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Authors: Ken L. Carter & Kelly Vodden

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Applicability of Territorial Innovation Models to Declining Resource-Based Regions: Lessons from the Northern Peninsula of Newfoundland

Ken Carter

Office of Engagement
Grenfell Campus, Memorial University
Corner Brook, Newfoundland and Labrador, Canada
kcarter@grenfell.mun.ca

Kelly Vodden

Environmental Policy Institute
Grenfell Campus, Memorial University
Corner Brook, Newfoundland and Labrador, Canada
kvodden@grenfell.mun.ca

Abstract

Resource dependent rural regions often struggle in the face of globalization and the movement towards a knowledge-based economy. Drawing on new regionalist literature related to territorial innovation models, this paper investigates the applicability of regional innovation systems and the quadruple helix of government, university, industry and community collaboration in innovation within the Great Northern Peninsula of Newfoundland and Labrador, a struggling rural resource-based region. The research finds key factors, including a weak and dispersed private sector and a lack of resources at the municipal level, limit the effectiveness of territorial innovation model recommendations to spur innovation. Other elements of territorial innovation models related to learning, network facilitation, increased knowledge flows and connections with post-secondary institutions, and development of a shared vision and action plan could, however, benefit the region.

Keywords: rural; territorial innovation models; regional innovation systems; quadruple helix

1.0 Introduction

Rural places focused on resource extraction have faced increasingly rapid change since the 1980s due to forces such as globalization and technological and ecological change. In response to this change, new regionalist approaches to development have increasingly placed regional competitiveness, and particularly innovation, at the heart of economic growth (Markey, Halseth, & Manson, 2006). New regionalist literature has primarily focused on urban areas, however, paying less attention to how or if models or theories of innovation systems apply to rural and peripheral resource-based regions. Territorial innovation models (TIMs), as the innovation-based handmaiden of new regionalism, suggest for example that agglomeration economies are critical to innovation, thereby precluding rural regions from participating in a critical element of economic development and regeneration (Wolfe

& Gertler, 2004). This case study of the Great Northern Peninsula of Newfoundland and Labrador, Canada, assesses the applicability of key elements of the literature around TIMs for stimulating innovation in remote rural resource-based regions, finding a weakness in the capacity of these frameworks to provide solutions.

This paper begins with a review of key elements of the innovation literature, including the rise of new regionalism and corresponding attention to the social and institutional dynamics of innovation and the importance of learning within regional innovation systems, all with an eye to the applicability of these ideas to rural contexts. Second, it outlines the methodology used in the study, including semi-structured interviews, case studies, and workshops. Third, it presents the findings from the research. Finally, it presents an analysis of the findings, with an emphasis on the applicability of key concepts within the TIMs literature. Overall, the lessons from this study suggest the limited applicability of TIMs to the innovation challenges of remote, rural resource-dependent areas. Some elements, such as an emphasis on the importance of collaboration between business, government, university/college, and community partners—the “quadruple helix”—to drive innovation can be problematic in remote rural regions. Instead, the authors suggest that a more appropriate strategy in regions such as the Great Northern Peninsula is to focus on strengthening regional governance capacity and a culture of entrepreneurship, in turn strengthening such multi-sector innovation collaborations over time. On the other hand, the research findings suggest that TIMs’ emphasis on learning to address rapid change associated with the knowledge-based economy applies to regions similar to the Northern Peninsula. This paper also investigates what roles regional partners, universities/colleges, and governments can and do play in supporting regional innovation in the case study area, with potential application to other remote rural areas.

2.0 Literature Review

Scholarship on innovation in regional development has noted the pervasiveness of technological change and its impacts on society. Among these impacts is a shift to a knowledge-based economy, which has led to an increase in scholarship on innovation within the field of regional development. Knowledge flows, learning, and innovation are seen as important to economic success (Wolfe, 2009). Within rural regions, knowledge flows, learning, and collaboration are critical elements needed in order to adapt to dramatic changes occurring in resource dependent economies. Based on research in Northern British Columbia, for example, Markey et al. (2006) discuss a shift from comparative to competitive advantage in rural regions of Canada. Whereas in the past comparative advantage from natural resource exploitation could be relied upon as a basis for regional development, there has been a push in the 1990s and 2000s for all regions to compete globally for market share based on strategic positioning of local assets and the attraction of highly skilled workers (Markey et al. 2006).

This focus on place-based competition has coincided with a reemergence of interest in regionalism in the literature. This ‘new regionalism’ has focused on a reemergence of the local as the appropriate locus of economic development and regional planning. TIMs, which are central to this new regionalism (Legendijk, 1997; Moulaert & Mehmood, 2010), have focused on social networks and relationships at the regional scale as vital assets for driving learning-based competitive advantage (MacLeod, 2001). Regional assets, local identities, and

regional governance structures are seen as providers of “soft economies” of collaboration and learning (Porter, 2000), positioning regions as “key economic units in the global economy” (Florida, 1995, p. 531), as well as important to new knowledge, innovation, and policy making (Welch, 2002; Harrison, 2007).

New regionalist literature related to territorial innovation emphasizes the importance of networks or linked economic actors where trust, reciprocity, and norms spur creativity and innovation (Zirul, Halseth, Markey, & Ryser, 2015; MacLeod, 2001; Cooke & Morgan, 1998; Storper, 1997). The social nature of innovation is highlighted with a focus on collaboration among governments, industry, community, and universities (Leydesdorff, 2012; Hall & Walsh, 2013). The concept of “institutional thickness” has also been widely discussed, emphasizing the importance of the presence and effective combinations of regional institutions in fostering learning and innovation (Amin & Thrift, 1995; Rodriguez-Pose, 2013). Others stress physical proximity and relationships between actors in proximity when establishing of competitive advantage, innovation, and economic growth, and in particular through face-to-face interactions (Buenza & Stark, 2003; Wolfe, 2009). Morgan (1997) cites the regional level as the scale where interactions are sustained over time and where knowledge flows and social capital are built. At the regional scale, local actors can resist the ‘slippery’ spatial characteristics of investment by building ‘sticky’ regions of development to retain and build a knowledge-based economy (Markusen, 1996; MacKinnon, Cumbers, & Chapman, 2002). From a governance perspective, new regionalist thinking calls for collaboration among key institutional players that can include enhanced local participation to compensate for government withdrawal (Zirul et al., 2015).

One key form of the TIM is the regional innovation system (RIS). Doloreux and Parto (2005, p. 148) suggest RIS is a “normative and descriptive approach that aims to capture how technological development takes place within a territory.” RIS includes relationships among key economic, political, and institutional partners in a locality which involve learning and increased knowledge flows (Doloreux & Parto, 2005). RIS emphasizes interaction and learning among a range of economic actors, including firms, industry associations, and support institutions such as governments, universities, and colleges (Hall, 2017; Rodríguez-Pose, 2013; Tödtling & Trippl, 2011; Nauwelaers, 2011; Florida, 2002). The RIS model encourages both private (e.g., workers and firms) and collective learning (e.g., through networks of firms and/or groups of support organizations) through increased knowledge flows among key actors.

Another, related example of TIMs is the ‘Quadruple Helix’ that encompasses: (1) government providers of policy/programs to support the region, (2) firms’ research and development initiatives, (3) community and institutional support partners and (4) education and research institutions (Foray et al., 2012; Etzkowitz, 2008). Key institutions including the European Union and OECD have focused on the quadruple helix in a regional innovation approach known as Research and Innovation Strategies for Smart Specialization or RIS3. RIS3 supports a regional “entrepreneurial process of discovery” where the region undertakes a “process to discover the research and innovation domains in which a region can hope to excel” (Foray et al., 2009, p. 2). Using this approach, a coalition of business, post-secondary education institutions, governments, and other community organizations act entrepreneurially to support innovation. Entrepreneurs are seen as best suited to

identify research and development and innovation specialization that might be useful to the region but the creation of new business activity is also seen as dependent on harnessing this entrepreneurial spirit across the broader community (Foray et al., 2012; Foray et al., 2011).

RIS3 strategies are described as “integrated, place-based economic transformation agendas” (Foray et al. 2012, p. 8) that drive research and development to support entrepreneurship, foster university/college connections to regions, and incorporate an inclusive regionally focused consensus-based governance structure (Foray et al., 2012). They are developed through a six-step process that includes: (1) analysis of regional conditions and innovation potential; (2) creation of a participatory governance structure that encourages local buy-in; (3) developing a shared vision; (4) identifying a small number of regional development priorities; (5) appropriate policies, and (6) an effective action plan for pursuing these priorities. The sixth-step acknowledges the importance of learning and adaptation through the integration of monitoring and evaluation mechanisms into the process (Foray et al., 2012).

Common to TIMs is the recognition that rapid changes in products, processes, and conditions require a collective ability to learn, adapt and innovate. Cooke and Morgan (1998, p.17) stress that “knowledge is the most strategic resource and learning the most important process” in innovation. ‘Learning regions’ are described as places where broader networks stimulate capacity to experiment, innovate, and adapt to rapid change (Asheim, 1996; Florida, 1995; Morgan, 1997). Hassink (2005) suggests that learning regions can avoid “political lock-ins” and destructive regional paths that, when applied together with other political and economic motivations, can block knowledge flows and learning, and lead to missed opportunities for regional resilience and adaptation.

Some literature exists on innovation in the context of rural regions (Polèse, Shearmur, Desjardins, & Johnson, 2002; Virkkala, 2007; Lagendijk & Lorentzen, 2007; Hall & Donald, 2009; Davies, 2010a; Hall, 2017). While there is undoubtedly innovation taking place in rural regions, these authors suggest that it is more often incremental innovation (Doloreux, 2003) and is marked by older or externally-controlled sectors (Tödting, Lehner, & Trippel, 2004; Woods, 2005). Tremblay (2005) and Gertler, Florida, Gates, & Vinodrai (2002) suggest that rural actors do not appropriately value knowledge as critical to economic growth relative to other resources. This lack of focus on learning in rural regions is problematic given the prevalence of rapid change in resource dependent economies. Another inhibitor of rural innovation is a lack of clusters in rural economies (Tödting & Trippel, 2005). Agglomeration economies, which are thought to be critical to well-functioning clusters, rarely exist in rural areas (Wolfe & Gertler, 2004). Typical economic structures in rural areas (based on resource extraction, tourism, services, etc.) mean less access to technology (Davies, 2010a), though these sectors are becoming more technology driven. Some have argued that the quadruple helix is less relevant to rural regions where knowledge infrastructure is lacking, entrepreneurs are dispersed, or there is a weak culture of entrepreneurship (Kolehmainen et al., 2016; Skogseid & Strand, 2011). In such a situation, particular elements of the quadruple helix can be more dominant (e.g., government or support organizations), causing less than optimal outcomes such as ideas coming forward with no entrepreneurial champion to implement.

The key reasons spurring innovation in regional economies, including globalization,

heightened competition, rapid economic change, and the shift to a knowledge-based economy are as applicable to rural regions as they are to urban centres. Therefore, the imperative to improve learning, knowledge flows, and innovation is important to rural and urban regions alike (Davies, 2010b). In a rural context, this can often mean a combination of incremental process innovation, buying new-to-region technology to improve efficiency and innovating in economic development processes. Network development can also mimic the effects of urban density in rural areas (Murdoch, 2000; Visser & Atzema, 2008) and networks can act as catalysts for learning and entrepreneurial discovery.

Previous research suggests therefore that there are specific stumbling blocks in applying TIMs approaches in rural regions but also a potential for applying aspects of them within such settings. This article asks what a TIMs approach has to say about key challenges, but also opportunities faced by remote rural regions, in particular, the Great Northern Peninsula of Newfoundland and Labrador, as they struggle to sustain and develop their rural economies, a topic few studies have reviewed.

3.0 The Great Northern Peninsula

The St. Anthony – Port aux Choix region, situated on the Great Northern Peninsula of the island of Newfoundland, is a sparsely populated remote rural region in the North Atlantic. The region possesses a 4,500-year history of settlement by Indigenous people, Vikings, and most recently predominantly English and Irish Europeans (Reader, 1998; Hartery & Rast, 2003; Renouf & Bell, 2008). Described as “inhospitable” (Simms, 1986, p. 4), the region boasted vast resources of fish and forests, which brought the first European settlers in the late 1800s. Sir Wilfred Grenfell, a philanthropist, established a mission and educational and health services in the region, to improve the lives of fishermen and their families on the Northern Peninsula and Labrador in 1892 (Rompkey, 2003). He also established an orphanage and a number of cooperative ventures including a sawmill, community gardens, and handicrafts.

Since the 1992 moratorium on Northern Cod, the region (Figure 1) has faced significant challenges including population decline, above-average dependency on government transfers and an economy focused on declining primary resource extraction. The Census population for the region in 2011 was 12,245 (Community Accounts, 2017). There was a 6.8% population decrease in the region from 2005-2011, while over the same period the provincial population increased by 1.8% (Community Accounts, 2017). The median age for the region in 2011 was 48, while the provincial median age was 44 (Community Accounts, 2017). The percentage of the regional labour force collecting employment insurance (EI) during the year measured at 56.5% in 2015, while the provincial level was 29.6% (Community Accounts, 2017). In 2011, 41.1% of the region’s adult population did not have a high school diploma, compared to 28.0% for the province; about 6.5% of adults had a Bachelor’s degree or higher, compared to 13.3% province-wide (Community Accounts, 2017). Recent projections suggest the region will lose a further 44% of its population over the next 20 years (Simms & Ward, 2016).

Figure 1. Map of the Island of Newfoundland.

Source: Gibson, (2013).

The region is home to 51 communities, including 16 incorporated municipalities and numerous local service districts and unincorporated communities (Community Accounts, 2017). St. Anthony is the largest community, with a population of just under 2,500. Newfoundland and Labrador currently has no regional government beyond the municipal level. The lack of regional government has meant that most communities on the Northern Peninsula have limited local capacity for planning and regional development. The region saw the loss of the Regional Economic Development Boards, and the resulting loss of associated staff for regional economic development planning, which was described by some as a 'retreat from rural' (Hall, Vodden & Greenwood, 2015). The result has meant fewer resources available locally for planning and economic development.

There is limited knowledge infrastructure in the region. A campus of the College of the North Atlantic, Newfoundland and Labrador's public community college, is located in St. Anthony and offers general first year programming and diplomas in office administration, heavy equipment operator, and powerline technician. Memorial University offers significant research and teaching services (including fishery research through the Marine Institute, outreach, public engagement and community-based research efforts conducted by faculty and graduate students with assistance through the Harris Centre of Regional Policy and Development headquartered in St. John's and Grenfell Campus of Memorial University). However, Grenfell Campus is 460 km away from St. Anthony in Corner Brook, and Memorial's main campus in St. John's is over 1,100 km by road, or a one and a half hour flight.

The provincial government's Department of Tourism, Culture, Industry, and Innovation (TCII) has two offices on the Northern Peninsula, offering a variety of funding for business startups, innovation, and other business programs (TCII, 2017). The federal government's Atlantic Canada Opportunities Agency (ACOA) operates from Corner Brook and offers startup, business loans, and innovation funding (ACOA, 2017). Other key regional support groups include Nortip Development Corporation (Nortip, 2017), with a loan portfolio and core funding provided through ACOA. There are three local development agencies in the region and the Viking Trail Tourism Association. St. Anthony Basin Resources Inc. is a community-based organization with an allocation of the northern shrimp quota, which is reinvested in the region (SABRI, 2017).

Primary resource extraction accounts for 24% of the regional economy, second only to sales and service (26%), with limited secondary processing (Community Accounts, 2017). Declines in the traditional fishery and forestry sectors have exacerbated economic and social difficulties. Dramatic cuts in the shrimp quotas of 78% over two years are having dramatic economic impacts, with local media coverage reinforcing expectations of decline.¹

4.0 Methods

This study was a part of a larger project that reviewed regional development approaches in four Canadian provinces. The study was multi-faceted and qualitative in nature. It included a review of academic studies underway in the region and relevant grey literature, such as strategic plans of key organizations and reports related to economic development, as well as government statistics related to a range of innovation indicators such as education levels and government innovation funding (White, Carter & Vodden, 2014). Additional data sources included observations from participation in local and regional meetings and in-depth interviews with local innovation system stakeholders in 2012-2014. Follow-up participation in workshops and events on the Northern Peninsula has continued since that time by the authors, including several sessions held in 2013-2017 to discuss results with regional stakeholders.

The research team used a purposive sampling approach to recruit participants who could comment on innovation efforts in the region from a business, community or government perspective. Aided by the local academic and grey literature, the research process began with a review of the local government business and community groups to create a list of potential interviewees. Input from key community leaders and economic development practitioners informed the completion of this list. This process identified a total of 25 local innovation system stakeholders from within and outside the region. Stakeholders from the business sector (including entrepreneurs from tourism, fishery, and forestry sectors), economic development support agencies, and various community organizations and government departments were invited to participate. Of the 25 participants contacted, 23 agreed to be interviewed, including eight respondents from local NGOs, six from federal, provincial, and municipal governments, seven from industry, and two from post-secondary educational institutions. These in-depth

¹ www.thelabradorian.ca/business/2017/4/12/shrimp-quota-cuts-expected-to-have-effect-on-st-anthony-area-bu.amp.html; www.cbc.ca/news/canada/newfoundland-labrador/northern-peninsula-my-other-home-1.384172

interviews were conducted both in the region and in key government offices outside the region.

Semi-structured interviews sought to gauge the level of innovation currently taking place within the region and the ways in which local and external collaboration has influenced these efforts. A final goal was to document the level of learning, evaluation and resulting changes in each organization or firm. Each interview lasted between 30 minutes and two hours. Insights from the interviews were immediately documented through notes and summary observations. Interviews were audio-taped and transcribed verbatim, coded in NVivo and then analyzed according to a series of key themes from within the innovation literature as well as others that arose (see White et al., 2014). Data from the interviews were triangulated with insights from the additional sources noted above.

6.0 Findings

Following on key themes from the TIMs literature discussed above, the interviews with business, government, community, and post-secondary leaders provided examples of innovation in the region and focused on the role(s) of key institutions in the innovation process, the extent of knowledge partnerships and innovation collaboration, the nature and extent of collective learning processes and openness to new ideas, and challenges and barriers to innovation.

6.1 Collaboration and Innovation Governance

Collaboration in the region was generally perceived as strong and valuable by those interviewed. There were examples cited of government and non-government support institutions that met regularly and shared information. As one respondent put it, “you get out of it what you put into it ... if you got time and energy to invest in it you generally get good results” (leader of local community organization).

An important example of the successes of collaboration was the Northern Peninsula Business Network (NPBN), a group of businesses that had come together as a group to work on training and marketing initiatives with support from both provincial and federal governments, as well as industry associations. The Network had undertaken key initiatives for its members, including export development initiatives, lean manufacturing training, business planning support, and joint marketing initiatives. A joint venture started among members created new employment in the region. The network was seen as a positive development but had waned over time and members no longer met as a group at the time of the interviews. Also, an ongoing network of heritage non-profit groups with a training and marketing mandate among 14 community museums and cultural spaces in the region was referenced as a positive example of collaboration (Butters, Eledi, Okusipe & Vodden, forthcoming).

Key challenges facing collaboration in the region were also identified, including a lack of social and business entrepreneurs being involved in collaborative efforts. As one respondent put it, “there is collaboration of facilitators and not doers” (government respondent). This barrier was framed as resulting in burnout among those who carried the burden of running key local NGOs and conducting regional development planning and, particularly, implementation. Respondents also lamented the lack of capacity among municipalities, particularly smaller towns, to play a development role, a concern also noted in the literature by Beer and Lester

(2015), for example. Local representatives suggested that only the municipality of St. Anthony had paid economic development staff able to support regional development initiatives. While some smaller towns were interested and did participate, their capacity to support economic development and innovation was limited. Others showed little ability or willingness to participate in regional development and innovation initiatives.

This issue speaks more broadly of the need to get an effective mix of players at the table, as noted by authors such as Rodríguez-Pose (2013). Increasingly innovation requires the collaboration of the quadruple helix of universities/colleges, business, governments, and community partners. While respondents pointed to ongoing networking, broader quadruple helix collaboration was largely absent. One respondent explained:

I think there's good networking taking place among businesses and community leaders in their own realm, I think the towns, municipalities, rural developers, they're doing good networking, businesses are doing good networking whether it's between businesses or in an industry, I think government within its own circles is doing good networking, but there is a disconnect between those networks (local entrepreneur).

The interviews revealed other nuances related to collaboration at the sectoral level. Within the fishery, necessity given the great distances between the region and suppliers and markets has led to the sharing of resources such as ice, equipment parts, transportation, and expertise between fish plants despite an atmosphere of fierce competition for access to scarce fish resources. One respondent in the forestry sector talked about working closely with counterparts in other provinces who were very open to knowledge sharing in both directions. However, collaboration at the industry association level was poor, with weak collaboration taking place across the province among larger forestry players. Within the tourism sector, the outfitting sector reported strong collaboration around marketing and the sharing of big game licenses, with a longstanding and active industry association. Other respondents in the tourism industry suggested there has been collaboration, but the industry has seen a loss of local planning capacity with the weakening of the local tourism association and the formation of a larger tourism group, the Western Destination Management Association (WDMO), covering a wider region. While the Viking Trail Tourism Association continues to operate and work directly with the WDMO, this is cited as a case where additional institutions (or added "institutional thickness") may have weakened rather than strengthened local development efforts (Rodríguez-Pose, 2013; Carson, Carson & Hodge, 2014; Beer & Lester, 2015).

6.2 Learning and Openness to New Ideas

Learning regions require increased reflection that takes into account what is happening in the region as well as elsewhere. Monitoring and evaluation (as in the RIS3 model), is an important element to creating new knowledge from experience, as is supporting the development of individual learning so that it is built into organizational and societal learning. When asked about the status of learning within their respective institutions, most self-describe as learning organizations that reflect

upon their experience and learn from mistakes. There is also generally a sense that organizations are willing to fail and try new things. While few organizations readily would acknowledge a lack of learning and reflection, there are telltale signs of weakness in this area. For example, respondents reported that few organizations outside of the provincial and federal governments had any significant budgets or access to funding for training. The interviews suggested that there was a good deal of informal learning from experience among development organizations. However, formal evaluations occurred only within government or when governments paid for them.

Pursuing adaptation and innovation based on individual and organizational learning requires openness to change. When asked about their openness to new ideas, generally, respondents said they were open to change and acknowledged the importance of new ideas to regional development. One entrepreneur talked about the need for stronger connections to the marketplace (e.g., building local tourism operators' understanding of world class sites through travel); another discussed the importance of market connections and the need to understand the sophistication of Japanese customers, who were willing to pay premium prices for quality fish products. The business respondents suggested that, without a deeper understanding of what customers were looking for, local businesses were unlikely to find market success.

Exposure to new ideas was seen by respondents as critical, as evidenced by the following observation: "we used to say the best thing for Newfoundland is put everybody aboard a boat or plane for a couple of years and bring them all back and see what happens" (local entrepreneur). On the other hand, another respondent referenced a greater openness to new ideas and wondered if this went back to Sir Wilfred Grenfell, saying: "maybe it had to do with Grenfell...with all the people coming in from outside" (local support agency respondent). Respondents acknowledged, however, that there was much more involved in commercialization than an openness to ideas: "we've been getting lots of ideas but being able to implement them, that's just different, well there's capital, there's support, research" (local support organization).

6.3 Challenges to Regional Development and Innovation

When asked about barriers to innovation in the region respondents emphasized two critical issues: first, the distance to markets and the size of the region; and second, outmigration and demographic change. One government respondent said: "the long distances, the travelling...I just got wore out travelling" (government employee). Another business person said: "a disadvantage of course we're so far away from the marketplace and getting things in is difficult and expensive" (local entrepreneur).

The second major barrier to innovation cited by respondents was the low population and outmigration, particularly the loss of young people and lack of entrepreneurs. There was a concern that the region has many dying communities with no young people left and no future, particularly in the smaller outlying communities. Private sector respondents highlighted the lack of skilled labour as a barrier to innovation. One respondent stated: "I think the biggest problem anybody is going to have now is getting employees" (local entrepreneur). Another human resource issue noted is the so-called 'employment insurance (EI) trap' which refers to a culture and lifestyle of seasonal work, involving working for enough weeks to qualify for EI and then

living on a subsistence economy for the rest of the year to supplement the EI payments. When firms want to keep people on for longer time frames, there can be resistance among some employees that leads to human resource challenges for local companies. This seasonal nature of the economy can be a detriment in another way as well. The fishery needs to attract a younger skilled workforce but can have difficulty due to the seasonal nature of the industry, which can hold back innovation in the industry. One fish plant manager explained of smart, bright post-secondary graduates that “can do all these things and you put something like that plant in their head and they can go and do amazing stuff with it” are often not interested in seasonal low-wage jobs. Others referenced the need to build a stronger culture of entrepreneurship. There was a broad consensus that there were not enough entrepreneurs in the region and that the innovation skills of entrepreneurs and their staff could be improved, particularly around commercializing new products, understanding market opportunities, and connecting to the latest research and development in the industry.

In a recurring theme, respondents cited the lack of strong local governance, particularly at the municipal and regional level, as a barrier to innovation. The elimination of the Regional Economic Development Boards meant fewer staff whose job it is to design and implement strategies for the region. One tourism entrepreneur discussed the need for a regional vision that has broad support, with key government and non-government support agencies working to implement this vision (again as recommended in the RIS3 approach). Several respondents mentioned a need for greater regional collaboration among municipalities, further regionalization of services, and a greater municipal role in regional development processes. Respondents see municipalities as an example of potential doers, as opposed to senior government development staff, perceiving that municipalities were well positioned to champion and lead initiatives and projects if they had the human resources capacity to do so.

Infrastructure issues raised by respondents were many and varied. Broadband and cell coverage in the region were raised regularly as key barriers to innovation. Lack of high-quality wharves and roads were also raised. Respondents were positive about the recent and ongoing development of the harbor in St. Anthony and the accompanying potential to link the region to European and North American markets for natural resource and other products through Iceland’s transportation firm Eimskip, which also manages a large cold storage facility in St. Anthony. However, the need for new infrastructure in other areas was cited as a barrier to economic growth. The lack of knowledge infrastructure in the region was also seen as a problem, although the CNA campus in St. Anthony is viewed as important to the region and most businesses and groups cited examples of collaboration with the campus.

6.4 *Fostering Innovation*

A key finding was that local partners needed to reach out to external knowledge support to foster further innovation. Respondents across all sectors mentioned the importance of new research and assistance with research, for example, particularly in knowledge-based sectors such as cultural and natural tourism but also in the exploitation of new species such as whelk in the fishery and new forest products. Several respondents noted the importance of past research to the tourism and fishery

sectors (e.g., archeological discovery of Vikings, Dorset, Paleoeskimo sites, among others). Generally, it was thought that post-secondary knowledge partners could do a better job of aligning their research to local needs, although ongoing research support through these institutions was acknowledged. Yaffle (<https://mun.yaffle.ca>), a knowledge and research brokering tool operated by the Harris Centre at Memorial's St. John's Campus, was cited by multiple respondents, for example, as important for local partners to access research capacity for regional initiatives.

Another key finding was that respondents felt that funders needed to broaden the definition of innovation in rural areas to include adapting technology and processes that were new to the region as legitimate regional innovation. Generally, respondents were not focused on radical new-to-world innovations. Business respondents supported adapting readily available technology in the region and incremental improvements to their operations. Examples of this sort of incremental innovation were cited in the fishery, forestry, and tourism sectors. While there was no consensus among government respondents on providing funding for adapting current off-the-shelf innovations and technology from elsewhere, many social and businesses entrepreneurs expressed the value of this kind of support.

As discussed above, previous research (e.g. Markey et al. 2006, Porter 2000) suggests the importance of identifying and building on local assets for place-based competitiveness. Respondents discussed regional assets including natural resources like fish and forests, but also cultural and heritage resources such as the UNESCO world heritage site at L'anse aux Meadows, where Vikings landed 1,000 years ago. The people and their commitment to place and government and local institutions supporting business, were also mentioned. As one respondent put it, "ACOA supported me and ... Industry Trade and Rural Development [now TCII], they're really good, they still support me in marketing and the people working for them are really good because they're on the local level and they understand what's going on locally, so that's a big plus" (local entrepreneur). Finally, several interviewees suggested that the size of operations in the region were right for niche markets. Given the size of the communities in the region, smaller business operators could have significant impact on employment and, therefore, the sustainability of the region. Respondents suggested that, in this way, smaller secondary processing fish plants, non-timber forest producers, and small tourism businesses were seen as a good fit with the region. Fostering innovation in the region will require recognition of these local assets and small-scale niche strategies to build upon them.

7.0 Analysis and Conclusion

The goal of this article was to review the applicability of key elements of TIMs, particularly RIS and the quadruple helix and their dimensions of learning and collaboration in innovation at the regional scale, in a struggling rural resource-based region. The literature on such regions is weak, with more research needed. The themes of TIMs investigated through this research include the level of collaboration among elements of the quadruple helix of university, government, industry, and community and related issues of institutional capacity, as well as the state of learning and knowledge flows at multiple scales required to spur innovation and adaptation.

This research adds to studies by authors such as Kolehmainen et al. (2016) that have questioned the applicability of 'quadruple helix' collaboration within rural regions with weak knowledge infrastructure and the lack of a strong entrepreneurial culture.

Our findings suggest that collaboration in innovation processes in the region is mixed. The study region has seen collaboration among government employees and local economic development NGOs, but other key partners are often missing, most notably municipalities and the private sector, both of which could play an important role in fostering innovation if their capacity to do so were enhanced.

A number of themes arose from the interviews around the need to strengthen the private sector and local government. First, the theme of stronger networking among entrepreneurs was raised, both within and outside the region, suggesting the need to expose firms to world-class innovation within their respective industries. Findings also noted that, while a previous business network eventually failed, the success that it experienced while it was functioning suggests that networks are indeed an important vehicle for regional growth and innovation in rural areas, as suggested by Murdoch (2000), Visser & Atzema (2008) and others. Greater understanding of the mechanisms and outcomes of collaboration among entrepreneurs through networks in rural settings where entrepreneurs are dispersed over significant distances is needed. Another issue identified was a lack of training and skills development. This is a theme that the Conference Board of Canada has highlighted across the country (Grant, 2014), and where post-secondary institutions can play an important role.

Generally, interviewees across the private sector, government, and post-secondary institutions referenced the need for stronger leadership at the municipal level, a level of institutional capacity also emphasized in recent work by Beer and Lester (2015) on institutional capacity for regional development. There have been discussions supported by Municipalities Newfoundland and Labrador, a provincial NGO that advocates for and organizes municipal governments as well as lobbies for regional governance, to form a regional level of government with the capacity to work on economic development. This seems the best option for strengthening local government leadership on the Northern Peninsula.

Without stronger local leadership from the private sector and more resources at the municipal level dedicated to planning and development, it is difficult to see how strong quadruple helix relationships can be formed. This deficit suggests that regions with a weak private sector and limited resources at the municipal or regional government level need to tackle these issues more directly in order to take advantage of synergies among multi-sectoral collaboration between industry, government, universities, and community. Otherwise, it is difficult to see how attempts at quadruple helix collaboration will succeed under conditions where key regional partners are widely dispersed, weak, or lack resources.

In the absence of strong leadership from entrepreneurs or local governments (which have limited resources to participate), there is a heightened expectation placed on federal and provincial governments, support organizations, and post-secondary institutions. Consistent with previous research globally, post-secondary institutions were seen as important in regional development, but possibilities for greater impact were also identified. There was acknowledgement of the importance of research in the past related to tourism and the fishery, for example, but interviewees suggested the need for more research that could have economic impact in the region. The local College of the North Atlantic campus has actively partnered with local business around innovative programming, such as outfitter guiding in the tourism industry. Memorial University supports development through public engagement, research, and experiential learning initiatives from both its St. John's and Grenfell campuses,

but the region's distance from both campuses is a stumbling block, and university partners currently face requests for support throughout the province with limited resources to meet these needs. In addition, while the college and university are important partners, they cannot lead local economic development and regional innovation. An important element within the RIS3 framework is entrepreneur-driven research initiatives, undertaken in partnership with research capacity (e.g., MUN and CNA) that can drive new business activity. This approach would appear to offer promise in the region.

Another possibility, which fits well with the legacy of Sir Wilfred Grenfell's regional development work in the region, is for the not-for-profit sector to lead development initiatives such as is currently done through the running of the Grenfell Historic Properties in St. Anthony. These community-led entrepreneurial initiatives can have significant economic and social impacts and partially make up for a weaker private sector as well as municipal services or programming where none exists.

Governments at all levels will also continue to play an important role. Generally, key regional stakeholders suggest that the region needs investment from the private sector and governments for basic infrastructure such as roads, broadband, wharves, tourism facilities, and other amenities in order to take advantage of economic opportunities. However, given the low population and expected further decline, it seems unlikely that significant investments across all these needs will be made. Local organizations and governments at all levels will need to work with what infrastructure currently exists and to be strategic about what new investments are requested and funded. The region must be smart about how it invests scarce financial and human resources. This suggests that more planning is needed with respect to infrastructure, and that a clear vision for the region needs to be articulated. This again suggests the application of an RIS3 type approach within this rural Atlantic Canadian setting.

While interviewees discussed learning within their organizations, not much evidence emerged about broader collective learning in the region. This collective learning is recommended in the RIS3 literature discussion around a regional "entrepreneurial process of discovery" (Foray et al., 2012). Evaluation and reflection on past practice were largely limited to federal and provincial governments and core-funded support organizations, which are few and shrinking in number. There is clearly potential for further efforts to foster learning within rural regions as "the most important process" in innovation (Cooke & Morgan, 1998, p. 17).

There are no simple solutions to the deeply troubling challenges facing The Great Northern Peninsula region. The sum of these challenges threatens the continued existence of the region as a meaningful economic and social unit. This study reinforces previous research that suggests elements of TIMs do not apply well to struggling remote rural resource-based regions (Kolehmainen et al., 2016; Skogseid & Strand, 2011) such as the Northern Peninsula, particularly the focus on agglomeration economies and clusters and the need for strong knowledge infrastructure. This study adds to this literature by reinforcing these insights and further suggesting that quadruple helix collaboration among governments, business, university, and community requires a robust private sector and strong system of local government, neither of which currently exist on the Northern Peninsula of Newfoundland. In regions such as this strengthening weaker elements of the quadruple helix is critical before meaningful collaboration can occur. More research

is needed on how to strengthen the private sector in the context of a region dependent on government, university, and support organizations. There are also opportunities for social enterprises to replace some elements of the private sector or missing local government services. The results of this research, however, suggest that other elements of TIMs including learning and improved network facilitation for increased knowledge flows, including an entrepreneurial process of discovery such as RIS3, could have benefits. As well, a formation of regional level government in the province could strengthen the smaller municipalities and unincorporated communities with limited capacity.

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