vice-versa. Third, the Rust Belt-to-Sunbelt transition that much of these theories use for illustrative purposes is much messier than amenity-based theories tend to suggest. Finally, Florida's hypothesis, particularly concerning its focus on tolerance as a primary preference of creative individuals is seen as conceptually and empirically problematic.

Storper and Scott (2009) suggest an alternative framework of human capital and urban growth that takes into account the mobility of production in addition to labour—as well as issues of local path dependency, cumulative causation and place-based specificities that influence local economic prospects. In other words, any case study on urban and regional economic transitions "needs to be treated with all due respect to its historical, geographical and sectoral specificity" (164).

Another alternative to the myopic amenities focus of Floridian analysis is the Creative Knowledge Pool model (Figure 2.3) elaborated by Chapin and Comunian (2010), which takes a more holistic view of the local and regional factors that enable individuals to participate in a

given industry. Although this model was designed with creative and cultural industries in mind, it is also partially applicable to industrial districts where small-to-medium firms are prominent, particularly with respect to analyzing the enabling factors of entrepreneurship and start-up firms. At the core of the model is the individual, and important considerations include their personal histories and the connections to the place they live. The second layer focuses on local firms in the industry, and establishes individuals' opportunities for employment and business development. The third layer of the model details industry-specific services, as well as social and professional networks that exist locally and regionally to support individuals and firms. Finally, the outermost layer takes into account the wider local and regional infrastructure and their interactions with the industry. Through their empirical work applying the Creative Knowledge Pool model to creative and cultural industries in Birmingham and Newcastle-

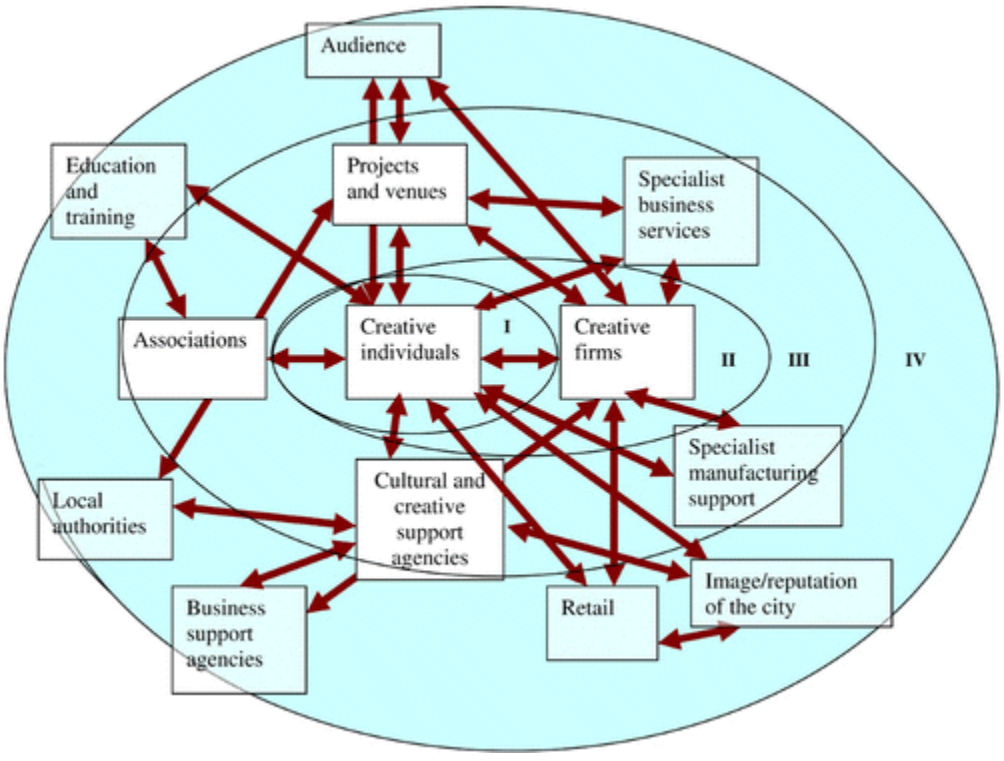


Figure 2.3: The creative knowledge pool model. *Source: Chapain and Comunian (2010: 722)*

Gateshead, Chapain and Comunian (2010) demonstrate the importance of soft location factors, social networks, institutions and work opportunities, in addition to place-based specificities that both enable and pose challenges to living and working in a given context.

2.4: Summary and Conceptual Framework

Having examined the various theoretical perspectives outlined above, one cannot help but be reminded of the parable of 'the blind men and the elephant': while each may correctly describe a portion of what is going on in regional industrial districts, most do not adequately address the big picture of place-based economic change. It is abundantly clear that theories of industrial agglomerations, knowledge and innovation, and the role of individuals each constitute pieces of a much larger puzzle of how best to understand regional development and economic performance. Any study addressing these questions must take care to synthesize these various approaches, while keeping in mind the influences of local and regional path dependency and location-based specificities. In particular, the approaches of Onsager et al (2010) and Chapain and Comunian (2010) are important guideposts to the understanding of smaller, more peripheral case studies such as the New Brunswick information and communications technology industry.

This study attempts to build a more synthesized theoretical framework based on the literature drawn upon in the previous sections this chapter. This framework, summarized in Figure 2.4, is organized around three major interrelated themes or categories of factors that influence the success or failure of place-based economic activity in the North American context. The first category, 'hard' factors, encompasses the more formalized factors at play that are emphasized by New Industrial Spaces scholarship: these include details that are transactions-based such as supply chains and customer markets; issues related to human capital and the labour pool; and

knowledge inputs in the more formal, structured sense. In other words, 'hard' factors are those that primarily concern a firm's 'bottom line'. 'Soft' factors are less tangible than the previous category: they include untraded interdependencies such as the local social environment and less formalized knowledge flows, as well as factors that indirectly support or challenge economic activity in a particular region, including factors that influence the locational decisions of individuals. Underlying the previous two themes is path dependency, which takes a longer and more holistic view of economic and social change in a particular place: of key consideration here are the historical narratives of a place, as well as collective attitudes and perceptions embedded therein. To put it differently, path dependency is involved in complex feedback relationships with the 'hard' and 'soft' factors that are bound up in a particular place.

Equipped with the above framework, the rest of the thesis will employ it to tell the story of the New Brunswick ICT industry. The next chapter establishes this story's foundational context.

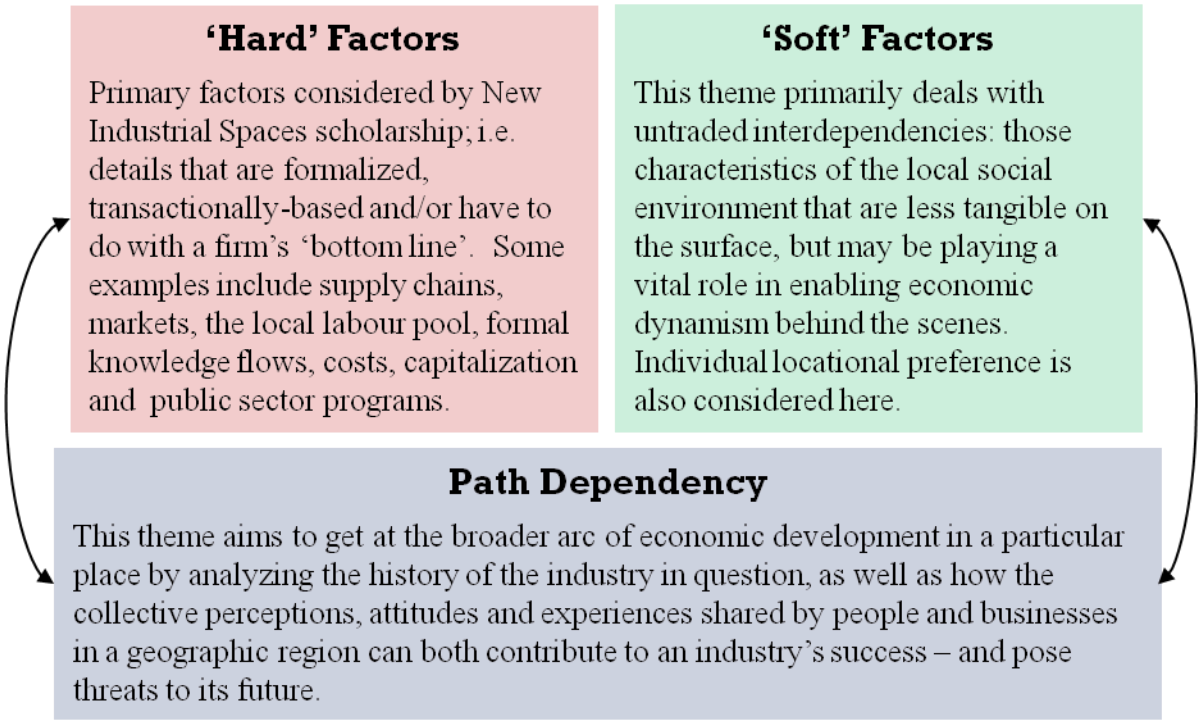


Figure 2.4: Synthesized conceptual framework for this study.

Chapter 3 – Context and Previous Empirical Studies

This chapter introduces the information and communication technology (ICT) industry in the Canadian context, takes a more detailed look at the development of the New Brunswick ICT industry from the mid-1990s to the early 2000s, and briefly examines empirical work in New Brunswick that has been published since. Section 3.1 defines the ICT industry and presents a brief overview of its key characteristics in Canada. Section 3.2 elaborates the New Brunswick context, drawing primarily on the work of Davis and Schaefer (2003) to describe its key historical developments and present a statistical overview of the industry as it was in the early 2000s. The more recent Moncton-based work of Bourgeois (2013) is also summarized in this section. Finally, Section 3.3 situates this thesis within the context of Chapters 2 and 3, and reiterates a few key motivations behind the research presented in the remainder of the work.

3.1: The ICT Industry in Canada

The development and proliferation of information and communications technology (ICT) has had a profound effect on the global economy and society over the past several decades, facilitating automation, data processing and long-distance communication, and ushering in a digital age. The ICT industry, which produces goods and services related to the computing, storage and transmission of digital information, is at the heart of this revolution and has been a major growth sector in Canada since the 1970s (Lucas et al, 2009). Major subsectors of this industry include telecommunications, ICT services, software developers and hardware manufacturers, all of whom supply their infrastructure, products and services to firms, organizations and individuals who use ICT. A major feature of the ICT industry is its reliance on innovation and R&D, both in terms of the underlying hardware and infrastructure, and the

applications that make use of them. In 1998, the world's 20 largest ICT firms spent an average of 7% of their revenues on R&D (Davis and Schaefer, 2003).

The emerging nature and rapid pace of change inherent to the ICT industry, as well as the proliferation of ICT-related employment in non-ICT companies means that it has been difficult to establish an exhaustive convention for what North American Industrial Classification System (NAICS) codes to include in analyses of the sector. While several core categories, including computer manufacturers, telecommunications providers, software developers, systems integrators and data processing services are typically encompassed by research on the subject, there are many other fields related to electronics, communications and the internet that are more sporadically included as part of ICT. As a result, many different definitions of the ICT industry are present in the literature, and researchers need to use caution when comparing data from different studies. Industry Canada has updated its definition of the sector several times since the mid-1990s, and made its most recent change to it in early 2013 (Industry Canada, 2013a). Refer to Appendix A for more details about the definition adopted in this study.

The Canadian ICT industry is an important part of the national economy. According to Industry Canada's definition of the sector, it employed 531,702 people and contributed $67.2 billion to the country's GDP in 2011 (Industry Canada, 2013b). It is also dominated by small firms: in 2011, 85% of the sector's 33,300 firms employed fewer than 10 people (Industry Canada, 2013b). Lucas et al (2009) give an overview of eight Canadian ICT clusters as they were in 2005, including Cape Breton, New Brunswick, Quebec City, Ottawa/Gatineau, Toronto, Waterloo, Calgary and Vancouver. Of interest are the characteristics and development histories and trajectories of each cluster, the common and contrasting features between them, and the subsequent policy implications. The authors identify path dependency as a central theme that

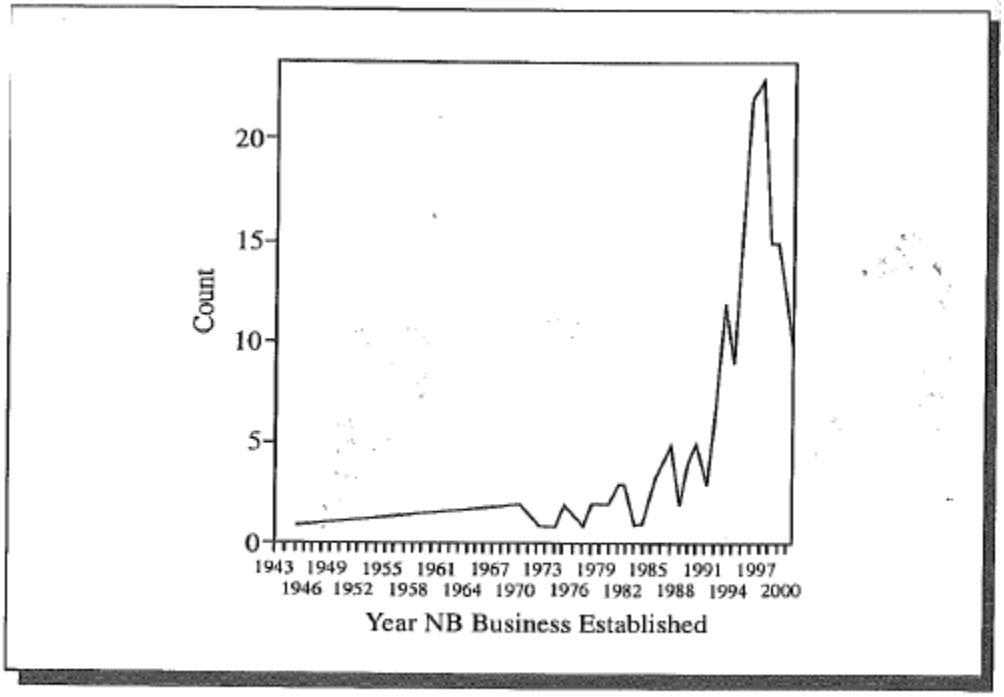
arises from the histories of these clusters, while finding that every cluster saw early commercial success through "exploiting the local knowledge base to commercialize new products" (194). Many clusters developed in response to the efforts of a key, innovating anchor firm, while others had a close relationship with local educational institutions from an early stage: either way, it was "a strong research base" (196) that laid the groundwork for cluster growth. Other common themes among Canadian ICT clusters include the role of the local labour market and 'magnet' firms for skilled labour, the high importance of global linkages over local ones, the need for a strong base of technical knowledge, the availability of venture capital, and the role of civic associations. Although venture capital markets are highly developed, particularly in Ontario and Quebec, a key challenge for Canadian ICT firms was securing middle-stage financing. (Lucas et al, 2009)

3.2: The New Brunswick ICT Industry

3.2.1: New Brunswick's ICT Sector Pre-1999: the NBTel Era

Davis and Schaefer's (2003) case study of the New Brunswick ICT industry offers a comprehensive historical overview and statistical snapshot. Throughout the 1990s, NBTel, the province's telecommunications utility, played a key role in the industry's growth. The company was an early adopter of digital switching technology and fiber optics in Canada, and its Living Lab developed a number of interactive telecommunications products and services, and exported them to other telecom companies around the world. Bruncor, NBTel's parent company, was also instrumental in creating several spinoff companies including Innovatia, iMagic, Genesys, NBTel Interactive, HealthFutures, New North Media, NBTel Mobility and Datacor. They also acquired MITI, JD Irving's former IT department, which would go on to become part of the large systems

integration firm Xwave. During the same period, the McKenna government was using promotional strategies and incentives to attract ICT firms from out-of-province in order to provide services to the nascent call centre industry. The combined strategies of Bruncor and the provincial government produced a surge in new ICT firm entries between 1995 and 1999 (Figure 3.1), creating a foundation of high value-added IT services, particularly software developers and e-learning firms. A key shortcoming of this period was the lack of reform at the province's post-secondary institutions in order to increase ICT R&D activity, an issue that persists to the present day. At the turn of 1999, the New Brunswick ICT industry resembled a state-centred district with Bruncor/NBTel as a primary anchor.



Note: Data show year of establishment in New Brunswick of ICT firms active in New Brunswick in late 2001. No data on exits are available.

Figure 3.1: Year of birth or establishment of ICT firms active in New Brunswick, 2001. *Source: Davis and Schaefer (2003: 142)*

3.2.2: New Brunswick's ICT Sector Post-1999: the Aliant Era

1999 saw the merging of Atlantic Canada's 4 provincial telephone companies into Aliant, and within a year of the merger, BCE had purchased majority control of the new conglomerate. Within a few years, and spurred on by the 2001 dot-com crash, Aliant began to divest many of its product development activities and spinoff companies in favour of core telecom services, causing a great deal of anxiety in New Brunswick and marking a key turning point for the growth and structure of the regional ICT industry. Meanwhile, public initiatives were attempting to make up for the lack of R&D-promoting policy during the past decade, opening an IT-focused branch of the National Research Council at the UNB campus in Fredericton, and introducing strategic innovation funds through the Atlantic Canada Opportunities Agency (ACOA).

In early 2002, the New Brunswick ICT industry amounted to 247 firms, of which 189 participated in Davis and Schaefer's (2003) survey, and had approximately 7,800 workers, including about 3,300 New Brunswick-based employees of Aliant. Excluding Aliant, the sector generated between $500 million and $700 million in 2001, and 63% of its revenues were gained from markets outside the province. From the Canadian perspective, the New Brunswick ICT industry is small: while housing 2.4% of the Canadian population, it accounted for just 0.8% of the country's ICT firms and employees and only 0.6% of national ICT revenues. However, it had a significant number of high-growth 'gazelle' (146) firms—52 firms in the sample—with more than 73% revenue growth between 1999 and 2001. ICT activity is primarily concentrated in New Brunswick's 3 largest cities, with Saint John, Moncton and Fredericton accounting for 93.7% of its employment and 94.7% of the sector's revenues. The industry is characterized by a few dozen larger firms that control the lion's share of employment and revenues, but it also has many small, independent firms: greater than 75% of firms had fewer than 15 employees. Firm

typologies include independent exporters that make extensive use of R&D programs; externally-owned subsidiaries with an export orientation; externally owned companies that have accounts with the provincial government or large, local companies; and independent firms that either cater to the local market or have export aspirations but are still in the startup phase. Davis and Schaefer conclude their case study by stressing that improving the ICT industry's export capability will be crucial for the future growth of the sector, and suggesting that the startup landscape in the province was on the precipice of another shift, with ex-NBTel managers who had substantial savings, contacts and experience beginning to found ICT companies of their own.

3.2.3: Recent Empirical Work on the New Brunswick ICT Industry

More recent work on New Brunswick ICT firms has been conducted by Yves Bourgeois (2013), whose Moncton-based research has investigated the nature and importance of knowledge flows, and the role of ICTs (the technologies, not the industry) in overcoming reduced opportunities for face-to-face contact in a small-city context. Bourgeois finds that for his sample of ICT firms in Moncton, key knowledge flows come from downstream in the supply chain (both local and external), as well as from employees and managers, particularly those who have spent time outside the region. They do not collaborate with local public R&D infrastructure to facilitate their innovation processes, which Bourgeois attributes to the predominant teaching orientation of greater Moncton post-secondary institutions, with only a few firms involved in casual relationships with universities outside the CMA such as UNB.

A bifurcation concerning the importance of face-to-face contact with customers was noted between Moncton ICT firms that were export-oriented—for example, a large manufacturer of gaming terminals—versus locally-oriented ones, such as a custom IT solutions provider. The

exporters tended to value scheduled, face-to-face meetings with customers as a key knowledge-building activity, while firms with local markets relied more on electronic communications. Another distinction concerning the importance of face-to-face downstream knowledge flows was found between off the shelf software developers, who could gain feedback electronically through error codes and automatic monitoring, and custom software and IT solutions providers, where extensive learning by interacting face-to-face with customers was indispensable. Bourgeois also finds that a local market orientation is often a deliberate choice by firms rather than a consequence of failure to export, and that often the scale diseconomies of a smaller market can be offset by higher profit margins owing to supplying first-to-market innovations.

As far as codified knowledge is concerned, ICT firms make extensive use of internet resources such as technical guides and open source code to develop their products. Finally, interfirm interaction among ICT firms in Moncton was found to be nearly nonexistent: in fact, there was concern expressed that social activities were being used by certain firms to poach employees. Bourgeois' findings point to an ICT sector in Moncton with well-developed knowledge pipelines connecting firms to customers and tailored to the specific needs of the firm, but a fledgling degree of 'local buzz' marked by a certain amount of distrust of other firms, at least at the managerial level, as well as a lack of institutionally-based R&D collaboration.

3.3: Context of This Study

The research conducted in this thesis seeks to pick up the story of New Brunswick ICT Industry where Davis and Schaefer (2003) left off. It has been over 10 years since the conclusion of their empirical work, and an updated statistical overview of the industry is long overdue. In particular, opportunities exist to look again at the spatial and interfirm structure of the sector, and

to analyze how the community of export-oriented ICT startups in New Brunswick has continued to evolve over the past decade.

Another key motivation for the selection of New Brunswick as a case study stems from the nature of most theoretical work that has been published on industrial complexes and cluster dynamics, which tends to focus on exceptionally large and successful agglomerations and metropolitan city-regions. Less scholarly attention has been given to smaller, more peripheral regions, resulting in a relative lack of nuanced theoretical understanding concerning the development dynamics at play in industrial districts outside of the core. Chapin and Comunian's (2010) theoretical framework suggests that a key first step toward a better understanding of these more marginal districts is to go directly to the views and experiences of the individuals who work, invest and do business in them.

In light of the theory covered in the previous chapter, a few additional questions and considerations are worth noting underneath the umbrella of the study's main research questions. Chief among these is exploring how relevant Markusen's industrial district typologies are in the New Brunswick context, since a focus on deeply developed transactional linkages may not necessarily be as applicable to localities like New Brunswick that are more focused on software and services than they are on devices. As a result, both Markusen's industrial district typologies and Bathelt et al's 'local buzz and global pipelines' model will be considered in identifying the type of agglomeration that the New Brunswick ICT industry most resembles. A key focus of analysis here will be to find out where firms' suppliers and customer markets tend to be located—in other words, how much supply chain interaction exists between New Brunswick-based ICT firms.

Another important set of questions relates to the local labour market. What is the nature of the ICT labour force in the province? Many studies cite a shallower talent pool as a key weakness faced by firms in smaller centers. Do ICT companies in New Brunswick face challenges in recruiting employees with the right set of skills, and if so, which skill sets are most difficult to find locally?

Expanding on the Moncton-specific research of Bourgeois, several other questions can be posed related to knowledge, innovation, and untraded interdependencies within the sector. What are the key sources of knowledge for New Brunswick ICT firms, and do they tend to be embedded locally or outside the region? How important is face-to-face contact for firms? Is there anything approximating a 'local buzz' in the province? Finally, are there any discernable differences between the ICT communities across New Brunswick's three cities in terms of spatial configuration, sense of community, and other qualities?

In order to address these points, this study draws on both primary and secondary data, as well as a combination of quantitative and qualitative methods. These data and methods are described in the following chapter.

Chapter 4 – Methodology

Recall the three main research questions of this study, articulated in Chapter 1 and expanded upon at the end of the previous chapter. Given the quantitative and qualitative components of this research agenda, the remainder of the thesis is divided into two sections; one for each approach. Chapter 5 focuses on updating the vital statistics of the New Brunswick ICT industry as a whole, describing its key characteristics and discussing the spatial distribution of ICT firms in the province. Chapter 6 takes a detailed look at the ICT startup community in New Brunswick, a sub-sector identified as particularly dynamic and promising for the industry's continued growth by both Davis and Schaefer (2003), and Campbell (2012).

This chapter describes the data and methods that have been employed in addressing this study's research questions. Section 4.1 presents the definition of the ICT industry used in the analysis. Section 4.2 discusses the quantitative data and methods drawn upon in Chapter 5, and Section 4.3 likewise describes the qualitative interview methodology employed in Chapter 6.

4.1: Defining the ICT Industry

As discussed in the previous chapter, many different definitions of the ICT industry exist within the research community, and are often tailored to the particular traits and specialties of the locality under study. Research on the New Brunswick ICT industry is no different, typically deeming e-learning or computer training firms to be part of the sector even though Industry Canada does not. Although the growth of both the call centre and ICT industries in the province can be partially traced back to the economic development strategy of the McKenna government, the ICT industry is a clearly distinct entity and call centres are generally not included in its definition. This study adopts the industry definition used in the unpublished empirical work of

David Campbell (2012), discussed below. It is important to note that Campbell's definition differs from that of Davis and Schaefer (2003), primarily with respect to his inclusion of NAICS 454111 (online shopping). Complete details of Campbell's definition are provided in Appendix A.

4.2: Quantitative Data and Methods

The first results chapter provides an updated statistical overview of the New Brunswick ICT industry, and relies mainly on secondary data. The principal data source for the following chapter is an unpublished report prepared by Campbell (2012) for the New Brunswick Information Technology Council (NBITC) called *ICT: A Growth Engine for the New Brunswick Economy*, which includes figures from Statistics Canada, the results of a survey to ICT firms, an assessment of the sector's economic impact and growth potential, and an analysis of the industry's infrastructure, assets, strengths and weaknesses. The report was delivered in March 2012, and the bulk of the data are from late 2011, with some Statistics Canada figures dating from 2010 and 2006. The majority of Chapter 5 is devoted to a summary and analysis of the findings of this report, with particular attention paid to updating the figures from Davis and Schaefer that were presented in Chapter 3.

The rest of Chapter 5 examines the spatial distribution of the New Brunswick ICT industry by presenting a map of ICT firms in the province. This map was generated by geocoding addresses from a list of firms compiled by searching Industry Canada's Canadian Company Capabilities (CCC) database by province and NAICS code. The CCC is a directory of Canadian firms that is intended to facilitate procurement and marketing among businesses within the country. Participation in the CCC is voluntary, and as a result only 120 of the 519 ICT companies

identified by Campbell are included in the map. In addition to the maps, a brief comparative analysis of ICT firm concentration in the central business districts of Saint John, Moncton and Fredericton is undertaken.

4.3: Qualitative Data and Methods

The more qualitative section of the thesis discusses the results of a series of interviews conducted with five anonymous entrepreneurs in the New Brunswick ICT industry, carried out between the summer of 2013 and early 2014. One additional interview was conducted in September 2013 with Gerry Pond, who is considered a key informant for the purposes of this study and agreed to be named. Pond was the CEO of Bruncor during its heyday in the 1990s, co-founded the IPTV services firm Mariner Partners in the early 2000s, and is currently at the helm of a Saint John-based venture capital firm called East Valley Ventures—in this capacity he has funded and mentored many ICT entrepreneurs in the province and is widely regarded as a leader in the regional ICT community. The participants for these six interviews were recruited using a combination of purposeful and snowball sampling. Half of the interviews were conducted in person, and the other half over the phone. Interviews generally took between 20 minutes and an hour to complete, and were conducted in a semi-structured format that included both specific and more open-ended questions. Although questions were sometimes tailored to the participant, particularly for Gerry Pond where the intention was to discuss broader industry trends, an example interview schedule is included in Appendix B. Chapter 6 elaborates the findings from these interviews, and analyzes participant responses in light of the above research questions.

The sample of ICT entrepreneurs interviewed for this study turned out to have certain particularities that should be noted. All five participants' companies were small startup firms

with fewer than 50 employees—the majority had fewer than 10 employees—and all were focused on exporting their goods and/or services to US and international markets. Four of the five firms were primarily involved in software development and SaaS (Software as a Service) provided over the internet. All firms were located in either Saint John or Fredericton (I also sought participants based elsewhere in the province, but none were successfully recruited for the study). These sample qualities mean that the results of this study may not be as applicable to New Brunswick ICT firms that are large, primarily focused on the local market, located outside of urban centres, or are branches/subsidiaries of multinational firms. However, this also presents an opportunity to take a detailed look at the very segment of the New Brunswick ICT industry that Davis and Schaefer argued would be crucial to the sector's continued growth: the small, export-oriented tech startup. Furthermore, the interview sample dovetails with Davis and Schaefer's discussion in another interesting way: including Gerry Pond, three of the six interview participants are ex-NBTel personnel.

Chapter 6 is organized along the three themes of the conceptual framework elaborated in Chapter 2. By examining 'hard' factors, 'soft' factors and path dependency, the chapter attempts to create a nuanced portrait of the ICT startup community in New Brunswick.

Chapter 5 – Quantitative results: The New Brunswick ICT Industry at a Glance

This chapter presents and interprets recent quantitative data on the New Brunswick ICT industry from a variety of secondary sources, with the goal of providing an updated statistical overview of the industry, mapping firms in the province, and ultimately, addressing this study's first two research questions. Section 5.1 summarizes the key findings of David Campbell's 2012 report on the industry commissioned by the NBITC. Section 5.2 presents several maps of a sample of New Brunswick ICT firms, as well as a brief analysis of ICT firm concentration in the central business districts (CBDs) of Fredericton, Moncton and Saint John. Finally, Section 5.3 provides a brief summary and discussion of the chapter's key findings as they relate to the overall research agenda.

5.1: The New Brunswick ICT Industry 10 Years Later

The statistics and information presented in this section are derived from David Campbell's 2012 report on the state of the New Brunswick ICT industry, which was commissioned by the NBITC "to help government, industry and community leaders, as well as the general public, understand the scope, scale and economic impact of the [industry]" (5). Its eight sections present a variety of quantitative and qualitative data on the sector, and together comprise the most comprehensive profile of the New Brunswick ICT industry produced in many years. Despite the stated goal of communicating the nature of the industry to a wider audience, the report was never published online and, to the researcher's knowledge, this thesis is the first time its findings have been reported in an academic setting.

5.1.1: Statistical Overview of the New Brunswick ICT Industry, 2010-2011

Campbell's statistical overview of the New Brunswick ICT industry primarily relies on data from Statistics Canada. As detailed figures from the 2011 census were not yet available at the time of the report's completion, Campbell used a number of CANSIM tables and other Statistics Canada surveys, mainly from 2010 and 2011, as data sources. A notable exception to this is employment data on ICT workers in firms outside of the ICT industry, which were only available from the 2006 census. Therefore, caution should be taken when examining those numbers alongside employment data within the industry.

In 2010, the New Brunswick ICT industry generated $832 million in real GDP (expressed in 2002 chained dollars), representing 3.8% of total provincial GDP. Compared to the other Canadian provinces, the ICT sector's GDP impact ranked in the middle of the pack at fifth overall. Likewise, New Brunswick's GDP growth rate in ICT has kept pace with the national average over the past decade. Within New Brunswick, the ICT industry's GDP grew at a rate of 43% from 2000-2010, more than double the province's overall GDP growth rate and faster than the finance, insurance and real estate sector. Provincial GDP generated by manufacturing declined by 3% over the same interval.

In 2011, Statistics Canada counted 519 ICT firms operating in New Brunswick, down approximately 7% from 556 businesses in 2005. The largest swings on a sub-sector basis were in telecommunications, which saw a 34% increase in the number of active firms, and computer training, where the number of firms decreased by 58%. The bulk of the industry's firms, 380, remain in computer systems design and related sub-sectors despite a modest 6% decrease in number. New Brunswick's concentration of ICT firms lags behind other Canadian jurisdictions:

its number of firms per 100,000 population ranks below every province except Newfoundland and Labrador.

While micro-businesses—those with fewer than 10 employees—still make up the majority of New Brunswick's ICT firms, the province saw an 8% drop in the number of companies in this category between 2005 and 2011. This was offset by a 75% increase in the number of ICT firms in the 50-199 employees category over the same period. The province bucked the Canadian trend in both cases: nationwide, the number of micro-businesses in the ICT industry increased by 23%, while firms with 50-199 employees decreased in number by 21%.

In the 3 sub-sectors for which data were available (computer systems design and related; data processing/hosting and related services; telecommunications), the ICT industry employed just under 7,100 people in New Brunswick in 2010, in both technical and non-technical occupations. Note that this figure—taken from the monthly Survey of Employment, Payrolls and Hours—includes both full-time and part-time positions, and does not take employment in the software publishing, internet publishing or computer training sub-sectors into account. An employment estimate for the entire ICT sector, based on Input/Output tables for the New Brunswick economy, is pegged at approximately 8,600 direct jobs, or 5,600 full time equivalent (FTE) positions (Campbell, 2012: 10). Remarkably, after adjusting for workforce size, New Brunswick has Canada's highest concentration of employment in two of the three ICT sub-sectors with available statistics—data processing/hosting and telecommunications. ICT employment in firms outside of the ICT industry is also significant for New Brunswick: in 2006, approximately 4,950 ICT workers in the province were employed by non-ICT companies.

The New Brunswick ICT industry continues to be mostly concentrated in its three largest metropolitan areas: in 2011, 71.5% of ICT firms in the province were located in one of the Moncton, Fredericton or Saint John regions, and 78% of ICT firms with 50 or more employees are located in the three metropolitan areas. The detailed proportional breakdown of ICT firms is as follows: 22.5% in the Fredericton region, 26% in the Moncton region, 22% in the Saint John area and 29.5% in the rest of the province. Of the three urban centres, Fredericton has the highest proportion of micro-businesses while Saint John has a greater percentage of larger ICT firms. While Campbell does not present a direct geographic breakdown of ICT employment in New Brunswick, companies located in the rest of the province tend to be smaller in size, suggesting that the urban concentration of ICT employment is greater than its concentration on the basis of firms alone.

5.1.2: Selected Results from Campbell's Survey to New Brunswick ICT Firms

Chapter 3 of Campbell's report presents the results of a survey sent to New Brunswick ICT firms that asked them about a variety of details above and beyond the data available from Statistics Canada. 43 firms employing a total of 3,675 employees responded to the survey, with representation from the south, northeast and northwest of the province. 20 of the sample's participants are in software development, 10 are involved in activities related to web-based publishing, three are telecommunications firms and the remaining 10 provide more general IT services. Results of the survey pertinent to this study include the sectoral and geographic market profile of participants, firms' perceptions of the recruitment environment in the province, firms' value propositions, and their views on pros and cons related to New Brunswick's business environment.

For the average New Brunswick ICT firm, the most important industry sectors from a revenue generation standpoint include professional, scientific and technical services; arts, entertainment and recreation; and finance, insurance and real estate. Of note in the New Brunswick context, neither the public sector nor the natural resource sector are major clients of ICT firms based in the province. From a geographic standpoint, the typical firm in the sample is not exceptionally export-oriented—36.1% of the average firm's revenue is generated within New Brunswick, and a further 36.5% from the rest of Canada. However, 54% of survey participants rely on the New Brunswick market for less than 20% of their sales, suggesting that a significant group of export-oriented ICT firms continues to exist in the province. It should be noted that the revenue breakdowns in Campbell's analysis use non-weighted averages to identify participant firms' top markets. The advantage of this approach is that larger firms do not skew the overall results—the trade-off is that the statistics may not be reflective of the largest contributing sectors and geographic markets in terms of the industry's gross revenue.

The two most common sources of staff recruitment for firms in the sample were out of other firms and direct from post-secondary institutions, while the extent of international recruitment tends to be more limited. 46% of respondents characterized the ICT staff recruitment environment in the province as fair, with only 16% rating it as poor. Specific recruitment challenges noted by participants primarily revolve around difficulties finding more specialized IT skills and workers with a lot of experience, as well as concerns about the low number of trained programmers graduating from the college system.

Firms were asked to identify their most important value proposition: in other words, what sets them apart from their competitors. Most firms cited either technical superiority or a niche market offering as the main sources of their competitiveness, and comparatively few firms

mentioned lower costs as being significant. Firms also rated various aspects of the New Brunswick business environment on a scale from 1 to 5, with higher rated conditions deemed more positive. Employee retention and talent coming out of the province's post-secondary institutions tied for the most positive scores from participants, while access to capital and air travel infrastructure in New Brunswick were rated the lowest.

5.1.3: Major Findings of Campbell's Study

Campbell concludes his report with a brief SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the New Brunswick ICT industry based on the findings in his previous chapters. The entire list of factors is presented in Figure 5.1. There are a few key points that Campbell covers in his analysis. In light of the high urban concentration of ICT firms in the province, Campbell calls for more research to explore the relationship between urban assets and ICT firm location. He also notes that software developers and firms engaged in internet-based activity have the highest growth prospects over the next three years, while profit margins among more general IT services appear to be low. Finally, he highlights four important weaknesses and threats going forward: lingering concerns about a limited degree of ICT entrepreneurship, declining post-secondary enrolment in ICT fields, difficulty finding more specialized ICT talent, and the opportunity for more inter-firm collaboration within the industry.

STRENGTHS:	WEAKNESSES:
↑ Relatively strong growth in employment and GDP. ↑ Strong growth in ICT industry revenue. ↑ Highest concentration of ICT employment in Atlantic Canada. ↑ Relatively high level of international exports. ↑ Solid profit margins for software development. ↑ Strong growth among mid-sized ICT firms (50-199 employees). ↑ ICT firms not relying on 'low costs' as a competitive advantage. ↑ Most ICT exporters using partner firms in external markets. ↑ ICT firms investing in R&D (44% of firms with R&D expenses at 20% or more of total costs). ↑ Well above average ICT activity outside the ICT industry. ↑ Relatively young ICT workforce (median 36 years) among ICT industry firms. ↑ High rating for the quality of the ICT workforce coming out of post-secondary education. ↑ High rating for ICT employee retention. ↑ ICT incubation capacity – PropelICT, etc. ↑ Industry association capacity (NBITC). ↑ Growing pool of early stage capital.	↓ Per capita GDP below national average. ↓ Well below employment levels compared to Ontario, Quebec and British Columbia. ↓ Weak profit margins for general IT services activity. ↓ Decline among micro-ICT businesses (less than 10 employees) compared to strong growth across Canada. ↓ 40% of the ICT external spend among non-ICT firms surveyed is external to New Brunswick. ↓ Concern among ICT firms about the lack of access to specialized IT skills (i.e. software engineers). ↓ ICT training environment - # of private firms decline and number of enrolments/graduates down among universities and colleges. ↓ Lack of out-of-province recruitment of ICT talent. ↓ Government organizations rated the IT-related labour cost environment much lower than non-government organizations. ↓ Overall access to capital continues to be a concern for the industry. ↓ Air travel infrastructure worst rated business environment factor (Moncton firms rated air travel at 3.7 out of 5 compared to only 1.9 out of 5 for ICT firms in the rest of New Brunswick).
OPPORTUNITIES:	**THREATS:**
→ NB ICT firms planning between 400 and 600 new ICT jobs over the next three years. → Well above average ICT activity outside the ICT industry could mean more opportunity for ICT firms. → The majority of non-ICT industry organizations say productivity improvement is a key driver of IT investments. → More collaboration between ICT firms for new product and market development. → Foster more ICT entrepreneurship. → Increase ICT training activity.	← Lack of ICT entrepreneurship. ← Weak profit margins among general IT service providers. ← Non-ICT industry organizations in New Brunswick are not expecting to grow their ICT budgets in 2012. ← All but one of the government departments and organizations surveyed are expecting to either hold or reduce the number of ICT staff over the next three years. ← Overall slowdown in public spending. ← Slowing of the post-secondary pipeline for ICT talent. ← Lack of cooperation among ICT industry firms.

Figure 5.1: New Brunswick ICT SWOT according to Campbell. *Source: Campbell (2012:51)*

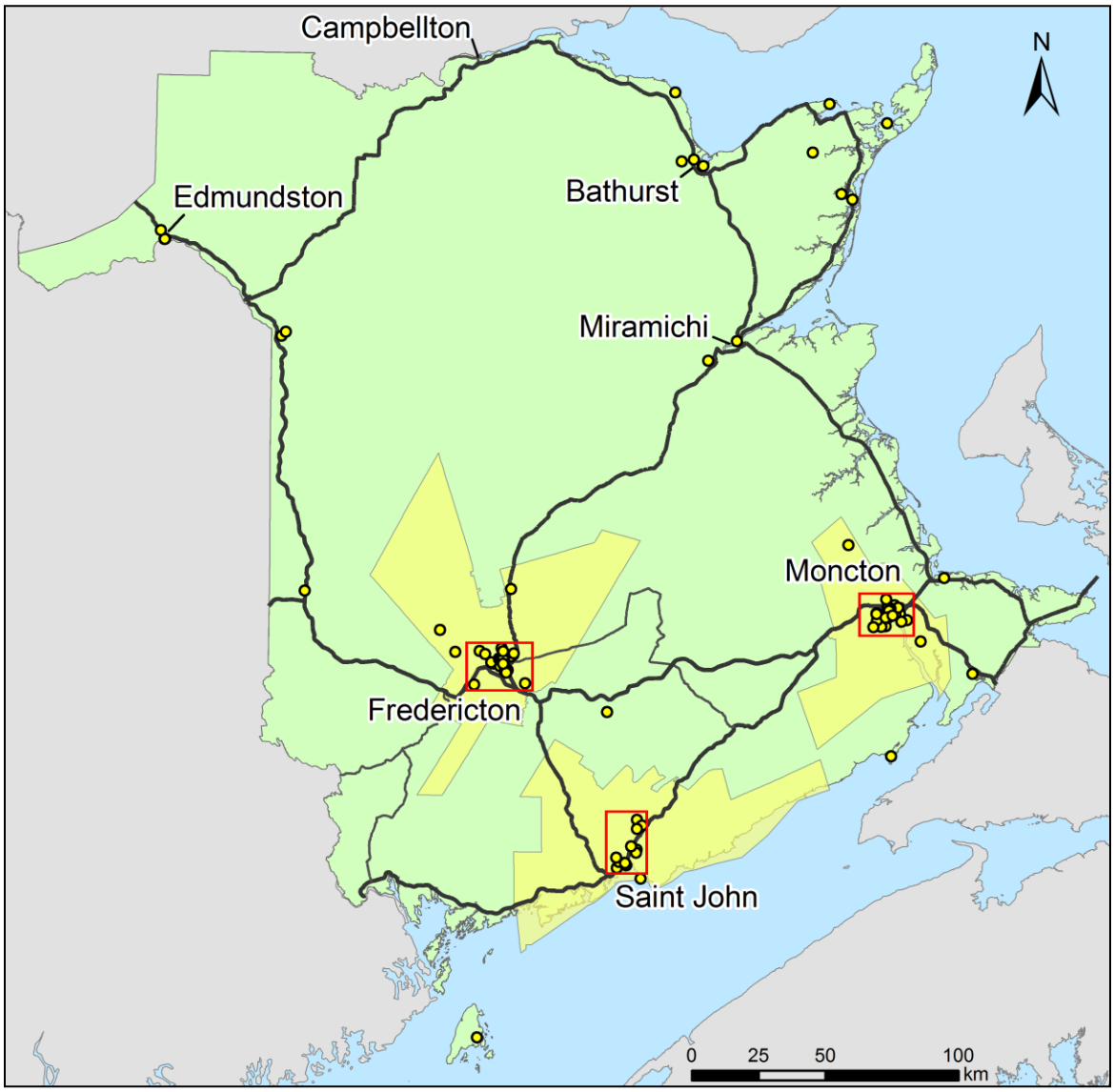
5.2: Mapping the New Brunswick ICT Industry

A key objective at the outset of this study was to produce a map of ICT firms in the province in order to provide a more nuanced picture of the industry's spatial organization. To this end, a list of firms in the industry subsectors used by Campbell was compiled by searching Statistics Canada's Canadian Company Capabilities (CCC) Database and then geocoded using an online service. The firm locations were subsequently brought into a desktop GIS environment for analysis and presentation. The CCC is a voluntary directory, meaning that only a sample of businesses are included in the maps below: provincewide, a total of 120 firms are plotted, representing approximately 23% of the 519 ICT firms counted in Campbell's report. Their spatial distribution by region of New Brunswick is summarized in Table 5.1. Compared to the overall provincial distribution reported by Campbell in Section 5.1, ICT firms in Saint John and non-metropolitan New Brunswick appear to be under-represented in the sample, while greater Fredericton is the most over-represented area.

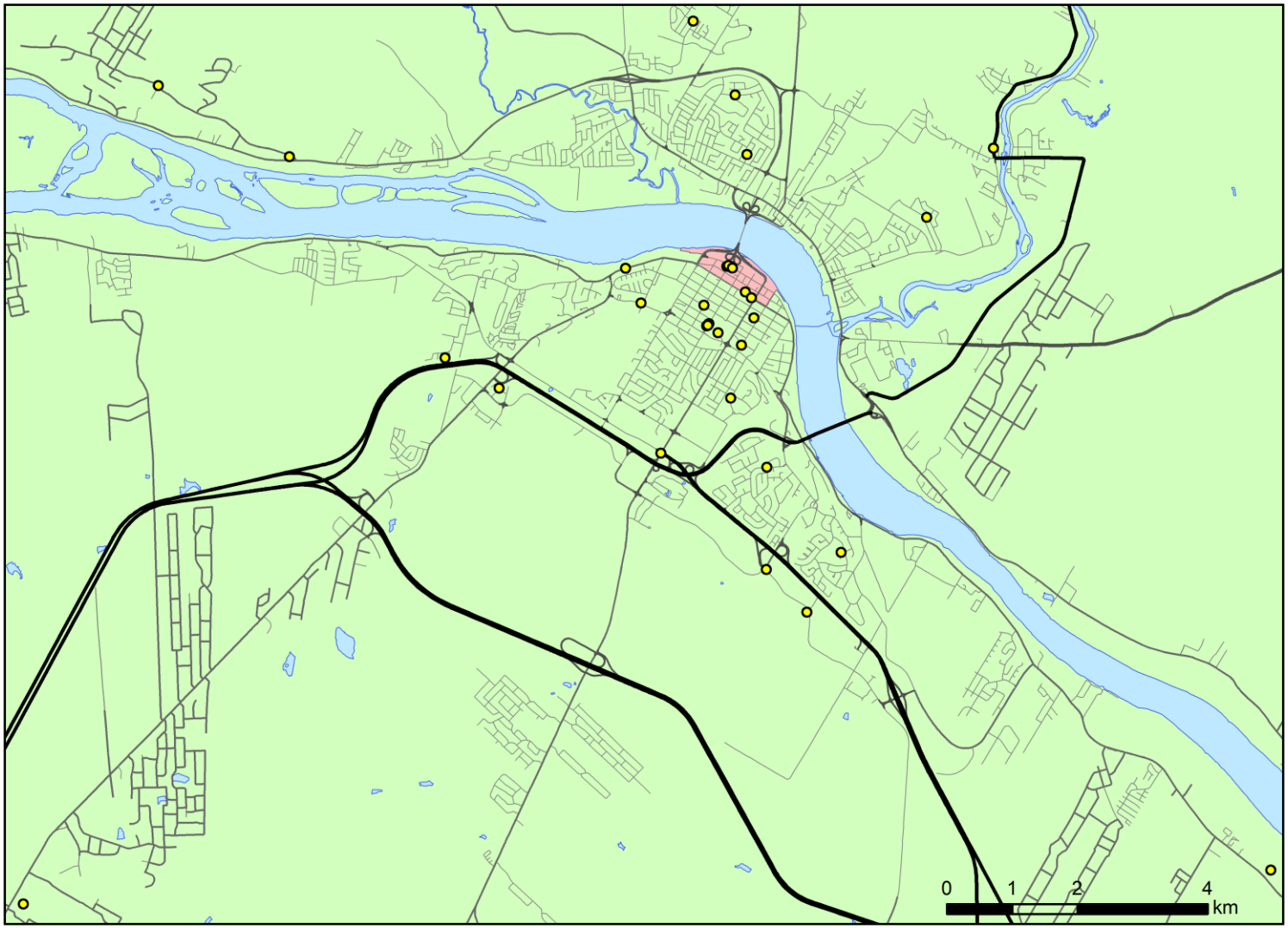
The overall provincial map of ICT firms is presented in Map 5.1, along with provincial trunk highways for additional context and orientation. The Saint John, Moncton and Fredericton CMA/CAs are shaded, and red outlines mark the extents of the more detailed city-region maps that follow. Maps 5.2, 5.3 and 5.4 show the detailed distribution of firms within each city-region, and all three are presented at the same scale to facilitate comparison.

Table 5.1: Spatial Distribution of mapped ICT firms.

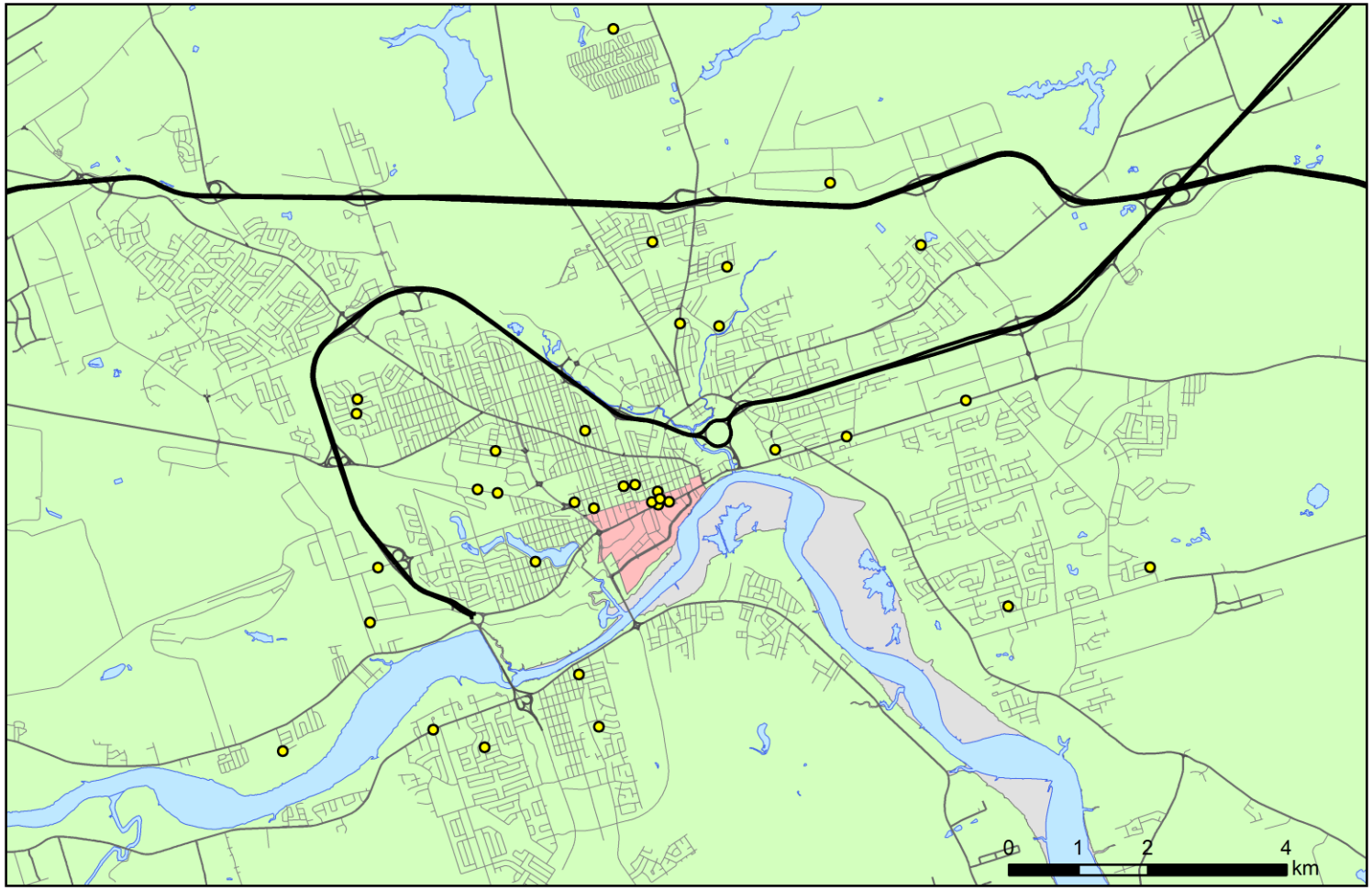
Region	Count	Percent
Fredericton	38	31.67%
Moncton	38	31.67%
Saint John	19	15.83%
Rest of NB	25	20.83%
Total	**120**	**100.00%**



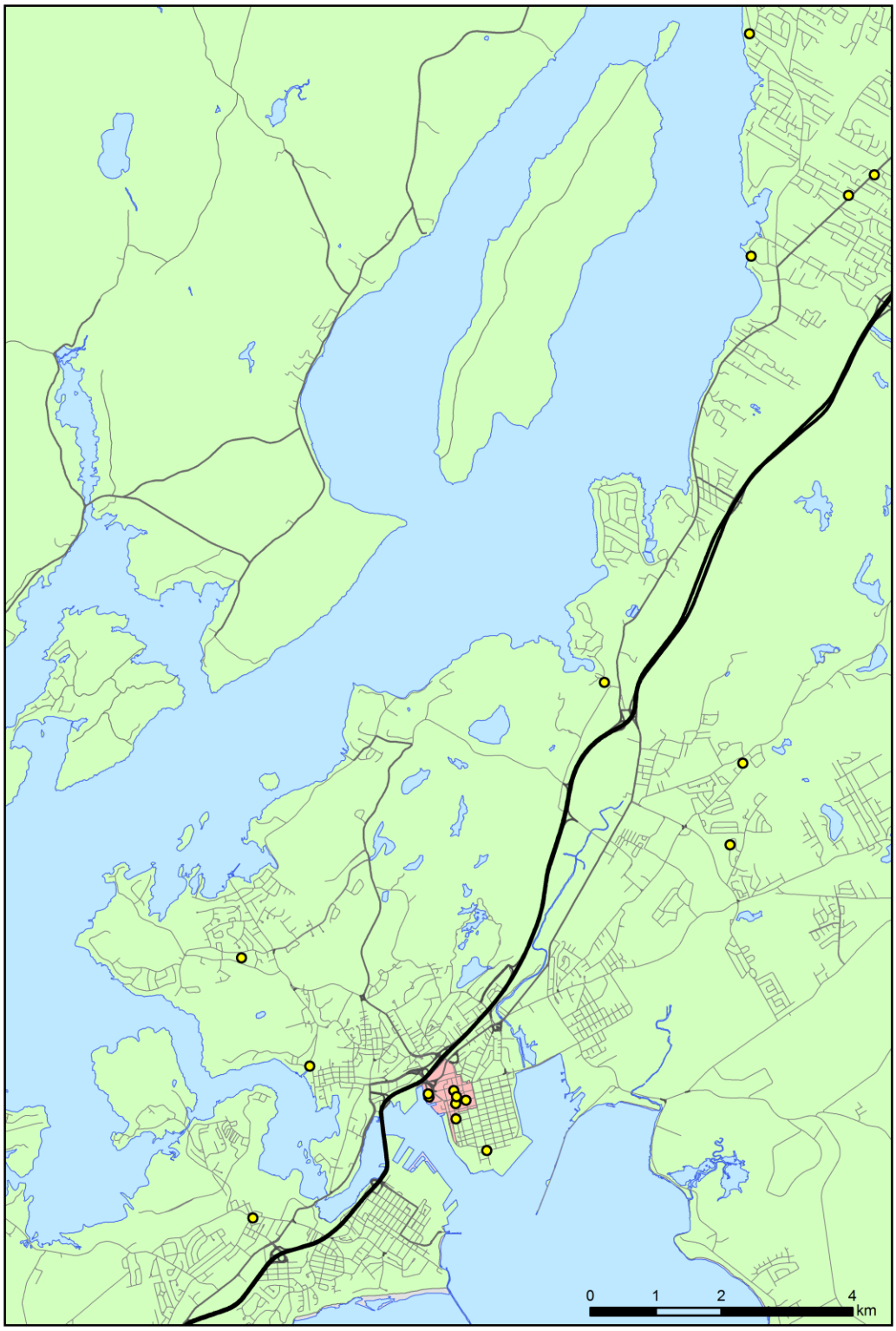
Map 5.1: Spatial distribution of a sample of 120 New Brunswick ICT firms. The CMAs for Moncton and Saint John, and the CA for Fredericton, are highlighted in yellow. Red boxes show the approximate extent of the detailed city-region maps that follow. *Source: Statistics Canada, Canadian Company Capabilities Database, February 2014. Scale: 1 : 2,700,000.*



Map 5.2: Spatial distribution of ICT firms – Fredericton area. The CBD is highlighted in red. *Source: Statistics Canada, Canadian Company Capabilities Database, February 2014. Scale: 1 : 100,000.*



Map 5.3: Spatial distribution of ICT firms – Moncton area. The CBD is highlighted in red. *Source: Statistics Canada, Canadian Company Capabilities Database, February 2014. Scale: 1 : 100,000.*



Map 5.4: Spatial distribution of ICT firms – Saint John area. The CBD is highlighted in red.

Source: Statistics Canada, CCC Database, February 2014. Scale: 1 : 100,000.

As expected, the maps show a clear concentration of firms in each of the three city-regions: outside of these centres, the most common for ICT firms in the sample is the Bathurst-Acadian Peninsula area in the northeast of the province. Looking within each metropolitan area, the picture becomes more complex. While there is evidence of small ICT firm concentrations in each central business district (CBD – for the purposes of analysis, defined as the central Business Improvement Area boundary and highlighted in red on the maps above), firms also tend to be distributed throughout the region—based on a visual analysis, the Moncton area appears to have the most even spatial distribution of firms.

Following up on Campbell's call for more details on urban assets and ICT firm location, a brief comparative analysis of firm concentration in each city's CBD was undertaken. Table 5.2 shows the proportion of each region's ICT firms located within 100m of the CBD boundary. Despite the visual evidence, in absolute terms the majority of mapped firms in each city-region are located outside of the CBD, suggesting that on the whole, the New Brunswick ICT industry is fairly suburbanized. In relative terms, the CBD concentration of firms in Saint John was double that of the other two cities. This suggests that there may be something unique happening with ICT firm locations in Saint John: a finding that turns out to be largely corroborated by the results presented Chapter 6.

Table 5.2: Proportion of mapped ICT firms in each metropolitan area's CBD.

Metro	Count	CBD* Count	Proportion
Fredericton	38	7	18.42%
Moncton	38	7	18.42%
Saint John	19	7	36.84%
All Metros	**95**	**21**	**22.11%**

CBD is defined as each city's central Business Improvement Area (BIA) plus a 100m buffer.

5.3: Discussion

The final section of this chapter summarizes key statistics from Campbell's report, and then links the chapter's findings back to questions of the ICT labour market, industrial district typologies and untraded interdependencies. The updated vital statistics of the New Brunswick ICT industry, dating to 2010-2011 (unless otherwise specified), are presented in Table 5.3.

According to Campbell, most firms are moderately satisfied with the recruitment situation in the province. However, firms do experience difficulty recruiting more specialized IT skills locally, and this is most likely a consequence of the smaller labour market. On the other hand, the excellent environment in terms of employee retention may speak to an advantage of the sector being small. It is a strange contradiction that this is the case considering NB ICT firms' strong propensity to recruit out of other companies, which corroborates with Bourgeois' findings of a degree of distrust among Moncton ICT companies. Firms are satisfied with the recruitment environment out of universities, but Campbell has raised concerns that the locally-produced talent pool's growth rate is slowing down. Overall, the labour pool situation in the New Brunswick ICT industry exhibits both advantages and disadvantages for local firms.

Table 5.3: The New Brunswick ICT industry at a glance, 2010-2011.

Number of firms:	519
GDP:	$832 million
Share of provincial GDP:	3.80%
Annual GDP growth rate (2000-2010):	43%
Estimated total employment:	8,600
Estimated FTE employment:	5,600
ICT employment outside industry (2006):	4,950
Firm concentration in major cities:	71.50%
Share of firms employing <10 people:	72%

Source: Campbell (2012)

In terms of industrial district typologies, there is not much evidence here of either vertical or horizontal relationships among firms, and evidence is mixed when it comes to reliance on exports. Although the public sector is a source of ICT employment, neither the government nor any of the universities appear to be a significant hub of the industry, nor does there appear to be a single large, private-sector hub firm. Both multinational branch plants and independently owned firms exist in the sector. Global pipelines and face-to-face contact do appear to be important to firms, particularly exporters, on account of frustrations expressed concerning airport infrastructure outside of Moncton. Based on the information in Campbell's report, none of the industrial district typologies discussed in Chapter 2 appear to fit the sector with any degree of accuracy: the New Brunswick ICT industry is simply too heterogeneous.

With regard to inter-firm collaboration or sense of community, there are few signs of a 'local buzz' within the New Brunswick ICT industry as a whole. However, there is evidence that start-up incubation and mentoring capacity is increasing, and that at least some firms have clustered themselves in CBDs—these themes are explored in detail in the next chapter.

Chapter 6 – Qualitative Results: An In-Depth Look at the New Brunswick ICT Startup Scene

This chapter presents major findings from the study's entrepreneur and key informant interviews. A total of six semi-structured interviews were conducted: five with anonymous entrepreneurs of ICT startups in the Saint John and Fredericton areas, and one with a key informant, Gerry Pond. Section 6.1 provides an overview of the entrepreneur sample characteristics and a brief discussion of their implications. Sections 6.2 to 6.4 present the study's major interview findings, organized by the 3 themes of the conceptual framework elaborated in Chapter 2. Text boxes with key quotes from participants can be found in Appendix C. Finally, Section 6.5 links the results from the previous 3 sections as they relate to the study's research questions—primarily questions 2 and 3.

6.1: Entrepreneur Sample Characteristics

Table 6.1 provides a few key summary characteristics of the companies of the five startup entrepreneurs interviewed for this study. Clearly, the profile of firms is highly homogenous: four out of five are micro-businesses; four out of five are primarily selling SaaS (Software as a Service) over the internet; all five firms rely primarily on the internet to deliver their services and all firms are focused on exporting to international markets.

The similar nature of participants' firms in the sample has clear implications for the generalizability of findings in this chapter. Findings may not be as applicable to New Brunswick ICT firms that are large, primarily focused on the local market, located outside of urban centres, or are branches/subsidiaries of multinational firms. On the other hand, findings are likely to be

Table 6.1: Profile of entrepreneur participants.

Primary Office Location	Participant's Location	Number of Employees	Sub-Sector	Internet-Enabled Service Delivery?	Export-Focused?
Saint John	Saint John	<10	E-Learning	Yes	Yes
Saint John	Saint John	<10	Software/SaaS	Yes	Yes
Fredericton	Fredericton	<10	Software/SaaS	Yes	Yes
Fredericton	Saint John	10-50	Software/SaaS	Yes	Yes
Fredericton	Fredericton	<10	Software/SaaS	Yes	Yes

highly valid for software and internet-oriented firms within the export-oriented ICT startup ecosystem in New Brunswick.

6.2: 'Hard' Factors

In this study's conceptual framework, 'hard' factors refer to tangible drivers of or limitations to a firm's success: factors that are transactionally based, formalized and/or have direct financial implications for the firm—in other words, the factors that are generally prioritized by New Industrial Spaces scholarship. This section begins with an overview of more general information on some basic 'hard' factor conditions for participant firms, including supply chains, primary markets and knowledge inputs. Next, labour market conditions including firms' required skills and difficulty recruiting are considered. Key enabling and chalenging 'hard' factors reported by participants are then respectively presented. Finally, the very special consideration of marketing for ICT startup firms is discussed.

6.2.1: Basic Information

Text Box C1 presents key quotes pertaining to the basic 'hard' factors faced by participants. Although almost all participant firms were very small, most reported using contract employees

on either a permanent or temporary basis. Contract employees are particularly important as a source of scalability in programming and quality assurance skills for when firms go through an intensive product development phase.

In the broader sense, firms are generally connected to suppliers both locally and further afield. Basic hardware and software supplies typically flow from the major global hubs of ICT activity such as Silicon Valley. Local connections within the ICT industry are particularly important for web developers and hosting services, and one participant stressed the importance of being close to non-ICT producer services such as marketing. However, for the most part, transactional supply chain linkages between ICT startups within the region are quite limited: these firms are primarily focused on creating a product in-house and selling it directly to end users.

As the supply chain situation might suggest, participants' downstream transactional linkages are invariably global in nature. All participants acknowledged that the local was not a primary market, and the most common reason given was that there simply would not be a critical mass of customers within Atlantic Canada. Global marketing of particiants' products and services is facilitated by the internet: as one participant put it, "You go where the customers are: the customers are in the cloud, we're in the cloud. It doesn't matter where you're located." While all participant firms have global aspirations, the local market was acknowledged by some as an important place to pilot new products and services before marketing them further afield.

Knowledge inputs to the firm come from a variety of sources, with one of the most important being customers: a firm's customers are the primary means of determining the effectiveness of a product or service offering, as well as of gauging and identifying important innovations to work on going forward. Other important sources of knowledge include open source code libraries and

the communities around them, as well as awareness of the technical innovations happening in ICT more globally. Certain knowledge, experience and know-how is embedded in human capital locally, but most formalized knowledge inputs flow from outside the region. One firm also mentioned collaboration with the University of New Brunswick (UNB) as an important element of their product development and recruitment process.

6.2.2: Labour Market Characteristics

Quotes pertaining to important human capital considerations and the difficulty firms have in securing employees with the right skills are presented in Text Box C2. ICT startups generally require skilled labour in both technical programming fields, as well as in business and marketing. Some firms sought out employees with a university education, but others acknowledged that it is inreasingly common to observe and hire self-learners in the labour market.

For many participants, technical skills actually mattered less than finding people with a certain mindset. What is most important to managers of small ICT firms is that employees are able to think critically and understand the nuances of risk and failure: they are "the hub of the wheel" in the sense that they must take on a wider range of responsibilities and have a very high level of accountability to the overall success of the firm. This is in contrast to a larger firm environment, where an employee is more of "a spoke in the wheel" whose role tends to be fairly straightforward and arguably less critical overall. This is why entrepreneurs often look to prospective employees who have prior startup experience, in many cases assembling teams who have worked together on past projects.

Participants' experiences were mixed when it came to ease of recruitment. On the positive side, participants tended to be small firms with a limited absolute volume of draw on the labour pool:

although the pool is smaller and shallower than in primary North American ICT hubs, it was generally adequate for the hiring needs of participants in the sample. Having a core group of former colleagues with existing trust and rapport also facilitated the recruitment process for participants, as well as, ironically, the presence of certain mature firms that were reducing the size of their workforce. On the other hand, securing very specialized technical skills, successfully integrating employees used to a larger organizational environment, as well as finding and retaining high-quality workers with certain high-demand skillsets all begin to approach the limits of the local labour market for participants.

6.2.3: Key Enabling 'Hard' Factors

Text Box C3 presents participant quotes on the major 'hard' factors that enable them to start and sustain an ICT business in New Brunswick. When it comes to locational decisions within the province, certain benefits of proximity are balanced by the need to find affordable office space. As one example, entrepreneurs in the Saint John cohort were quick to point out the productivity benefits of being located in the central business district (known locally as Uptown), within walking distance of other ICT firms as well as key producer services and mentors. Meanwhile, Fredericton entrepreneurs were more likely to cite proximity to UNB and National Research Council facilities there, as well as the cluster of ICT firms and supporting organizations in the city's suburban Knowledge Park, as influencing factors on their physical location. In both cases, availability and affordability of adequate and scalable office space also tended to be important factors.

Besides localized geographic considerations, several other enabling factors were identified by participants. While the talent pool is shallow in some areas, local expertise in fields such as

telecommunications, SaaS and cloud-based services is very well developed. There is also evidence of local entrepreneurs and experts being closely attuned to the changing nature of the global ICT industry: having successfully tapped into the past decade's growth in social media-based enterprises with startups like Radian6, local attention is now turning to understanding and creating business models around the newer industry trend of big data analytics. Although both factors were also mentioned as challenges to local startups, participants acknowledged that the labour market and access to capital for experienced entrepreneurs were both typically adequate and improving. A key strength reported by participants was the excellent employee retention environment in the province vis-à-vis 'hotter' ICT locales: as one participant commented, "if you do a good job of hiring the right staff I don't stay up at night worrying who's a flight risk.... there are some cost advantages but they're relatively minor compared to the [stability and predictability of the labour market]".

Another important enabler of ICT businesses in New Brunswick, particularly those providing cloud-based services, is the quality of local broadband infrastructure from the province's cities to major global markets. New Brunswick was an early adopter of fibre optic infrastructure, and today a redundant fibre backbone runs from the province to the subsea cable landings in Nova Scotia. This infrastructure provides a very large amount of reliable, low-latency bandwidth to both New York City and the British Isles, increasing the quality of internet-enabled services that local firms are able to provide to these key nodes in the global telecommunications network.

Two other 'hard' factors have played a major role in enabling startup activity in New Brunswick. First, the setup costs of an ICT business have lowered dramatically over the past ten years: the cost of computers, software and broadband internet—the foundational physical inputs to any software developer—no longer pose major obstacles in urban North America. This has offset a

significant amount of the risk associated with starting an ICT business. Second, participants cited the presence of a well-developed network of supporting organizations and institutions in the province that are increasingly catered to guiding new companies through the startup phase and providing some initial funding. Many of these initiatives are government based, but several others stem from the private sector, including the PropelICT and Planet Hatch accelerators.

6.2.4: Key 'Hard' Factor Challenges

Major challenges faced by participant firms are reported in Text Box C4. First among them is the small size of the local market, which limits the growth potential of firms without export aspirations and means there is little room for mistakes when dealing with local clients. On the other hand, the latter point could also be interpreted as an advantage, because it requires companies to put their best foot forward from the outset when piloting their products and services. Another major challenge to ICT startups remains capitalization, both at the early and middle stages of the company. External venture capitalists tend to ignore Atlantic Canada: as one participant colourfully explained, "when you start looking at the data, you see that VCs very rarely venture any further than where their electric car's going to take them". While local sources of venture capital are becoming more common, there are still concerns about the number of local angel investors who are willing to sign the first cheque to fund a startup. Meanwhile, at the middle stage of New Brunswick startups, there is a dearth of options to finance further growth and/or provide an exit strategy other than acquisition. Although the acquisition of a local firm by a multinational injects capital into the region and has other advantages, it also de-localizes the acquired firm's intellectual property—setting the stage for future restructuring and/or job losses—and diverts a significant portion of future revenues away from the province.

This is exactly what has happened to Radian6 in the years since it was acquired by Salesforce.com in 2011.

Three other important 'hard' factor challenges were identified by participant firms. First, there was significant consternation about the state of air travel infrastructure in the province. Each of New Brunswick's three major cities has its own airport with direct flights to Halifax, Montreal and Toronto—however, their distributed nature means that each airport lacks the economies of scale to support frequent flights and competition between carriers, driving up ticket prices and making schedules to get to major centres less convenient overall. Moncton is currently best served by air travel infrastructure, owing to the inclusion of much of eastern New Brunswick, Prince Edward Island and parts of north-central Nova Scotia in its cachment area. Second, concerns were expressed about the speed at which educational institutions, from grade school all the way up to universities, were reacting to the changing knowledge and skills requirements of the ICT sector. Untapped opportunities for R&D collaboration with universities was a secondary concern here. Finally, participants expressed the need for better co-ordination among the various government programs that are available to support startups in the province: it was suggested that a 'one-stop shop' approach to program delivery would be more convenient to entrepreneurs and help to reduce 'red tape'.

6.2.5: ICT Startups and the Importance of Marketing

The quotes in Text Box C5 demonstrate that marketing is a major 'hard' factor consideration among the participating startup entrepreneurs. This is something that is not immediately intuitive because the immediate association with ICT startups is the techical skills—however, once the product, platform or service is developed, a startup's primary focus becomes marketing

itself as well as differentiating itself from competing firms. When introducing a new product or service, this consideration also extends to educating consumers about its category, pricing and value proposition. It is possible to ride the wave of awareness around a certain trendy category by being in the right place at the right time, as Radian6 did with social media monitoring, but more often than not the key challenge faced by a startup is in creating interest and awareness of its brand among key market segments: "you have to create your own wave, and you have to manoeuvre your way to the top of the wave." Interview participants expressed concern that many ICT firms in New Brunswick were continuing to fail at doing this.

6.3: 'Soft' Factors

In contrast to the 'hard' factors described in the previous section, 'soft' factors are far less tangible. Nevertheless, they are still capable of making the difference in the success of firms in a particular place. This section begins with a brief look at interview findings related to the Floridian thesis of individual location: are skilled workers attracted to a particular place by amenities, or for other reasons? After that, the section focuses on several untraded interdependencies within the New Brunswick ICT startup scene including the urban social environment, face-to-face interaction, access to mentorship, and finally collaboration and sense of community.

6.3.1: Individual Location and Place-Based Amenities

The Floridian growth thesis, discussed and critiqued in Chapter 2, states that individuals in the Creative Class are primarily influenced to move to a particular locality by the urban amenities that exist there—all other considerations, including the availability of gainful employment, are considered secondary to the amenities preference. This stance has been critiqued by scholars,

largely on the grounds that it misinterprets the direction of causality at play. Key interview quotes touching on this theory are presented in Text Box C6.

It is notable that none of the interview participants moved to New Brunswick primarily for reasons of amenities: of all six interviewees, three moved to New Brunswick for family reasons, and the other three were working at NBTel in the mid-1990s and are still in the province today. For the most part, it appears that rather than either amenities or job prospects, happenstance is the most likely explanation why these individuals originally chose to locate in New Brunswick. This flies in the face of both Floridian growth theory and its critiques!

One reality of contemporary work that is particularly pertinent for the ICT industry is telecommuting or working virtually: due to widespread adoption of broadband internet and more sophisticated online communication and collaboration tools, it is now possible for employees of firms to work remotely from the main office on a regular basis. This was mentioned both as a contributing factor of being able to move to the province, and as a key driver of the team of one participant startup with a workforce and executive team distributed across the Maritimes and even the United States. For this firm, the key factor that makes this distributed arrangement work is that the founders and core team had worked together at previous startups, so the trust and camaraderie necessary for a fast-moving professional team was already present.

Despite evidence that amenities were not the primary factor behind participants coming to New Brunswick in the first place, there is evidence that they may help to keep talent in the region, and may also have somewhat of an influence on the office locations of some startups. In addition, amenities-based factors, particularly the lifestyles and work-life balance available in the region, are used in the discourses of many interview participants as an important strategy for promoting

New Brunswick more broadly. These results suggest that while not a primary motivating factor of individual locational decisions, amenities may be playing a more complex role in the New Brunswick ICT industry than either Floridian growth theory or its critiques have been able to articulate—particularly in light of the increasing prevalence of working virtually in recent years.

6.3.2: Untraded Interdependencies

The importance of untraded interdependencies—those less formalized interconnections between firms in a particular industrial district—have long been considered important by economic geographers. This subsection looks at four different untraded interdependencies at play in the New Brunswick ICT startup scene: the urban social environment (Text Box C7), face-to-face interactions (Text Box C8), access to mentorship (Text Box C9), and finally a culture of collaboration (Text Box C10).

The urban social environment was a very strong enabling factor for entrepreneurs located in Uptown Saint John specifically, much more so than entrepreneurs based in Fredericton. The walkable, mixed-use urban setting in the Uptown was praised as being a place where spontaneous interactions with colleagues and competitors happen frequently throughout the workday, and these interactions were identified by participants as facilitating assistance, collaboration and innovation within the neighbourhood. While these characteristics are present in any sufficiently dense city, Saint John was characterized by participants as not being too large, either. In other words, the CBD has sufficient density to enable spontaneous interactions, while the overall size of the community is manageable enough that the likelihood of running into someone you know is not significantly dampened by the sheer volume of strangers present in a very large city like Toronto. Despite the reported benefits of being located in the Uptown area,

participants also expressed concern that the productive social environment is threatened by the prevalence of suburban and exurban commuting among ICT workers, which is viewed as transforming much of the Uptown into a community whose vibrancy only exists from 9-5.

Two other important untraded interdependencies identified by participants were face-to-face (F2F) interaction and access to mentorship. F2F contact is crucial for many startups to build trust, both between the firm and customers, and among the members of a firm's team. As described in the previous subsection, once trust is established, more remote work models become easier to sustain. F2F is also very important as startup founders try to raise venture capital, so much so that startup entrepreneurs will

the importance of F2F is likely part of the reason why participants identified air travel infrastructure in the province as a major challenge. Ease of access to leadership and mentors within the New Brunswick startup scene is another major strength identified by participants: indeed, mentorship and leadership was a common thread that ran throughout all of the interviews, particularly when it comes to the depth of collaboration and sense of community reported by participants.

The final and most brought up untraded interdependency is this very sense of community that is present in the province's tech startup scene. Every single participant identified the collaborative ecosystem within the community as a primary advantage of starting an ICT company in New Brunswick, describing its social and professional networks as "influential, far-reaching, generous, optimistic [and] supportive." A genuine desire to help one another—one described by participants as lacking in larger centres, was almost universally reported as present in the province's startup community, and is clearly seen by interviewees as one of the largest

differentiating factors of the local ecosystem, and one that they consider to be fledgling and/or superficial even in Silicon Valley. On the other hand, there is also evidence that some entrepreneurs and firms are being left out of this tight-knit community, and that the ecosystem's strengths in collaboration may eventually be threatened by its continued growth.

6.4: Development Dynamics and Path Dependency

This section on path dependency can be best summed up by a point made by Storper and Scott (2009), who said that any case study looking at the success or failure of a particular industry in a particular place "needs to be treated with all due respect to its historical, geographical and sectoral specificity" (164). To that end, the interview results reported here all in some way get at the broader arc of economic development in New Brunswick—not just in ICT, but across the whole spectrum of overlapping industrial transitions. Although this section only provides a brief analysis of this theme, the key quotes below suggest that path dependency provides very fertile ground for more detailed research. Four sub-themes are touched on: the NBTel legacy (Text Box C11), development dynamics from 2003 to the present (Text Box C12), the Maritime and Canadian context (Text Box C13) and perceptions of the New Brunswick ICT industry, both external and internal (Text Box C14).

6.4.1: The NBTel Legacy:

A key interview finding, from entrepreneur participants who were both inside and outside of NBTel in the mid-1990s, is that the legacy of the utility's activities during that era continue to bear fruit today, almost a decade and a half after it was merged into Aliant. Interviewees mentioned NBTel's early adoption of fibre optic infrastructure as a major precursor to the high quality of broadband service enjoyed in the region today, as well as its nurturing of many

innovative spinoff companies sowing the seeds of an entrepreneurial culture in the province's ICT sector. Indeed, key NBTel alumni are credited with founding the first round of new tech startups in the post-Aliant era, and the composition of this study's interview sample indicates that many of them are continuing to found new startups even today.

6.4.2: Development Dynamics Since 2003

Davis and Schaefer's 2003 study of the New Brunswick ICT industry ended on an ambivalent note: on the one hand, Aliant's R&D and startup incubation capacity in the Maritimes was quickly disappearing, but on the other hand, they also observed the grassroots ICT community beginning to fill in the gap. The intervening decade has seen their more optimistic speculations about the future of the sector largely realized: the startup scene in New Brunswick is extremely active today. Figure 6.1 presents a brief timeline of the sector's development since the mid-1990s, filling in the intervening decades with information gained from this study's interviews.

Four important developments have occurred since Davis and Schaefer's study was published 11 years ago: subsequent generations of startups were founded with some major success stories; talent continued to recycle into new startups; a support network of incubators, accelerators and mentors was developed; and attitudes toward entrepreneurial risk began to shift.

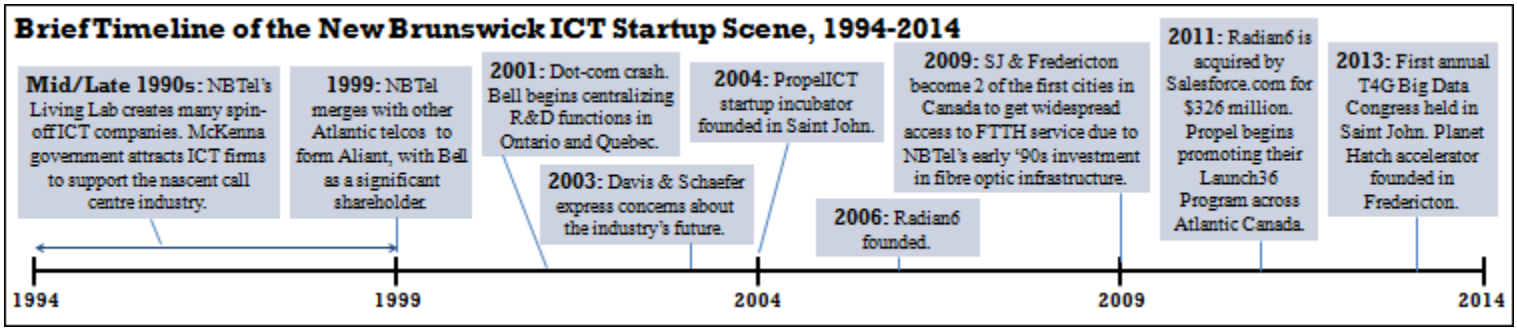


Figure 6.1: Brief timeline of the New Brunswick ICT Startup Scene, 1994-2004. *Sources: Davis & Sshaefer (2003); Interviewees.*

Concurrent to the founding of new startups, several key individuals who had been involved with NBTel also began to create new entrepreneurial support infrastructure to replace the now defunct Living Lab. The PropelICT startup accelerator was founded in Saint John in 2004, and has since played an important role in mentoring and incubating many New Brunswick startups, including Radian6. Propel has since expanded its programs to include all of Atlantic Canada, and Planet Hatch, a Fredericton-based accelerator, joined the ecosystem in late 2013. Finally, over the intervening decade since Davis and Schaefer's study, a shift in attitudes toward entrepreneurial risk has gradually taken place in both New Brunswick and Canada: interviewees report there is a heightened willingness to try new ideas, and a growing understanding "that it's OK to fail".

In short, the ICT startup community in New Brunswick has gone from a period of great uncertainty in the early 2000s, to an extremely optimistic period today. Indeed, all interview participants expressed confidence that the region presently has the people and the tools—and increasingly, the capital—to continue producing high-growth startups going forward. It will be interesting to observe how successfully the ecosystem is able to adapt over the next ten years.

6.4.3: Deeper Path Dependency, Perceptions and the Fate of New Brunswick

The final two text boxes in Appendix C present interviewees' thoughts on the deeper trajectory of the New Brunswick economy, as well as the attitudes and perceptions embedded in the Maritimes that have influenced its path and may continue to do so into the future. While space constraints rule out a detailed treatment in this work, the quotes therein weave a complex narrative of a region that is both constrained and liberated by its own history. The New Brunswick ICT industry has been a beneficiary of parts of this narrative—but is threatened by others: this framework holds great potential for future qualitative work on industrial districts.

6.5: Discussion

Through the complimentary theoretical lenses of 'hard' factors, 'soft' factors and underlying path dependency, a complex picture of the New Brunswick ICT startup community may be described. The results presented in this chapter demonstrate that while there are a number of significant challenges to starting and sustaining an ICT business in small, peripheral places such as New Brunswick, there are also a wide variety of advantages to doing so, ranging from employee retention to affordable rents to manageable urbanity to rich networks of collaboration, mentorship and mutual support. Indeed, while interview participants pointed out that the internet is making location less important for ICT startups, their responses also suggest that *place* remains a vital part of the equation and can confer major advantages. The advantage side of the coin in places like New Brunswick, unfortunately, often missed by prevailing theories of industrial agglomerations that privilege the economic core, and this restricts these theories' utility in explaining economic dynamics in contexts outside of the few ultra-high-profile case studies that are habitually reported in the economic geography literature.

The question of an industrial district typology for the New Brunswick ICT industry as a whole may not ultimately be answerable in this study, and perhaps has no single answer at all. For the province's startup scene, the formalized transactional and knowledge flows to and from locations outside of the region, coupled with a high degree of untraded interdependencies present within the region, suggest that the 'Local Buzz and Global Pipelines' model is the most applicable fit to what is happening in that sub-sector of the industry. However, the very different firm typologies in other sub-sectors, as well as previous empirical work in Moncton by Bourgeois, imply that this model is likely not as valid outside of the startup ecosystem. More research across a wider swath of the industry will be required before this question can be definitively addressed.

Several open questions remain pertaining to the sense of community reported by interview participants in the New Brunswick ICT startup scene. Who is included, and who is excluded? Is the community sustainable in the long run? How will it respond to the next 10 years of growth and change in the global ICT industry? These are enormous questions with no easy answers, but the theoretical lens of path dependency, and its influence on key 'hard' and 'soft' factors within the province, may prove useful in teasing out some possible responses.

Chapter 7 – Conclusion

In this thesis, I have attempted to contribute to the field of economic geography by highlighting the case of a tertiary-or-higher-tier regional industrial district in the economic periphery of North America that is primarily concentrated in small cities—all characteristics that tend to be under-represented in the case studies that inform the sub-discipline's theoretical foundations. The conceptual framework described in Chapter 2 has proven to be of great value in guiding the study's description and analysis of the New Brunswick ICT industry.

The ICT industry in New Brunswick is difficult to sum up in just a few words, and this is largely because it is such a heterogeneous sector: indeed, one of the key conclusions of this study is that it is probably better conceptualized as several distinct sub-sectors. A large hardware manufacturer, for example, has almost nothing in common with a small SaaS developer, which in turn is very different from the branch operation of a multinational IT consulting firm, even if all three are located next door to each other—yet they are all placed under the categorical umbrella of ICT. This is likely a partial explanation of why the definition of the ICT industry is so fluid among different studies and time periods: other than computers, telecommunications, and a few common skillsets, there is actually very little common ground among the various sub-sectors, and many non-ICT firms and organizations continue to vertically integrate their information technology-related functions, leaving a significant chunk of ICT workers out of statistics on the industry. Likewise, a significant proportion of ICT firms, particularly smaller startups marketing to a global customer base, require a great deal of non-technical skills in order to be successful. Future work should look into a more consistent way of defining the ICT industry—and if that proves impossible, the category's dismantlement and reconceptualization may need to be put up for consideration.

The sector's high degree of heterogeneity is also the primary reason why it has proven impossible in this study to assign a clear industrial district typology to the New Brunswick ICT industry as a whole: depending on where you look, there is evidence both for and against nearly all of the typologies outlined in Chapter 2. The most tenable classification appears to be Bathelt et al's 'Local Buzz and Global Pipelines' model, and that is primarily because it is much less transactions-based than the typologies proposed by Markusen. Even within this model, there is evidence of local buzz being vital to certain sub-sectors of the New Brunswick ICT industry such as the startup community; while being completely nonexistent in others, as Bourgeois found among the ICT firms he studied in Moncton. An entire second thesis could be written on the applicability of these models to clusters of industrial activity, as well as whether or not to consider more than a single industry as being embedded in the same local buzz—as there is evidence for in Uptown Saint John. Continued work in this area may even help to one day bridge the longstanding gap between the amorphous, individual-focused Floridian concept of the creative class and its major critiques along more structural lines.

When it comes to the New Brunswick ICT startup scene, a lot has changed in the decade since Davis and Schaefer completed their empirical work in New Brunswick. Starting from the foundation laid by NBTel in the 1990s, and through a period of great uncertainty in the early 2000s, the startup community showed remarkable resilience in the face of the major structural changes that were happening around them. Instead of rolling over and accepting their new position in the Canadian telecommunications sector, key alumni of the NBTel era set out to create their own niche, founding subsequent generations of ICT firms in the province and gradually building up an infrastructure of support for new entrepreneurs. Ten years later, there is plenty of evidence to suggest that the actions of both NBTel and its alumni are now generating

significant payoffs,with highly developed broadband infrastructure enabling the cultivation of local firms providing goods and services in key internet-enabled markets that are currently experiencing rapid growth, all supported by a high degree of collaboration and mentorship on the ground. The successful exits of several of these startups have not only instilled local confidence in the sector, they have also allowed founders and key development and marketing teams to take their skills and experience with them to collaborate on the next generation of startups: in other words, the recycling of local ICT talent and experience is continuing to build capacity and still more experience within the startup community—a community which is now beginning to spill across provincial borders and interact with startup communities in the rest of the Maritimes. While exits by non-local acquisition carry with them significant disadvantages and threats, the injection of money into the region with each successive sale is also producing a larger pool of venture capital that may eventually begin to address the continuing capitalization issues reported in the previous two chapters.

While optimism appears to be very high within New Brunswick's ICT startup community right now, this analysis would be incomplete without also touching on the opposite side of the coin: this study has found evidence that there are individuals and firms in New Brunswick that are not as connected to this ecosystem, and questions were raised by interview participants about the longer-term sustainability of the sector's sense of community and culture of collaboration as the pool of entrepreneurs continues to grow. What might seem like an internal contradiction in some conceptual frameworks is accommodated quite well by the approach of 'hard' factors, 'soft' factors and underlying path dependency adopted in this study. A complete treatment of this point is perhaps out of the scope of the thesis, but very briefly, the continued growth of the ICT startup community may eventually tick up several 'hard' factor advantages while undermining

some of the key 'soft' factor strengths that have contributed to the ecosystem's growth and successes so far. These underlying development dynamics can be teased out by looking more closely at the longer arc of the sector's development and at the regionally-grounded attitudes and perceptions that have both steered its past development and may continue to do so into the future. Thus, the foundational lens of path dependency may in fact hold the key to understanding, however provisionally, the changes yet to come in the New Brunswick ICT industry. Regardless of where the sector is headed next, one thing is for certain: considering the major developments and changes that have taken place over the past decade, the next chapter of the New Brunswick ICT community's story is all but guaranteed to be a fascinating one, and economic geographers would do well to be paying attention.

An undergraduate honours thesis is no place for the exhaustive development of theory: however, the basic conceptual framework proposed here appears to be adept at painting a far more nuanced and enlightening picture of place-based industrial change than the lazier and more common dichotomy of 'bigger is better'. The findings of this thesis have clearly demonstrated that there are a number of major advantages to being a small fish in addition to the more widely recognized challenges, particularly in the internet-enabled world of today's ICT industry. This point should also remind us of Martin and Sunley's key observation concerning Porterian cluster theory: that the celebrated bigger fish have their share of disadvantages, too.

On the same day that Thompson's (2014) "Why 'the Next Silicon Valley' Is Always Silicon Valley" was posted at *The Atlantic Cities*, *Pacific Standard* published an article by economic geographer Jim Russell (2014) entitled "Bright Flight From Silicon Valley". Russell's article presents some preliminary evidence suggesting that Silicon Valley, the mightiest of global ICT clusters, may be starting to become a victim of its own success. Despite its exceptional

innovative activity and the presence of numerous high-tech superstars, ballooning real estate prices in the Bay Area are beginning to drive labour out of the region in search of places with more "reasonable" costs of living—and not just skilled IT workers, but also the large numbers of low-wage, low-skill service sector employees that are vital to the continued functioning of an archetypical Floridian creative city (Storper and Scott, 2009). These developments reported by Russell are a good reminder of another key consideration that risks being missed when economic geography focuses only on today's first-tier agglomerations: the possibility of regional change and decline as well as growth.

Sixty years ago, Detroit was the superstar of Fordism and seemed unstoppable in its innovation and dominance over the global automotive industry. Thanks in part to the example of Detroit's catastrophic fall from grace, today we are well aware of just how fickle regional economic fortunes can really be. However, perhaps because it has been several decades since the crisis of Fordism reached its nadir, in recent years we seem to have forgotten to apply this awareness to the world around us. It may be true, looking casually at Silicon Valley today, that a similar collapse seems unlikely if not totally preposterous. But the thing about 'windows of locational opportunity' is that you can never be completely sure when, where or how wide the next one is going to open. Ten years from now, another detailed empirical study of the New Brunswick ICT industry will be necessary—but it is entirely possible that we will need to take another look at Silicon Valley as well. It is my greatest hope that the approaches and findings contained in this thesis will help in some small way to move the field of economic geography beyond simply reporting these great regional economic shifts, and toward the ultimate goal of being able to anticipate them.

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Appendix A: ICT Industry NAICS Definition

The following table displays the formal North American Industrial Classification System (NAICS) codes included as part of the ICT industry for the purposes of this study. The definition adopted here is identical to the industry definition employed by Campbell (2012), and the table below is taken directly from the appendices of his report.

NAICS Code:	Description:
334110 - Computer and Peripheral Equipment Manufacturing	This industry group comprises establishments primarily engaged in manufacturing computers and computer peripheral equipment.
454111 - Internet Shopping	This industry comprises establishments engaged in retailing all types of merchandise using the Internet.
511210 - Software Publishers	This industry comprises establishments primarily engaged in computer software publishing or publishing and reproduction.
517111 - Wired Telecom. Carriers	This industry comprises establishments primarily engaged in providing telecommunications and video entertainment services primarily by copper twisted pair links to the network.
517112 - Cable and Other Program Distr.	This industry comprises establishments engaged in providing telecommunications and video entertainment on networks designed for the distribution of television channels.
517210 - Wireless Telecommunications Carriers	This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry include cellular phone services, paging, wireless Internet, etc.
517410 - Satellite Telecommunications	This industry comprises establishments primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites.
517910 - Other Telecommunications	This industry comprises establishments primarily engaged in providing specialized telecommunications applications.
518210 - Data Processing, Hosting and Related Services	This industry comprises establishments primarily engaged in providing infrastructure for hosting or data processing services including web hosting, streaming services or application hosting and providing application service provisioning.
519130 - Internet Publishing and Broadcasting and Web Search Portals	This industry comprises establishments primarily engaged in 1) publishing and/or broadcasting content on the Internet exclusively or 2) operating Web sites that use a search engine to generate and maintain extensive databases of Internet addresses and content in an easily searchable format (and known as Web search portals).
541510 - Computer Systems Design and Related Services	This industry comprises establishments primarily engaged in providing expertise in the field of information technologies through one or more of the following activities: 1) custom software writing and testing; 2) planning and designing computer systems that integrate computer hardware, software, and communication technologies; 3) on-site management and operation of clients' computer systems and/or data processing facilities; and 4) other professional and technical computer-related advice and services.
611420 - Computer Training	This industry comprises establishments primarily engaged in conducting computer training (except computer repair), such as computer programming, software packages, computerized business systems, computer electronics technology, computer operations, and local area network management.

Appendix B: Example ICT Entrepreneur Interview Schedule

1. Please briefly describe your career trajectory from around the mid-1990s to today.

2. What is the primary activity or activities of your firm?

3. How many people are employed at your firm, including full-time, part-time and contract work?

4. What is the educational background or skill set that you require from your employees?

5. How challenging is it to recruit employees with the right set of skills?

6. Where are your customers located? What are your most important or lucrative markets?

7. Does this firm have any suppliers of inputs into its production? If so, where are those suppliers located?

8. What sorts of knowledge inputs does your business require? Do the most important of these originate locally, nationally or internationally?

9. What made you locate your office in this particular neighbourhood of the city?

10. Why did you choose to locate in New Brunswick in the first place?

11. What enables you to continue operating here, both locally and regionally?

12. What are the biggest challenges your business faces?

13. How do you think the New Brunswick ICT industry has changed over the past 5-10 years?

14. What are the biggest strengths, weaknesses, opportunities and threats you see for the New Brunswick ICT industry going forward?

Appendix C: Key Interview Quotes

Use of contract employees:

"We have seven [employees] in total, and when we're going through a development phase, it goes to go up to as high as 18. We don't like to keep a full complement staff for development because typically developers all run on a project basis. And when you're in a small community such as this, you are in an environment that you share your resources."

Location of suppliers:

"Just wherever they are. We've got a partner company in Toronto that we do a lot with. They provide some services for us, to our clients. But like the web developers and the marketers, they're all here. The people that help do copyright, do graphic design, they're in the next building over. A couple people work out of their homes, but they're uptown all the time. Those people need to be nearby. "

"So, great example. I use a local company... for hosting. Great company.... They're ideally located here for our services... You know how we've located ourselves, when it comes to anything for IT services, the only thing we do not get locally is our phone service... We basically use an IP phone set which was provided from out west; it's the most cost effective. That's really about it. All of our services, all of our goods, are gotten right here, except for our phone. We like to feed our own."

"We do have one big supplier in Norway. We have some contract people that are more local. We do have one special advisor out of Toronto, and I think that's it for now."

"We don't have any supply chain, like as a software company. We rely on some open-source technologies that are readily available, but all of our software product is really our own handiwork. So we don't really have any supply chain."

"Well, in terms of software and to some extent hardware, but more so software, the largest purveyor of software in the world is the United States, and the largest region in the United States is Silicon Valley. So our connections are automatic to companies there. The other one of course are the hubs of IT development, innovation which occur in Canada, fortunately. We have the Waterloo area, the Ottawa-Kanata area, Calgary area, Vancouver. Waterloo obviously being one of the hot spots, although recent news will tell you that they're going to take a bit of a hit... A lot of the actual assembly is done offshore, but most of the design and architecture, even for the hardware, is still done in the United States. We're less connected to Europe... but we do have connections, mainly into the UK." –Gerry Pond

Location of markets:

"[Our markets] need to be international. So we've done a pretty good job here in Saint John. We've really validated our approach."

"Export. And that's something that's a pretty simple thing. It's that I cannot support a business, my kind of business, local or regional, because there's not a critical mass. So I'm developing the idea that the product servicing will have to have a global appeal... I have customers in New Brunswick and Nova Scotia and in PEI, but the bulk of my customers are in large centers. And I don't even have to be there because of the way my business runs."

"I would say that as of now it's about 50 percent national and 50 percent United States and Europe."

"[Our markets are] primarily US... And then in second place would probably be international English markets after that. And then international markets and Canadian markets after that point. And the local is not necessarily a market.... It's more a global basis from the start. You go where the customers are: the customers are in the cloud, we're in the cloud. It doesn't matter where you're located."

"U.S. market is our primary target right now. And we are looking at expanding to Western Europe, so U.K.. countries like–Germany, Switzerland, Austria, Czech Republic. And then probably later this year we'll be expanding to Australia, New Zealand, and some key countries in AsiaPAC... [We have] a handful of accounts in Toronto and Montreal."

"Mostly international. These are companies focused on growth and you won't grow in the Maritimes, and you won't even grow in Canada to be a $100 million company. So they were companies that were founded to be $100 million or more companies; that was the idea. So we were by default in an international market." –Gerry Pond

Knowledge inputs:

"Knowledge inputs? They come from my customers. If my business isn't paying attention to customers, we're dead in the water. Because they're going to tell you what your innovation needs to be. If you want to learn where you need to go, you listen to your customers. They'll tell you. They can't articulate it to you, but they know."

"Well, it's a combination... when you have an early-stage company, you really kind of break it down into maybe three areas. One is the gap that you see in the marketplace as a team. So it's your experience of being able to see that gap and see what you possibly could create and that could satisfy need. And you do that constantly, you're constantly trying to understand that need better and better. Once you start getting customers, or beta customers, or actual customers or whatever, then you start listening to what customers are saying, and it starts to be given a higher weight because they're actually using the product, and giving you flat-on feedback because they're saying 'I need this to do this' or 'this is missing.' And that's really good because you're now finding ways that you can further focus it on the marketplace. And then finally, it's what's technically possible... your roadmap is always going to have probably ten times more stuff on it than you can actually accomplish. It's always this long list. So, if there's some stuff that's technically easier, it's kind of like ROI [return on investment], if we can get it done pretty fast, and I can tack it onto something else while we're doing something else the customer wants, then I'm going to do that. So that input would come locally, from the technology guys, the leadership which describes the other thing, and the customer's input would be from the locale wherever our customer is."

"I guess further afield. Open-source technologies are one, but then there are some, we'll just take the main experts that are readily available in open-source communities. So, if we needed some very specific knowledge around the use of an open-source library or technology, most of them have a fairly active community willing to help and they could be anywhere in the world. That's part of the beauty of open-source."

Collaboration with universities:

"...we did a collaboration project [with UNB]. We had 2 Masters students in Computer Science doing a four-month work term with us. We gave them a fairly interesting and challenging problem that we were faced with, to go away and research and find some solutions for. So that was very important. The University benefitted from it, so did their students, grabbed some real-life experience from it working with us at our office for four months. We've also used co-ops, undergraduate CS students come in for a sort of junior development roles, for QA automation roles. So it's been great because it gives us an opportunity to preview talent before we may extend an offer for full-time employment or continue with summer employment outside the co-op program."

Text Box C1: Key interview quotes: basic information.

Labour pool – skills required:

"In this day and age, people can be on the Internet, they'll look at Wikipedia or at YouTube, and they may hack something together. And the two things that I can't get that I search for is, number one: critical thinking... If they're not critical thinkers, they'll do things to spec, but they don't think about the end product... The next part of what I want to have around are people who understand failure. And that's a huge problem... if you understand failure it means that you're willing to try... it may be failure but you know that you've got a learning experience... it doesn't matter if you're a front line employee or a developer, those are the two most critical components for success in my books.... Above and beyond the type of [technical] skills. There's a lot of self-learners out there in terms of that. I look at the percentage of developers that we use and some of the staff developers are classically trained, in university. It's about a 50-50 split."

"I think that all of [our employees] have university degrees. It tends to be a Bachelor, a Master, and one PhD here... both Computer Science and Business."

"... the employees that we have, they generally fall into two pockets, from previous experience. Most of our developers... come from a previous startup... which the two founders had... they worked together before, they trust one another, they know their skillsets. We have a number of co-op students that we brought on as well... In terms of the sales and marketing and even user-interface design... customer set-up, all of those folks come from [another startup]. I think there's probably to a dozen or so, yeah about a dozen folks from that side... their backgrounds are more the marketing background –tech marketing, tech sales, customer service, that kind of thing. I mean, we've all come with startup experience for the most part except for the co-op students."

"Undergraduate degree in Computer Sciences is desirable. We have a couple members of our staff that have yet to finish their Computer Science degree, and they're taking it part-time because they view real-life work experience to be more valuable than academic. So, but undergraduate in Computer Sciences is sort of our preferred criteria."

Labour pool – recruitment challenges:

"Really hard in some areas. It's really hard to find good web developers around here. I found a couple, but the talent pool is really shallow... Obviously, I can't say I have a hard time now because I've got them there and I like the guys there that are helping us. But finding them was not easy. And one of the problems I have is they're so busy now because they're good... they're busy all the time. They have less and less time for me and my work."

"If I go by the set of skills I'm looking for, I have some difficulties. It's been difficult in this area mostly because of the fact that if they happen to be part of some of the larger corporations... where you're not so much the hub of the wheel, you're a spoke in the wheel. So the way that you interact is very different.... first of all, they're not used to the entrepreneurial environment... And even if they [are more accustomed to] that that risk type of environment, the other challenge they have is how to fulfill their personal needs and benefits, security etc."

"I don't know, it's not too bad because we're lucky enough to be located in Fredericton where two big tech companies are actually laying off a lot of qualified people (chuckle)... So, we grabbed a lot of people from Radian6 and also a lot of people from Blackberry. So, so far so good for us from a hiring perspective."

"It hasn't been challenging for us only because we're a very small organization... Our hiring plan this year... we'll see some growth spurts. We don't anticipate any challenges only because we'll remain a small- to medium-sized firm. I don't want to put any numbers on it, but we think that the labour pool and talent availability will meet our needs in the Fredericton region."

"Some folks talk about talent and talent acquisition and retention –it hasn't been a problem for me at my company, and even prior to that in my last startup, so that generally isn't an issue."

"Well on a global basis there is a shortage of IT skills as there is a shortage of electrical engineers... and the reason... is that it's a growth industry. So it's kind of good news - bad news. The good news is it's a growth industry. The bad news is there's a shortage. But if you look at what causes a shortage that's a good kind of problem to have if I can say it that way." –Gerry Pond

Text Box C2: Key interview quotes: labour pool and recruitment challenges.

Geographic considerations:

"We have a... geographically clustered sector here [in Saint John] which is a huge advantage. If you go to Moncton or Fredericton, if you're going to visit an IT company it could be in any of their industrial parks, it could be in someone's basement. In this city, we're all uptown. Within three blocks of where we're sitting there's over 30 IT companies. That doesn't happen in most cities. We have what other cities wished they had. Cities like Boston and San Francisco are trying to create what we have which is a cluster in the center of the city of companies that all complement each other. And we've already got that. That's a huge advantage..... It's a walkable city. All the different layers that a business needs to grow are all in the same area. So it's not just the ICT companies that are here. My lawyer's a block away this way, and my accountant's a block away that way. Every mentor that I've drawn for help is within two blocks of where I'm sitting right now. All of my resources in the entire realm of what my company needs is all in this neighbourhood. And that's a huge advantage."

"...if I look at Fredericton and their influence by the University of New Brunswick, and a model around the campus and the Knowledge Park, so you have a tendency for the startups to be connected to the university community which would include the locale called the Knowledge Park. There are some startups as you know in downtown Fredericton where there's some reasonably priced real estate because that tends to be also a driver is fairly low cost real estate - rent that's close to amenities such as banking, obviously restaurants and hotels –things that are important to a business of any type, but in particular to a startup. You don't have to drive to your bank because you're going to have to do some banking. You don't have to drive to go see your lawyer or accountant. Cross-town kind of this, a half hour, is a waste of time. So Uptown Saint John provided a convenient location for amenities and for reasonably low cost housing or office space. And I think in Moncton you'll see the community's a bit more distributed." –Gerry Pond

Other enabling factors:

"We have really great technologies. We've got amazing engineers. We've got a wealth of telecom experts. So the things that enable the Internet, the things that enable ICT, those skillsets, we have in abundance here."

"It's not an expensive city to be in. And the Internet, our FibreOp, honestly, is a big factor.... Basically, if you want to know the benefits just look at the benefits of cloud computing and what that does for a business, the flexibility and the freedom that it gives you is what we have because of that high speed connection. Because I've used cloud based services on slow connections and it's just not the same thing. "

"There is far more appetite to try.... that attitude has been coming, more and more. And even more importantly, there are organizations that are there to help. So Propel is one accelerator program. I remember coming back in 2006 when it just began, I thought 'this is nice'.... And you have access to mentorship, you have access to guidance. Whereas there was nothing really formal with that before. So now we have some of this underlying infrastructure and guidance that you can go to, it's significantly changed attitudes towards entrepreneurship."

"I think probably right now we have a lot of expertise in the SaaS model [Software as a Service]... We have an infrastructure for it. We have technical expertise. I think it's a beautiful way to bring huge amounts of export dollars to this province at very low cost. For customers it's a huge opportunity. And probably the biggest thing of all is that with the SaaS companies that have been talked about, some of them are just starting out, is big data Huge, huge, huge, huge opportunity in big data. It's just mind- boggling. And what's really cool about this is that a lot of the expertise here, that they realize that it's not [just], that big data's important. But if we all realize, at least in this region, that it's not the answer that matters, it's the questions. What do you want to know? What do you think we need to know? We've got the data, so what's your question. Having the expertise and people who understand that means that how they deal with the customers and look at the customers is a little different. It really changes the competitive landscape. It's a great big opportunity."

"Well, first one is, with me being here when I got my idea, so that was probably step one. But also there was available angel investment money, of the right kind and the right amount."

"...we've got a lot of incubators and people creating some amazing stuff between Planet Hatch and the Launch36, the Propel folks, everything. And there's just a lot of really great assistance that I'd say. Even

Other enabling factors (continued):

government programs as well that are available – probably too many to mention –but there's quite a few that are available that really help startups keep costs down. And they try to attract people and hire them earlier than they would. And that helps you build a company faster and give you a great competitive advantage."

"[We] are connected through a redundant fiber [optic] backbone from both Aliant and Rogers. That backbone then goes down through Nova Scotia to and connects to the… main [subsea cable] link between Europe and North America. So we have a whole bunch of bandwidth going overseas that lands in Belfast, and we have all kinds of bandwidth going to New York. So a lot of the fibre is still available on that which means that our latency in terms of our connectivity, I can still run everything out of Saint John and the lag, because we have real-time applications, we're talking maybe at the maximum latency, 300 milliseconds, that's the maximum latency."

"The labour market is sizable enough and talented to meet the needs of the startups that I've done... There are some cost advantages, but the real reason is there aren't any issues of retention. So, if you do a good job of hiring the right staff I don't stay up at night worrying who's a flight risk, and you see that in some hotter markets, like particularly in Silicon Valley where folks will leave at two weeks' notice for other hundred-thousand options. So that's the real reason, is labour market, the stability and predictability, and as an employer, that's really fundamental. It has to be cost-effective and there are some cost advantages but they're relatively minor compared to the first."

"...it's easier to start now; you don't need the same level of capital to get started. It's much more of a— if you can cover your payroll and have a little bit for your base services, you can always build your own data centre, buy servers and things like that. So, the friction of getting into it and the cost of getting into a startup are greatly reduced."

"People. Money. People capital. International sales and marketing would be third on my wish list. And obviously a steady supply of mentors who have the t-shirt, that have done it. They can be moved in and out, they don't have to live here to be mentors. It's probably better that they live in this region but you can get at some of that stuff in a remote model way. Even capital is a remote model to some extent. It doesn't have to have its head office here. Probably never will." –Gerry Pond

Text Box C3: Key interview quotes: enabling 'hard' factors.

Small local market:

"It's a small market. There's not a whole lot of room for mistakes, but that's kind of a good thing too, it teaches us how to be good.... I think that being small... it is a disadvantage in one sense: there's no big market. Like in Vancouver I could piss off a client and it wouldn't have any impact on me because it's too big of the city for it to have one. It probably may have an impact now because of social media, because that client can now review you. (laugh) Before social media it would be easy to find new clients and to grow in a place like that, but in a place like this you just have to be good or else you don't go anywhere. So I don't know if it's an advantage or disadvantage."

"The weaknesses are that people usually think very small, they tend to focus on the local market which is, which is a very, very small market obviously, just because of the size of the population. So, people tend to feel more comfortable trying to sell in New Brunswick or in Atlantic Canada, and for most businesses that just isn't a big enough market to be able to make money."

"Access to expertise is always a challenge, although as I said before [that for my company it] hasn't been so far a too much of a problem, but generally speaking, access to very high-level expertise in narrow fields can be a problem."

Capitalization:

"In this region, capitalization. You know, typically when it comes to VC [venture capital] or large investors, typically when you start looking at the data, you see that VCs very rarely venture any further than where their electric car's going to take them. So then in Waltham [Route 128, Massachusetts], you'll see most of their investments are probably within a 120-200 kilometre range, Silicon Valley, etc.... So the biggest challenge is getting a change in mindset in terms of these large entities, where they're going to pour their capitalization into... And this is why you're seeing [home-grown VC firms] in the Maritimes: East Valley Ventures is one of them... and now you have the Maritime Fund that's coming together—15, 20 million, whatever it is now. Because there's a realization that it's so difficult to get the required capital to [fund] these companies. "

"...when you do get that capital, when you get this growth and you're doing amazingly well, is that there's the exit strategy. And what's the exit strategy? In today's day and age it sure as hell isn't an IPO. That isn't going to happen. Well I shouldn't say that isn't going to happen, it's hard to happen. The next logical choice is you're going to be acquired. And who's going to acquire you? Someone who's hugely capitalized, and is definitely not in the Maritimes. The perfect example is Radian6. The company buys them up, they'll absorb the IP, integrate it in their machine, but there's no need to continue in New Brunswick. So what happens? We lose the core competency, they're gone, they've sold it off. Whereas if we have the type of capitalization that would allow us to stay here and grow, you could actually accelerate industry, the IT industry. This is a huge problem."

"[I think would be healthier if there were more sources of initial seed capital], let's call it the first $60,000 investment. The angel [investors] tend to want to chip in more for, let's say after he's got $100,000 or $200,000. But there are not many who are willing to write that first cheque."

"I think the access to capital –it's certainly getting a lot better. I think that's another strength –we do have access to capital here, but it's probably not to the same degree as you would in, let's say, Boston, New York, San Francisco. But it's certainly improving –that's on the positive side, it's improving."

"This time around... financing and capital is a little easier having done an exit—my prior startup it was a challenge... to raise financing and funding. We were looking at doing a small seed round... we weren't able to close around a financing with anybody, which was fine. We were quite happy to bootstrap. And it worked out better for us because our exit meant that we kept all our proceeds internally to the founders and employees. So in the end it worked out, but I would say that startups continue to struggle with that early-stage funding component, so the first half million to get started—it's always a challenge to raise that."

"I think there are some opportunities... for some of the normal venture angel funding agencies to really start to look at how to come in a little earlier on some of the early-stage investment opportunities."

"Weaknesses, I think, I guess early-stage funding and removing or reducing the effort to get access to that. I think that's symptomatic of any region really, but it's particularly the Maritime region, and even Canada in general we tend to be a risk-aversive society, so I think that's always going to be there. But to the extent that we can find folks that are willing to take risk with an investment, that's something we need to work on."

Training and academia:

"Universities don't understand failure, they never talk about failure. They never talk about failure all through school, they push through grades now... So when you finally do fail, it's devastating."

"...educational institutions are not keeping up. Absolutely not keeping up... [on] all fronts [both training and R&D]. I'm sure I'd have some pretty hot arguments with them at UNB, but I'll wrestle them to the ground because you can't change fast enough.... The way the market forces work today the way change happens has accelerated so much year over year, that we don't see that same thing happening. I remember walking into an MBA class, it was a year and a half ago, and said 'how many of you with an MBA, how many of you use social media?' 50%, OK. Of that 50%: 'How many of you use Facebook?' Pretty much all of them. 'How many use Twitter?' Two. 'How many of you use Linkedin?' Three. And I said to them, I said 'If you came to interview with me, and you weren't fully engaged in social media, I would escort you out the door.' Because I don't own in my brand; my customers own my brand. So if you don't understand how social media works, then you could end up destroying my brand. Why is that not taught? A lot of classical teaching in terms of how things are taught is very valuable, but it doesn't keep in time with change in the marketplace and doing business. So it's a huge weakness for me. Community colleges are catching up more quickly, they seem to have the ability to react more quickly, but still it's reactionary; it's not being proactive"

"We don't have enough kids going into technology; taking computer programming and stuff.... we need more of that. And we need to raise awareness of that for other kids to follow along and to be entrepreneurs.... it's certainly something that I think has become a high priority for people to focus on."

I think there are some opportunities for better collaboration with academia, not... for the sake of technical research but I think where you will have some entrepreneurs that are sitting in a CS class going through the motions and I think there's an opportunity to allow them to do their own work term that's funded rather than going to work for, let's say, the power utility or the telecom company managing exchange service. So there's some opportunities to find the next entrepreneur who may be sitting in that third-year computer science or engineering class."

"So the industry generally has... a pretty poor track record of training people. So that's a culprit here in creating a shortage. Not a shortage of people, a shortage of people with skills in new languages, whether it's HTML, Python, or whatever it might be. It's not a shortage of people really, it's a shortage of trained people and the industry does a very poor job of investing in training. So that being said, is that a good company, a company that's got a good product, a good reputation, a good training program, a good people-oriented program, will never have problems getting good people because there are so many mediocre companies in this business... And one thing about us in the Maritimes is I think we still have a very strong desire to be high quality providers of our services which means we're demanding a lot more quality, and that tends to allow us to continue to attract people."
–Gerry Pond

Air travel infrastructure:

"Travel! No matter how many floppy articles they write in the Telegraph-Journal, our airport sucks. I should be able to get to Boston several times a day in an hour and a half, same with Toronto. If I can do that, that would be a huge thing.... This is something that people don't talk about enough. If we're going to be connected to the world, we have to have better travel options. And Moncton got it, that's why I think Moncton's been able to grow faster than the other two cities because they've got it."

"...to sell in the United States is a lot of jumping on planes and it's really hard to get there, especially when you have crazy polar vortexes and all that kind of junk that just makes life miserable to try to get here. So travelling is tough."

Coordination of government programs:

"Generally speaking the public sector should be more, well, better coordinated between most of the initiatives and the programs that we have available for startups. Each of those programs usually comes with its own red tape and that tends to change from one program to the next so, I would really welcome a one kiosk kind of approach to support the tech sector from a government perspective.... Maybe that's one opportunity that can be tackled."

Text Box C4: Key interview quotes: challenging 'hard' factors.

"I'm not a geek, but this is one of the problems with the IT industry, the world thinks that the IT industry are geeks. The IT industry is... a business. It's full of technically-minded people, and then you go back to the business side which actually sells the product... you hear it everywhere but you hear it a lot in New Brunswick where they say 'we don't need to worry about marketing our product because it's so unique it will sell itself.' I think New Brunswick has a bad reputation over the years with poor marketers."

"...in order for an IT company to make it, in the first phase of a company's startup phase, you have to give all your attention to the product that you're building, the technology that you're building.... So 90% of your resources go toward technical resources: coders, programmers, user interface designers, whatever the skill is. And about 10% of your company goes towards business stuff, maybe 20%.... But then what happens is you get to a point where the company needs to flip, and it needs to be 90% business-marketing engine, 10% technology.... And that's where our tech companies are missing the boat, traditionally, in the past we have. And they still are in some cases but I think in recent years were getting a lot better at it."

"One of the biggest challenges in my world is that in what I do customers don't know what they need and I have to educate them about the field. So if you need to do your taxes, you know an accountant will do your taxes, you know generally how much an account will cost, like it's a product that we all have an expectation of. Or you need new shoes to walk to work, you generally know where to buy shoes and how much they should cost. No one's going to pay $1000 for a pair of running shoes because we all know running shoe should be between one hundred and two hundred dollars. But no one has that sense around our industry, so we've had to educate them."

"So in the early days of any startup it's really about making the market. It's about making sure that people start thinking that this is something that we want to approach, and it's important for them to look at it. And you have to create a bit of a movement around that so it becomes a priority, and that takes time... you have to gradually make the market. You'd love to be able to collect the figures to make it overnight, but you can't unless you've got forces behind you, external, that are pushing it. In the Radian6 case they were lucky because everyone was talking about social media, so as long as they got the surfboard up on the wave, and stayed up there, they were able to ride that wave a bit. In our case there is some discussion around [our category], but it's certainly not the same as social media was for Radian6. So it's a bit of like you have to create your own wave, and you have to manoeuvre your way to the top of the wave. And every company would be in the same boat."

"I think it really just comes down to go-to-market, and really trying to get brands' presence, edgy, relevant, and top of mind in key vertical. So we sell to Fortune 500, so the big airlines, banks, insurance companies, telcos, etc. So, it drives a small company. It has nothing to do with location; you would have the same problem if you were in New York or in Menlo Park, California. Being small has a perceived risk in the Fortune 500 community, and so our go-to-market is always challenged by finding those who are willing to take a risk on an early-stage company. So that's our number one challenge, and it has nothing to do with geographic location, I think every startup faces that. We've chosen to offset that perceived risk by an indirect go-to-market strategy so the majority of our sales are done through partners and that helps our credibility, and it's a little bit more time-efficient to convince my partner to take a risk when that opens up a Pandora's Box of accounts that they already have relationships with. It makes that process that much easier."

Text Box C5: Key interview quotes: marketing and startups.

Why participants moved to New Brunswick:

"And this was my ex-wife's hometown, we came here together and this is why I came to Saint John... I was from Nova Scotia, but I didn't want to go to Halifax, nothing appealed to me about Halifax. Halifax was as expensive as Vancouver but it didn't have any of the benefits. The only neighbourhood you could afford to live in was the suburbs, and I always felt that if I could only live in the suburbs then it doesn't matter what city I'm in."

"I moved back here... as a choice for family, and the fact that both my wife and I were working virtually, we could work anywhere.... So coming back here was very easy. What I was unaware of when I got back... is how vibrant the ICT industry is here."

"So coming back here is not– I never came back here saying to myself 'it's going to be tough back there. I don't know what I'm going to do.' I came here saying 'I can't wait to see what I'm going to do when I get here.'"

"Ah, well by marrying a New Brunswick girl probably did it."

Dispersed location of employees & telecommuting:

"We have an office in Fredericton... we have an office actually in Halifax as well... some of the guys use it full-time.... And... we have people spread out, we have probably six people in Saint John who all work from home. And then we have people in the U.S. as well..... on the exec team, I'm the only guy living in New Brunswick, and I'm not even at the office per se, in Fredericton. So, it's a very virtual company. It comes down to where is the talent, where are you living now, and then where you can find the talent to grow, and where is the environment best to grow that. So what we discovered... is that there's this great technical talent pool that exists... [the other founders] personally knew those people they happened to be living in Fredericton right, because they worked with them before. So they were like 'well we know we can get the team, and that we know we can build a great company with these guys because we've done it before.' And I said the same thing basically on [my] side... I know that they can accomplish great things. And it's like wherever they are living we're I not going to ask them to move. So really... nobody's moved anywhere. Everyone just stays where they are. If you happen to live in New Brunswick, you live in New Brunswick. And wherever you are, in some cases people travel to Fredericton once or twice a week if it involves an immediate need to be in front of the team, the technical team. But if you don't need to be, you don't necessarily travel there. You can just work from home. And we use so many virtual tools like Skype... [Google] Hangouts... texting and email, you don't necessarily need to be in the same physical space."

Amenities - Floridian growth theory:

"We also have very unique architectural gems [in Uptown Saint John] that our industry is drawn to. When they do persona profiles on the ICT sector, ICT employees are drawn to authentic things. They don't like the Disneyland version of things, they like the authentic real things. And so the history and the architecture of this place would be generally appealing to ICT people. We don't have the broader options for spending wealth here that they would like, though. (chuckle) You can't rent a Ferrari for a weekend here."

"You actually can begin to attract people back to Saint John... I talk about this... the quality of life here and the cost of living, all of those components would make it very appealing to be here. And today's technology, in today's day and age, it doesn't matter where you live. What matters is the kind of work that's fulfilling and that you're engaged in your work. So I'm bringing some people in, it's pretty cool to show them the city... coming here, being here, is a different lifestyle than what there is elsewhere... there's nothing better than having some visitors from Toronto or Ottawa. When they get here they have a full-out day, and then we say let's go for a sail, and 5 minutes later we're on the Kennebecasis [River]. You don't do that in Toronto. You don't do that in Montreal. You don't do that in Ottawa. You don't do it. So there's a different perspective."

"[We chose our office location for] basically the easy access to restaurants and bars (chuckle)… It's as simple as that –the staff likes to... go out for lunch and stuff like that, so that is essentially why we're here... [It helps us to] recruit and retain, I guess."

"Well, I think this is one of the top places in terms of the total balance if you will, the work-life balance, just call it the balance. I think the physical attributes, the natural geography attributes of the region, along with the attributes that our society has - some people call it laid back, I could call it civilized and say it's a civilized society." –Gerry Pond

Text Box C6: Key interview quotes: personal location decisions.

"We have these serendipitous meetings that other places try and manufacture, they just naturally happen here. I can't even tell you... how many days I've come to work and I've got a list of things to do and among them I have to talk to these five people... and I'll see those people at the coffee shop and at lunch... I just see them walking down the street or waiting in line for coffee, and we talk, we have the conversation we need to have and I don't even have to pick up the phone and call them – we just run into each other. And that is really rare, that is a really special thing. You know, when I lived in Vancouver and Toronto you never run into anyone ever for any reason at any time. You never run into anyone you know, period.... if you leave the [office] in Toronto and go to a restaurant, you're never going to see someone you know. Almost never. But here it's like two thirds of the restaurant, you know them. So it's kind of neat, it makes business really easy to do here. That's a real strength here."

"I'll say this is the only campus in the Maritimes that I'm aware of that doesn't sit in a knowledge park. And there's big, big, big benefit. When you look uptown and you realize, I think there's 35 in a five block radius, IT companies. When I go out for a coffee, I meet all kinds of people. I meet developers and other people and you start having conversations. And the conversations turn into collaborations in the moment. It's a unique environment – I've been in Ottawa, I've been all over the place – in that it's a very collaborative environment, particularly – I know in Saint John particularly. If I have an issue, if I have a cash flow issue in my business, I can call up another CEO anywhere uptown here, and say 'George, you will not believe the friggin' problem I have,' and I'll explain it to him and he'll go 'Ah, well you could talk to George down the street here, give him a call and tell him I told you to call.' I call him, we talk about the issue, in spades! Again it comes back to this philosophy where it's not just me against the wall, it's us against the wall. So this collaboration, the difference of having this in an uptown area, means when I encounter [another] developer, we actually start talking about business challenges... where it's not so much I'm taking something away from you, we're trying to give each other something. So we can build something together. In the uptown, it's much easier because I'm going to see you at a restaurant, I'm going to see you at a drink after work, I'm going to see you at breakfast. I'm going to see you. And it's that environment where you're constantly interacting, that you're more of a community as opposed to when you're in a technology park and you go into a big-ass building with a coffee shop. I might take off at lunch to a little restaurant, or the cafeteria, and I might see you, but it's a completely different environment. So, to me, this is the ideal place to have your business right in the uptown where I can interact and communicate with people in ways that are new and unique, and more importantly different."

"Once a cluster forms, it's self-perpetuating because workers like to hang out together, and so if you're in walking distance, you can go to the same restaurants, you can have after work parties and rendezvous that allow you to mingle and mix and be part of a community. Once that starts it tends to evolve under its own momentum." –Gerry Pond

"...it is a frustration that people leave [uptown] at the end of the workday and go a great distance away because it creates a permanent barrier for the rest of the day. As soon as you, I used to live in the KV [Kennebecasis Valley, suburban bedroom communities] so I know what it's like. I would go home after work and once you're home and pour yourself a glass of wine, you're not going back in the city at all. So It turns our community into a 9 to 5 community which is a problem. In the ICT industry, that's a real problem. I'm not saying the ICT people should work 100 hours a week but that flexibility of scheduling becomes a problem in a city where people live so far from where they work. And that might be coloured by my own personal opinion about suburbs vs. urban. Maybe a 25-minute drive is isn't a big deal for other people at 11:00 at night if you need to do it, but where the social component is so important then that's a problem because you can't even go grab a beer after work. Most people have to drive home after the beer. And so it impedes the social connections and the scheduling possibilities to have so many people living so far. So having more of the industry living in the urban center where the work is would be really great for our city."

Text Box C7: Key interview quotes: urban untraded interdependencies in Saint John.

"...[our customers] understand it's an online activity, but they still want to talk to us, they still want to trust us in the real world in some way. It's not easy for customers to give you, let's say, $3000 unless they've met you and know you."

"The people who are helping us create our company need to be close by. It's very hard to do that kind of thing virtually. We'll often have meetings and come; it's an expense to me but have all seven of us here in this room on that whiteboard saying 'OK, this is what we need to do. How are we going to do it?' and will try to be efficient about it, but we really need to be together. We need to know each other and like each other and not be nervous about offending the other person, you know those kind of relationship-based things."

"I won't mention the entrepreneurs, but when they went [to Silicon Valley] a couple of weeks ago they said, 'Yup, the only reason I keep going to California is to make sure they see my face. I spend all kinds of money traveling back and forth so they're familiar with me. So my next round, they think I'm local.'"

Text Box C8: Key interview quotes: face-to-face interaction.

This is why I came.... there was something appealing about the entrepreneurial environment here. At the time when I was in Vancouver, my brother in law told me, because we were thinking about moving here, and he said... 'You should really talk to my friend's dad. [He] just loves to encourage entrepreneurs... he does anything to encourage them. He can answer any questions you have about the IT industry or about starting a company in Saint John. If you want me to connect you with him, I will." And I said "Yeah, sure." So he arranged this phone call with him, and I talked to him for over an hour – it was Gerry Pond! So that was my first connection with Gerry, talking to him on the phone from Vancouver, and him telling me about the ICT industry and about entrepreneurship.... He really gave me confidence that this was the place I should go to.... Things like that conversation with Gerry also helped for me to want to be here."

"I think I'd say people, the leadership is extraordinary. The teaching— the godfather [Gerry Pond]... he's a great example of someone who is a leader. Here's a guy who's made some money and is putting it into businesses that may not, even in his mind, may not totally make it. But because he's given a belief to someone, even if they do fall, they're gonna be guaranteed to get back up again because of that belief. That's leadership. Here it's all about leadership.... It's a huge strength. Huge strength."

Text Box C9: Key interview quotes: access to mentorship.

Collaboration & sense of community:

"I didn't make a lot of money when I worked for [my first few jobs in Saint John], but I really got to know the community really well. And that really changed my perspective on everything. Everything I've done since the foundation was laid then, and my care for the IT industry, that's where it was formed."

"The best thing we've got going for us here is that people – and this could die, this could be something that could disintegrate if we became a big city, I don't know what causes that – we help each other here. People don't just pay lip service to collaboration, we really know how to collaborate here in ways that everybody else doesn't get. Really, everywhere else I've lived people talk, they say nice things and they talk about helping each other and collaborating but they don't really. Here we actually do. We just do. And so it's really easy to access influential people in our community."

"The network is irreplaceable here. Everybody in the whole world has their own network of people, but the network you can build in this place is influential, far-reaching, generous, optimistic, supportive –it's just really remarkable. And that network is what makes this such a powerful place to build any kind of company in, but especially an IT company. It's really the IT industry that's really mature in this place."

"All of our services, all of our goods, are gotten right here, except for our phone. We like to feed our own."

So when I'm trying to find [new hires] I'm looking for a combination of key things that just don't answer my needs but answer the community needs at large. Because we're not about - it's not about my company against the wall, it's about the community against the wall. It's a very different and unique environment."

"People kind of collaborate, they go out to help each other... All these various things aren't available in Silicon Valley... it's not so much in the community having technical expertise, it's about having the willingness to make a change. Because change makes things interesting: it engages people.... It doesn't matter how tired you get, how exhausted you get, the people that are around you will lift you. In this community that really makes a difference."

"People now are beginning to realize our strengths. Our strength in collaboration. Our strength in pulling people together. Our strength in being able to come together to help someone move forward. Without the [expectation of something in] return. You see this whole movement here with Pay it Forward. That's not an aberration, it's actually just a reflection of the community at large, in putting an organized fashion."

"To me opportunity is everywhere. It's not dependent upon location, it's dependent upon your mental capacity to make a difference. You can do business anywhere in this day and age, the internet makes it so that you can do business anywhere. The question is how do you collaborate and bring people in with you, how do you inspire people to build in that direction. What you're seeing in Saint John and in Fredericton and in a couple of other places is that there are people who can actually go out and inspire, they believe they can make a difference. And they don't take "no" for an answer."

"There's a strong sense of community and also the small size of industry makes it possible to talk to pretty much anyone within a few weeks. So that's probably the biggest strength."

"I would say the last thing would be the fact that we are, as Maritimers we're really open to sharing, and we don't mind taking the time to do that. We've got guys like Gerry Pond, as well, that will literally go out of their way to try to help anyone, with their time, and then the angel investors that are willing to invest. So I think we've got— let me put it this way: strength-wise we probably have what 99 percent of areas out there in places outside of the traditional centers in the United States and Canada would give a left arm for. We've got it already."

"I guess, strengths is a growing entrepreneurial community. Either employees are part of startups or founders who have seen some success or have learned some lessons. There's this increasing density of that entrepreneurial community which is very important. And it's a fairly connected community, although it's small, it's actually an advantage in that it's easy to stay connected, get introduced, and find the right folks who can help you as a first time founder or even second time. So I think our size is a strength for the entrepreneurial pool and the intensity that we're starting to see emerging here."

"I see [New Brunswick's cities] as one entity. In fact, I see the whole Maritimes as one entity in terms of the IT sector. I would even take it as far as Newfoundlander and Labrador. That's the little harder because it is a longer distance and there's different history in Newfoundland, but I do believe that we're soul brothers for a bunch of reasons. So I see the

Maritimes for sure as one entity. So the three largest cities in New Brunswick are definitely one entity in my mind. And in most cases the companies I'm involved in prove that, they're operating in the three of those cities. Obviously they have an executive function but maybe more one then the other, but in terms of the total output it's a product of three cities and in many cases five cities." –Gerry Pond

Evidence of firms outside of the ecosystem:

"... it seems to be the companies who are attached to that ecosystem that are... understanding how important marketing is. But you still see geeks out here, writing code and who are disconnected from the ecosystem, maybe based on their personality, maybe they like being private, coding, and that's what they want to do. But the ones who are unplugged from that ecosystem seem to be still back to where they were focused on coding the product and not understanding how important the marketing side is."

"It's hard because I don't know how much of it is just my own personal view from where I'm at. The industry... we don't seem to have a community like we did.... I see groups... doing good stuff.... but they've done a terrible job of building a community around themselves. And I think that was one of our biggest strengths and advantages; that we were a community, we knew what our problems and challenges were, and we were helping each other solve them. We knew who each other was and what companies existed in our ecosystem, so we knew to look out for each other and encourage each other. I don't really see that anymore. I know the businesses around my neighbourhood because I know them but if I didn't know them five years ago I wouldn't have gotten to know them in the past five years.... We always had a really tight community, the senior people. It was always harder to get the workers, the lower level.... So I think we'll do well if we build a solid community and we'll be challenged if we don't."

Text Box C10: Key interview quotes: collaboration and sense of community.

"...I observed it with Aliant in the early days that NBTel was considered an engineering marvel. When I was in Vancouver my friends who worked for BCTel and then Telus used to ask me things about NBTel because it had this reputation of just being this little hotbed of amazing activity with real bright technical engineers who would build really cool shit. And it was the only jurisdiction I think in the world, but definitely in North America, that had two fibre networks because of the competition between NBTel and Fundy at the time. They both ran fibre optic networks underneath our streets. And so we were really advanced from a technical point of view."

"We don't manufacture things, like we don't manufacture devices, we're primarily a software city. But because of our telecom heritage we've got a lot of people, when it comes to the cloud, the cloud is enabled by servers – computers, and networks, and servers –that's what we've got in abundance here. So we've got great skill sets in those kinds of stuff. If you're building a cloud-based company there would be a lot of people in the city who could mentor you and give you advice on how to choose the right technologies for what you're wanting to accomplish long-term."

"Gerry Pond's been encouraging entrepreneurs since way, way back. And he used to do it at NBTel from what I'm told, like he used to give people a lot of freedom to be creative and build new things."

"...this sense of collaboration: it comes from way back, it comes actually from NBTel. 'Cause NBTel was an organization that when it was built, it was all about collaboration—within the organization, and all the interactions, and taking accountability, and sharing and spreading that load. And a lot of what built the IT community here in New Brunswick came from that building across the street. Gerry Pond, Ian Cavanaugh, I can go on and on and on. All the boys left, they come back, and they bring this same philosophy back, and they build their businesses. And that propagates throughout the community because those who are part of those businesses do the same thing as they go out and propagate."

"...mid-90s was when I would have started to get into tech startups... I started my career off at NBTel... back in the early days before it became... Aliant and all that stuff... it was the little telephone company that could, it was very entrepreneurial for a telephone monopoly. And it really instilled a lot... to me about how you can pretty much do anything you want to do when it comes to tech if you really put your mind to it. If you focus on customers... and you really try to figure out what customers want... those two things. So... in the mid-90s I started off with a tech startup that was still under the NBTel wing called New North Media, which eventually became Innovatia. And then I moved from them, I moved to a startup called iMagic TV, and that's where I met a lot of the guys that I ended up working with [in later startups] as well..... So, yup, so startups are in my blood, pretty much."

Text Box C11: Key interview quotes: the NBTel legacy.

"You've got the Radian6 guys, the one great company that actually broke, I don't know if you knew, but they broke a Canadian record... They went from nothing to a $226,000,000 [cash] sale in five years"

"What's happening is that people are thinking more about 'I'm willing to try. I'm willing to risk. It's calculated, but I'm willing to risk. I've got an idea'. Whereas before, I remember saying to Nortel, 'c'mon, I'm thinking this could be a great idea.' And we'd all talk about it. 'And what are you going to do about it?' 'Well, there's nothing I can really do about it. It's not really applicable to Nortel'. It's a cool idea, and sits in our head, and it dies with us. Because there's been no real outlet."

"...the fact that we do have some good success stories in the IT sector, it makes a lot of expertise available in the market so we can get locally access to people who have done it before, let's put it this way."

"The fact that there is a pocket of experienced people here already.... The fact that we have had some successes already; the confidence is high right now. So with the Radian6 exit and the Q1 Labs exit and others it's given people confidence."

"An opportunity for us is the fact that we've got this great startup community already that people would literally kill for. We've got this focus... we've got also this amazing pool of talent that recycles, like... Radian6, Chalk Media... If we didn't have that it would have been harder to create our company and other companies that are here. So, we've got the talent pool, the opportunity to leverage it. We've got a lot of people in that talent pool who are willing to encourage students and others to get into it. We've got this momentum that is attracting more people to take the leap and become entrepreneurs and start startups. We've got the infrastructure and the people willing to share to make this happen. So I really think that the world's our oyster in this, and we're starting to see it, and I think it has tons of potential."

"...there's a general acceptance now that it's okay to fail. Not every startup will succeed, and I think globally that it's well recognized that startups are high risk and that failure is an okay outcome. It's not ideal, but it's okay because you'll have learned some things in that failure that you may be able to use in your next venture if you so choose. So I think there's been an increased level of activity, particularly in the last 12 or 18 months with folks being willing to take that risk because the risk is a lot lower now than it was 15, 20 years ago."

"... as a young person graduating from University back in the 90s, the goal was to go and find a job at a big firm, whether it was NBTel or Anderson Consulting which became Accenture. Ten or fifteen years ago, that was your trajectory: to go work for NB Power, or leave and go work for a large engineering firm, or something like IBM or Oracle in Toronto. There wasn't really much of an entrepreneurial mindset in New Brunswick back in the mid-90s. But it started to change when people, under the umbrella of NBTel, got taste of it with things like Connectivity and New North Media and iMagic TV. But what really I think was the catalyst was where we started to see folks that were this NBTel alumni starting to venture out and founding some firms like Radian6. My own personal experience, it'd take me a couple of years to get to the point where I was comfortable doing my own startup, but I joined a startup out of San Francisco in 1999. So I think that there was a sense of optimism and comfort that it was fine and somewhat acceptable to go and do your own startup and be a bit of a risk taker in New Brunswick. Because of that I think that if you fast-forward the last 12 or 18 months, there's an increased level of activity."

"In terms of the industry, what happened was there were enough individuals who were part of the initiatives that were undertaken by these four [provincial telephone] companies in their respective cities and towns that continued on. So iMagic TV which was a spinoff out of NBTel that became a spinoff out of what is now Bell Aliant, was purchased by Alcatel in 2003, I think it was. So there were a number of people there and a number of other companies –Innovatia I mentioned. So I can use the phrase some ex-NBTel-ers, some ex-MT&T-ers [NS]... were part of the ecosystem that started these companies, or stayed with those companies. And they're all in place today these people. They're all part of the ecosystem today. So that's the... reason, I think, it survived was that the people didn't move to Toronto, they stayed here. And Mariner was formed, Brovada was formed, mostly with one or two founders coming from the old NBTel/Bruncor establishment." –Gerry Pond

"So with some good strong exits like GoInstant out of Nova Scotia, Radian6 and Q1 Labs in New Brunswick, Ocean Nutrition out of Nova Scotia, in the last few years we've proven that we can grow gazelles, these are award-winning companies in terms of return on investment." –Gerry Pond

Text Box C12: Key interview quotes: development dynamics since 2003.

"Because in this city, or in this province, more particularly in this city, is that there's this - how shall I say that - there's a shift in the machine from an industrial economy to a knowledge economy. And so we're in the middle of this, we're not at the beginning of it, we're not near the end of it. We're dead smack in the middle. So there's all kinds of this transition happening. It can be very difficult because you have parents telling their kids to run off of west or run out [of] here to get real work, because the parents think there's no work here, but the parents are actually losing their jobs because they're being downsized because of technology. And where the opportunity is, ironically, is in technology. So how can you tell your kids that when you've just lost your job? And that becomes a bit of a challenge."

"I would have to say, [our strengths] would have to be on innovation. As we said earlier that vulnerability is the birthplace of innovation and creativity. It really is, it's not one of my quotes, it came from Brené Brown from one of her TED talks. And it resonates because it's so true. When it comes to business, at least in the Maritimes, we're used to being vulnerable. So a lot of people see being vulnerable as a weakness. To me it's a huge strength. Because it allows you to look at things in a very different light. It allows you to understand the impact for you, what are the changes you can make, what are the differences you can make. So that's what I'm seeing, innovation and creativity. And I see it with every one of the IT companies that are here."

"Promoting [ourselves]. Promote, promote, promote. Shamelessly promote. Promote it again, promote it again. Do it even more shamelessly, and promote it again. I can't even begin on that topic because in the Maritimes we tend to be very humble, you know, we don't want to be very boastful. Goddammit, we have $1.8 billion in investment and exits between Saint John and Fredericton. That's huge dollars, right? So if we hide some things, I think it's a huge weakness because what it does is, if you're not letting people know about how we operate here between the campuses, how the collaboration works, the successes that we have, or even how we deal with failures—if we're not telling those stories, nobody's listening. But if they listen, they may turn around and say 'this is a place where I can do business too. This is a place where I would like to be because this is the type of cultural environment I want to be in, because I don't want a Donald Trump success.'"

"I think that, it's funny, I look at what we have here, and it's almost stealth. It's funny, what comes out of here is stealth. And I've often thought that that might be never talked about, but it might be an underlying thing as to why people don't promote. Under the radar, under the radar, under the radar, then boom, we're there. That's what happened with Radian6, and others. So it's hard to, because we look at these problems all the time... we all talk about these things. And the thing that we just come down to is that it's like 'put up and shut up and just get it done.' And I think that attitude, if I were to boil it down to it, that attitude is what's really, on a really base, guttural level, what's gotten us so far. That put up, shut up, and get it done. Get something you want to build, build it. Just get it done. That attitude to work with what you have at hand, that's done so well for us. On that base, guttural level."

Text Box C13: Key interview quotes: path dependency and the Maritime context.

External Perceptions

"I would think it's probably a perception problem. We sell essentially outside of the province.... when we start to collect in Toronto and Montreal, especially Toronto, they think it's very small, very remote and [there is] a credibility factor that we simply don't get by being located in Fredericton. And if our business was [located] in New York or Toronto we would not have that problem. But when it comes to the United States or Europe: well they don't even know what New Brunswick is, so that problem is even stronger. What's been helping us to counterbalance that is that we can actually say it's the same city where Radian6 is, and since most of our colleagues already do business with Radian6 it kind of helps, it helps to counterbalance that perception."

"And then the threat, I think the biggest threat is why do I want to do my startup in New Brunswick? Why wouldn't I relocate to Montreal and be part of FounderFuel... or everybody's going to the Valley or Boulder or Austin where all the cool kids are. And I think that's going to remain for a lot of jurisdictions, but particularly for New Brunswick."

"...we should be able to market this region as one of the strongest where to go to start your business and be successful, even though on the surface of our history doesn't have a big track record yet. On the point some would argue 'its over'. They would say, 'Silicon Valley won: Boston give up, Dallas give up, Calgary give up, Waterloo give up, it's over'. It's never over. It's always changing. There's a next gen to everything. So I think you have to look at this and say we've got the next gen and be optimistic about that. But you've got to believe in yourself first, right? We can't import success. Import people but maybe not success." –Gerry Pond

Internal perceptions:

"I would argue that one of the biggest obstacles the ICT sector has over the years is the general public thinks of call centres when they think of ICT. Maybe that's just in New Brunswick, I don't know. Maybe that's the case everywhere, but in New Brunswick when you talk to a parent about the kids getting an education and you say they should get an education for the ICT industry, they think you're saying 'send your kid to university for six years to go work for $10.00 an hour at a call centre.' And they don't want to have anything to do with it."

"One of the things I learned when I left the Maritimes was - I lived in Toronto, I lived in Vancouver... is that Maritimers generally, we leave the Maritimes and go out in the world thinking that we're less than everyone else, that the rest of the world is better than us, so we work really hard to try and catch up to everyone. And it turns out we're better than everyone! I couldn't believe the things that I did in my six years in Vancouver. The things I accomplished... I'm incredibly proud of and it really was because I went there and I worked my ass off. And I felt like I had to compensate for being from the Maritimes, and it was just the opposite."

"If we look at traditional New Brunswick, it's a resource-based economy. And there's nothing wrong with that, but the resources are finite. There are renewable ones, that's great, but... [w]hat I worry about as a threat is that because we have –I'm going to use two words –'just enough' of everything: 'just enough' mega-projects, 'just enough' forestry, 'just enough' fracking, 'just enough' whatever, or 'just enough' to pay the taxes so that we keep our credit rating –the 'just enoughs' are going to hurt us... And we don't want to wake up one morning and go 'holy crap, we're another Detroit; we're totally hosed!' So we need to get serious about this. We need to dive in and take advantage of this. The threat is we don't do it fast enough. And other jurisdictions might leap ahead and we would lose our advantage. 'Cause our opportunities and our strengths are greater than most places. We need to totally take advantage of that."

"When a population, I guess the world has proven this over time, when a population is put down and it starts to believe that it's put down, it stays down. So if we can't continue to show the power to change is from within us, if we can't show that, demonstrate that, believe it, we will be our worst enemy. We will self-defeat." –Gerry Pond

Text Box C14: Key interview quotes: path dependency and perceptions.