Alberta: Policy inaction, crises, unintended consequences and cluster success in the semi-periphery

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Abstract: The developmental state literature has typically focused attention on the role of nation-state actors. However, cities are increasingly important centres of innovation and commerce (OECD, 2006). Thus as national state policy instruments are progressively governed by international conventions (Wade, 2003), can non-national level actors influence industry development? This paper explores the role of policy in the development of Calgary’s (Alberta, Canada) wireless cluster. The paper shows that while the Alberta Government was important in the early phase, it withdrew leaving the cluster struggling through recent crises. Policy suggestions that are pro-market and pro-innovation and relevant to the context are indicated.

Keywords: technology and globalisation; developmental state; cities; wireless industries; cluster policies.


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1 Introduction

The aim of this paper is to develop a perspective on the developmental state debate that is little explored. The ‘state’ in this literature typically refers to nation-states (see Hira et al. this issue), but sub-national jurisdictions (states/provinces) are also occasionally (perhaps even increasingly) important actors. A number of advanced and developing economies (Australia, Canada, Germany, Mexico and the USA) have a federated political structure and thus a decentralised power system. From one of these we have chosen an interesting case. In Canada, the Province of Alberta experienced a State induced development of a
wireless cluster. The purpose of then of this paper is to explore the role of the state alongside the history of industry development timelines at the sub-national level.

This study is part of a series of that were designed to examine the development of wireless (manufacturing of mobile/cell phones) industry clusters across a range of countries with the focus of understanding the role of governments in their developing trajectories (see Hira et al. this issue).

The case material for Alberta is divided into three time periods that are indicated by crises in the general economic climate for wireless products but which also happen to roughly coincide with technological transitions in wireless technologies. The first period covers 1982–1992 (the era of NovAtel in Alberta), the second is 1993–2001 and the emergence of an Alberta cluster, while 2001–2009 can be characterised as restructuring.

2 Background

2.1 Global wireless production

The global wireless industry is a fascinating production system to choose for the focus of a series of studies across a number of economic scales, development levels and time periods. Although we have the advantage of a relatively clear set of activities for this group of studies and an interesting range of examples (Korea, Mexico, Brazil, Finland and this one from Alberta), choosing this particular economic activity has particular background concerns that are important. Wireless because of its modular design has special characteristics that need to be considered and understood. It appears that the scope for new players to enter the market for wireless related components (not necessarily handsets) is higher than others as the value structures continue to fragment. However, any visit to an electronics store will tell us that architectural control of the products remains highly concentrated in the hands of a few multinationals such as Nokia, Sony-Ericsson, Motorola, Samsung, BlackBerry and recently Apple in the high end smart phone category along with other smaller players.

Rosenkopf and Schilling (2007) have recently shown what we would expect, that the computers and communications industries (which is a broader category than just wireless) has a high degree of technological modularity (meaning that components are made separately to assembly and that there is a high degree of interoperability) and that this industry consists of an incredibly dense set of networks of alliances with a high degree of centrality (a measure of the number of hub organisations in the system). Wixted (2009) reveals that related economic activities have amongst the highest requirement for imported component inputs of all economic sectors. Further, Wixted (2009) also reveals that communications and electronics production systems have amongst the most diversified international trade partner structures compared against other manufacturing industries. Thus the electronics and communications production systems are amongst the most internationally fragmented both by the share of production and by the number of countries involved in the production networks. The technology, business models and production system underlying what we call wireless continues to evolve rapidly.

With this background, the history of a so far successful cluster in an advanced economy illustrates many important dimensions of industry development patterns and government policy in high technology activities.
2.2 Economic distance and being on the semi-periphery

As already noted this paper mainly focuses on the example of Alberta, a province of Canada that provides a fascinating example from a high income economy but a region, which needs to be distinguished by its distance from other major centres of technology and commerce and on the nature of its economic base. Distance is far from dead for technology industries as any review of the clusters literature will make clear (see Cruz and Teixeira, 2010). Concepts such as Triple helix (Leydesdorff et al., 2006), Regional Innovation Systems (Cooke, 2001), clusters (OECD, 1999, 2001) and local/city innovation systems literatures all emphasis that proximity to other corporate actors and sources of talent and basic technology (universities), and knowledge flows (see Wolfe and Gertler, 2004) and deep labour markets (2001) are important for cluster success. It is not surprising then that some recent research has suggested that city size matters for innovation (see Wolfe and Bramwell, 2008). What then of distant locations.

We can think of Alberta as being on the semi-periphery (Boreham et al., 1989; Synder and Kick, 1979; Terlouw, 1993; Wallerstein, 1976) because it is not in the US West (California) or the Canada-USA mega-regions of Ontario’s south, Michigan, New York State and Massachusetts (see Florida et al., 2008). Adding interest to this particular example is that Alberta, like a number of less developed nations is resource rich and heavily dependant on the exploitation of oil reserves. However, unlike many economies it has leveraged important technology and professional service sector activities off the economic returns from this natural resource base.

The case reveals that policy has been important is initially kicking off the cluster and that location has been part of the reasons for success and also part of the barrier to further development.

2.3 Alberta’s development trajectory

Alberta is a resource rich province in Western Canada. Over the last 50 years or more its development trajectory has been particularly influenced by two features: its geology and geography (see Figure 1). Conventional oil was discovered in Alberta around 1900 with significant discoveries found south of Edmonton (north of Calgary) after World War II. Today, conventional oil and gas are still significant but it is the ‘oil patch’, a massive area of land that contains substantial oil reserves that are locked up in a bitumen form (unlike conventional oil) that has become the main driver of development. Because of the geological and physical characteristics of oil sands it has encouraged of late large resource industrialisation (mines, oil extraction facilities etc) and ancillary service industries.

In 1963, 29% of Alberta’s GDP was derived from mining, while the share for the Canadian economy was 8.1% (Dominion Bureau of Statistics, 1967, p.1085). Although contributing only a small share of employment, the petroleum sector contributed one fifth of provincial GDP (Druge and Veeman, 1980). By 2008, although oil production continues to rise, the Alberta economy has diversified with mining now accounting for 8.5% of the economy (Statistics Canada, 2009), which almost certainly underestimates its significance from an economic multiplier perspective. Mansell and Schlenker (2006) estimate that between the mid 1960s and mid 2000s Alberta’s growth was about 1% above the national average. They also note that economic performance has been closely
tied to prices for oil and gas, and that directly and indirectly the oil and gas sector has contributed to about half of Provincial GDP during the period 1971 and 2004.

**Figure 1** Locating Alberta and Calgary Canada (see online version for colours)

![Map of Alberta and Calgary, Canada](http://commons.wikimedia.org/wiki/File:BlankMap-USA-states-Canada-provinces.png)

However, at the point where wireless becomes important in the Alberta story, the Alberta economy was going through a sustained economic shock. During the 1980s, Alberta suffered a serious recession on the back of lower prices for petroleum and grains, the two main commodities of the economy (Mansell and Percy, 1990). These authors comment:

“In 1982, after almost a decade of exceptionally strong performance, the Alberta economy suffered a reversal notable for its sharpness and persistence. Output fell by almost 5% (compared to a drop of slightly more than 3% nationally) and did not show any significant recovery until 1985. Then, in 1986, adversity struck again. The collapse of oil and grain prices dealt a severe blow to the province’s economic base and focused attention once again on the apparent instability and vulnerability of the Alberta economy and on the enormity of the associated social and economic costs.” (Mansell and Percy, 1990, p.1)

A key concern of academic writings and Government at this time was industrial diversification away from resource and low technology towards high technology products such as computers. This can be seen in the wider debates arising from the economic turmoil and transformations of the 1970s and through the 1980s as inflation and unemployment rose and manufacturing shrank as a share of GDP (de-industrialisation of advanced economies – see Crafts, 1999). At the national level this period of transformation was met with market liberalisation in Anglo countries such as Australian, Canada, UK (Crafts, 1991) and the USA.

Many authors at this time viewed the policy response to the declining share of output being attributed to manufacturing as a negative phenomenon and argued for policies that maintained an industrial base to OECD economies (see Cohen and Zysman, 1987). Their position was that the manufacturing sector matters for national economies and its ability to provide high wage jobs. Low technology based regions were doomed to low growth. Such authors make a case for policies that shifted regions away from these industries to ones with higher knowledge content and high growth potential. In the context of Alberta Drugge and Veeman comment:
“The term ‘industrial diversification’ has several connotations. To an economist, diversification involves broadening and changing the industrial mix so that there is less dependence on a few industries which are characterised by short run price and income instability. Presumably, such a strategy would imply moving away from resource staples which are typically characterised by short run price inelasticities of demand and supply as well as by exogenous shifts in demand and supply.” (Drugge and Veeman, 1980, p.223)

However, what was implemented by governments of course did not necessarily align with these contentions as Drugge and Veeman note in their analysis of the Alberta Government’s diversification policies:

“Currently geared as much, if not more, to the issues of provincial development or ‘province-building’ than to the mitigation of short run instability. The province desires an intermix of industries which (1) will maximise provincial product, and (2) will stabilise provincial income in the short and long term.” (Drugge and Veeman, 1980, p.223)

In both a continuation of earlier debates but also with some important distinguishing features, the relevant debates shifted during the 1990s. Eden and Malot (1993) argue that the 1980s and early 1990s were marked by privatisation, deregulation, liberalisation, spending cuts and contracting out. The example here then might be particularly interesting to policy scholars.

The case study falls rather neatly into three major time periods with a fourth emerging at the time of writing. First, a quick snapshot of the current situation will be provided before examining the origins of the cluster, the first period of which covers the emergence of NovAtel (1983–1992; its rise and demise). The second period takes us from the death of NovAtel to the turn of the millennium. The final period considered is the early to mid 2000s.

### 3 Alberta’s wireless cluster in 2010 and beyond

#### 3.1 The state of play of the Calgary cluster

At the time of writing, we are still in the midst of huge economic turmoil across any number of industries, spanning the globe. In the early part of 2009 there were significant declines in the ICT sector that was extremely rapid. According to the OECD, OECD economies experienced declines similar to those experienced in 2001–2002 and the:

“De-coupling of non-OECD countries also proved to be an illusion with non-OECD Asian economies (China; Chinese Taipei; Hong Kong, China; and Singapore) severely affected. Chinese Taipei’s output was down by 40% in the early part of 2009 as was Japan’s, and Asian ICT trade has been down by 25–40% year-on-year as the crisis took its toll in integrated Asian production networks.” (OECD, 2009, p.6)

The NASDAQ composite index reflects the challenges. Although the full onslaught of the financial crisis emerged in late 2008, the system had begun to unravel in 2007, as Figure 2 indicates. The index provides supporting evidence to the analysis of the OECD. There was a sharp decline in early 2009 but share prices (and production according to the OECD) began to rise again around the middle of 2009.
The 2008 financial crisis was the final nail for Nortel Networks, the Canadian multinational, based primarily in Ottawa and Calgary, which had been struggling since the 2000 dot.com crash. Other companies in the global wireless market have also struggled. Sales by Motorola’s mobile devices division declined from USD$3,334 m to USD$1,829m a percentage decline of 45% between 2nd Quarter 2008 and 2nd Quarter 2009. Nokia has reported declines of 20% for devices and services from 2008 to 2009.

Figure 2  NASDAQ composite index: closing values from 1994 to 2003

According to Calgary Economic Development (2008), Calgary’s cluster is second to San Francisco on a per capita basis with about 55,000 employees in its entire ICT sector. The wireless segment of ICT (Table 1) comprises about 10,000 employees although this also incorporates the telecommunication carriers, which are also the largest employers.

Table 1  Wireless segment

<table>
<thead>
<tr>
<th>Wireless activities</th>
<th>No. of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier/enterprise network equipment</td>
<td>54</td>
</tr>
<tr>
<td>Network operators/service providers/engineering and installation</td>
<td>112</td>
</tr>
<tr>
<td>Contract manufacturing</td>
<td>6</td>
</tr>
<tr>
<td>Software and design services</td>
<td>64</td>
</tr>
<tr>
<td>Satellite and location based services</td>
<td>44</td>
</tr>
<tr>
<td>Remote instrumentation</td>
<td>22</td>
</tr>
<tr>
<td>Wholesale and retail services</td>
<td>38</td>
</tr>
<tr>
<td>Devices</td>
<td>41</td>
</tr>
</tbody>
</table>

Source: Calgary Economic Development (2008, p.12)

However, the city is also the home of some significant players in systems development and GPS technologies. For example a Calgary based wireless company, bought by General Dynamics in 1998 is the home of significant expertise and R&D capability in large systems development being awarded a $1.1 billion contract by the Canadian military. Another company (Hemisphere GPS) develops precision agriculture solutions, evolving out of CSI Wireless, a Calgary based company founded in 1990.
It is hard to get an accurate reading of the impact of the financial crisis on the wireless industry in Alberta, which is largely centred in Calgary (a city of about 1 mill), however, indicators for the city as a whole are revealing. Manufacturing employment in November 2008 was 56,300 but by November 2009 it was 45,000, a drop of 11,300. Similarly professional, scientific and technical services employment has declined from 88,700 to 79,800 (–8900) according to Calgary Economic Development (2009). More specifically, an ad hoc look through some financial statements available on the web reveals significant decreases in sales for the year 2009.

On the policy front Alberta has started 2010 by initiating a new policy package for innovation. Primarily this is a re-packaging of existing organisations into five ‘new’ corporations which are hope to bridge the public research and technology organisations with private companies. The focus on ‘commercialisation’ with the belief that there is a need to improve the return on investment of public research is largely a continuation of the existing neo-liberal approach to innovation without a re-appraisal of how innovation happens.

3.2 Beyond 2010

The challenge for the Calgary wireless cluster lies not with the current recession but from the two dimensions of economic geography and the technology. As technological complexity increases it is harder and harder for any one location to maintain a strategic position in a particular technology for significant periods of time. As one example, Steinbock (2003) has shown the value chain for wireless is fragmenting away from traditional device design and manufacture towards applications though, perhaps examples like the Blackberry and Apple’s Ipod/Iphone (Linden et al., 2009), might be exceptions. As a part of the same process there are opportunities for new locations to emerge with new technological capabilities. In time as we have argued in Hira et al. (this issue), these capabilities can grow to be significant.

Across time, although innovation policies frequently focus on manufacturing and the perceived high R&D (and by extension the highly knowledge intensive) segment of activities, what matters is the evolving value structures. It is this aspect of innovation that Governments have had a hard time grasping (see Royal Society, 2008).

4 From 1980–2008: 3 stages of evolution


It is rare in the analysis of the historical record to have access to information, which is contemporary to the times, conducted with a forensic level of scrutiny and addresses questions of future interest. However, in the case of Alberta’s early foray into wireless technologies we have in good part exactly this combination, in the form of an Auditor’s report of the failure of a Government owned business, NovAtel. However, perhaps due to the political sensitivities of the time regarding investing in business the report highlights all the negatives and none of the successes.

Like other clusters (Buenstorf and Klepper, 2009), the birth of the Alberta wireless cluster can be traced back to a limited number of organisations (one in this case). Also of note here, is that commercially oriented research activity focused on wireless
communications starts surprisingly early in Alberta. Westech Systems Ltd in the late 1970s was developing cellular technologies (Ali, 1983). By the early 1980s this R&D had progressed to a commercial stage. As Ali describes, the basis of the technology was the Aurora system:

“Since its creation in the fall of 1978, Westech Systems Ltd. has been involved in, design, and development of cellular and automatic mobile telephone systems to meet the ever-growing market demand for this line of products. The first such system developed by Westech is a custom designed, 400 MHz band, AURORA System for Alberta Government Telephones (AGT). This system is now in operation in Edmonton, Alberta, and installation work is under way to provide province-wide mobile telephone service by later 1984.”

This alliance with a Government corporation created the first cellular network in North America in 1983 (see Salmon, 1992, p.129). It is unclear what happened to the Westech brand. Around the same time as Ali’s paper, a new organisation was being formed to carry forward the research and production activities. An alliance between Alberta Government Telephones (later the privatised TELUS) and another Government utility, Nova Corporation (which had responsibility for maintaining oil pipelines) funded a new organisation – NovAtel.

It is unclear from this distance in time what role hard Government policy had in this. Though probably encouraging it, such encouragement may have stopped short of sanctifying the arrangement. At this point in time agriculture and manufacturing were actually falling as a share of GDP. Between 1961 and 1977, the Alberta economy had boomed, but with a downturn in the oil sector, industrial diversification policies had been at least placed on the agenda of Government (Drugge and Veeman, 1980).

NovAtel’s early products were bulky and expensive as all ‘mobile’ phones of the time were. The technology developed was particularly suited for relatively flat rural landscapes of the prairies. First Generation phone users were business and trades people and in the case of rural area users travelling business salesman or farmers.

At the outset it is worthwhile providing a snapshot of the history of this rather rare intervention into the market with the attempt to create a new market oriented government corporation (see Tables 2–4). More rare for it being counter to the political cycle (remember this is the period of Thatcher and Reagan).

<table>
<thead>
<tr>
<th>Year</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>First commercial cellular network in North America (Edmonton and Calgary)</td>
</tr>
<tr>
<td></td>
<td>Joint venture between AGT and Nova launched NovAtel</td>
</tr>
<tr>
<td>1984–1986</td>
<td>NovAtel pursued a dual strategy of developing systems (telecoms business) and subscriber equipment (handsets). The systems business was high margin small production runs while the subscriber business was high volume small margin business</td>
</tr>
<tr>
<td></td>
<td>NovAtel’s technology was particularly suited to regional (non-mountainous) markets</td>
</tr>
<tr>
<td>1987</td>
<td>NovAtel started to develop business partnerships with businesses bidding for regional market cell phone licenses in the USA</td>
</tr>
<tr>
<td>1988</td>
<td>Nova wanted to sell its 50% share of NovAtel</td>
</tr>
</tbody>
</table>
Table 2  A brief time line of NovAtel (continued)

<table>
<thead>
<tr>
<th>Year</th>
<th>History</th>
</tr>
</thead>
</table>
| 1989 | AGT bought Nova’s share for $42.5 m  
AGT began looking for a strategic partner stabilise the NovAtel and began negotiations with Robert Bosch GmbH |
| 1990 | NovAtel expanded workforce from 1200 to 1900. A Cimplex plant was built in Calgary. AGT privatised under the new name TELUS  
NovAtel initially transferred with the other assets from AGT to TELUS  
The Robert Bosch GmbH partnership fell through |
| 1991 | 31 December 1990 NovAtel sold by TELUS to the Alberta Government  
Management Committee appointed to run NovAtel  
NovAtel losses were announced as $203.9 m  
Staffing was reduced, the Cimplex plant was not opened and new management was recruited  
New strategic partnership negotiations began |
| 1992 | NovAtel switching sold to Northern Telecom (Nortel) [the systems business] with a commitment to continue R&D in Calgary and a Hong Kong business man bought the subscriber business. Liabilities and physical assets were retained by the Province |

NovAtel’s total cost to the Province of Alberta $566 m

Source: Salmon (1992) various pages

In just nine years, NovAtel launched the first commercial services in North America, developed a serious R&D and manufacturing capability in wireless systems and built up a staff of nearly 2000 people (see Table 2). However, suffering from product quality and new product development problems in the handset market, and mistaken loans to potential regional service providers in the USA, it sustained significant losses.

The next sections examine this history from the perspectives of the different lenses of our study.

4.1.1 Finance

In an era before a significant venture capital industry existed in Canada, NovAtel was financed by the Alberta Government through two major utilities. Although small by competitor standards, the level of financing provided by the Province should probably be considered as significant given this is in 1980s dollars (Table 3).

<table>
<thead>
<tr>
<th>Year</th>
<th>Finances: gross profit (Sales – cost of sales)</th>
<th>Finances: expenses</th>
<th>Finances net profit / (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>4,190,000</td>
<td>15,507,000</td>
<td>(11,283,000)</td>
</tr>
<tr>
<td>1984</td>
<td>6,949,000</td>
<td>26,162,000</td>
<td>(43,650,000)</td>
</tr>
<tr>
<td>1985</td>
<td>(7,546,000)</td>
<td>28,652</td>
<td>(36,808,000)</td>
</tr>
<tr>
<td>1986</td>
<td>17,818,000</td>
<td>26,764,000</td>
<td>(18,694,000)</td>
</tr>
</tbody>
</table>
For a number of years the business was tracking well, heading towards the black. However, the financial commitment to expansion, loans and the lack of success in developing new products eventually generated unsustainable losses. The final cost of the experiment was $547 m.

4.1.2 Product development

NovAtel pursued a strategy of focusing on two distinct markets, handsets for the mass market and business systems (Table 4).

Table 4

<table>
<thead>
<tr>
<th>Year</th>
<th>Product development</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Westech Systems of Edmonton and Systcoms of Montreal develop Aurora (roaming Radio) NovAtel formed to identify business opportunities for these products</td>
</tr>
<tr>
<td>1987</td>
<td>Product quality and introduction problems were already hampering the company’s ability to gain share in the market</td>
</tr>
<tr>
<td>1990</td>
<td>&quot;Cellular systems business continued to be successful, but the subscriber business suffered further setbacks. Quality problems continued ...the company could not meet new product introduction dates, and therefore had difficulty competing with other manufacturers. NovAtel had decided to enter the highly competitive and price sensitive retail market&quot; pp.11–12</td>
</tr>
<tr>
<td>1991</td>
<td>SRI assessed the systems business as potentially viable but the subscriber business was unlikely to be viable p.88</td>
</tr>
</tbody>
</table>

Source: Salmon (1992) various pages

While NovAtel was successful in the first period of cell phone development it failed to build a long term capability in successfully commercialising handsets. For a start-up it was doing well, but even, at the time, analysts suggested that the market for handsets was crowded and that it needed to focus resources on the business to business activities. The demise of NovAtel may have also been forced by external events with the 2nd Generation of cell phones beginning to appear. Novatel, with its focus of rural services, although large in the USA, was not in the growth markets of the cities.11
The strategy of NovAtel was in many ways reflective of the archetypical industrialisation advice, in so far as it pursued mass manufacturing rather than the behind the scenes business systems. In the case of NovAtel, although their advantage lay increasingly with business systems, the management team was focused on success in the consumer market.

But the strategy of going after the large mass market consumer goods placed NovAtel in direct competition with the larger telecommunications and electronics firms. In contrast to its competitors, NovAtel was a very small player. For example, according to Salmon (1992, p.137) NovAtel spent about $28 m on R&D on $219 m sales in comparison to Motorola’s $932m R&D on $11,400m sales (though obviously not all of which was related to wireless). NovAtel was a start-up trying to capture market share against large players with established interests in wireless technologies. Motorola, for example had been developing and marketing communications equipment since the 1930s (Motorola website). Though NovAtel did achieve a measure of success, in the end it did not have the strategy or the deep pockets to survive.

“NovAtel was a company with some early successes in a start-up industry. It had an entrepreneurial management who focused on technology and had ambitions to establish the company as a recognised player in the international market. The market was dominated by multi-national companies with huge resources. However, the company lacked strategic direction, adequate budgeting and sound management information systems.” (Salmon, 1992, p.18)

At the end of 1992 NovAtel was dissolved. Nattalia comments:

“According to Shosteck, Novatel sold a lot of phones but could not make a profit. The company attempted to make it on volume by selling to the low end of the market. NovAtel was able to recover its manufacturing costs, but could not make up its R&D expenses. In the 1980s, the growth was there. NovAtel’s revenues of $15.8 million in 1983 jumped to $282 million by 1989. But losses, which had gone from a high of $43.6 million in 1984 to a low of $3.7 million in 1989, soared to $203.9 million in 1990 while revenues peaked at $285 million.”

(1993)

It is worth highlighting the observation that even in the so called high technology communication industry there is a ‘low end’ of the market.

4.1.3 Personnel

From its origins in Westech a small R&D company in Calgary NovAtel, backed by two government owned utilities grew an idea to a multi-million dollar enterprise with significant levels of staffing. According to one interviewee, NovAtel employed about 400 people in 1988. Salmon estimates that around 1990 the workforce expanded from 1200 to 1900.

4.1.4 Public policy

The example of NovAtel reveals why when governments get involved with individual corporations the success of the venture rides with the management of that organisation. In this case it is clear that the organisation could have been managed better. In some ways, such a study reveals why it is all too easy for governments to lose their appetite for industry policy. The Government rather than the utilities as an accidental backer could
use the failure as the excuse for withdrawing from the appearance of any industry development policies. Salmon as the Government Auditor is careful to document all the problems, mistakes and little of the successes. But, Novatel did develop some very strategic technologies as shown by Nortel’s interest in picking up the technology. This case then also provides lessons in why policy evaluation can depend upon the time scale adopted. Unexpected repercussions are not uncommon.

4.2 Evolution 2 – 1993–2000: from failure to boom

The time period for phase two has been chosen by the events of economic history, although it too roughly equates to a wireless generation (Steinbock, 2002). Phase one started with promise and ended with crises. Phase two interestingly becomes a story of surprising success. We end our phase two with the boom of the late 1990s.

It is common enough in the current era of regional development studies to read of the importance of clusters, sticky labour markets and the importance of the so called ‘creative class’ (Florida, 2002). In these studies what becomes important is the lifestyle that a particular city offers. Florida writes:

“The literature suggests that places attract human capital or talent through two interrelated mechanisms. The traditional view offered by economists is that places attract people by matching them with jobs and economic opportunity. More recent research suggests that places attract people by providing a range of lifestyle amenities. This is particularly true of highly educated, high-capital individuals who possess resources.” (Florida, 2002, p.745)

He further suggests:

“Talent is more closely associated with diversity than with conventional measures of climate, cultural, and recreational amenities. Taken together, the findings suggest that talent is not only associated with economic opportunity, as conventional theory allows, but is drawn to places with low barriers to entry for human capital.” (Florida, 2002, p.754)

From a critical social science perspective it is easy to be doubtful of the extent of the claims constructed either from correlations in statistical agency data or from the perhaps self-justifications of people after they have lived in a particular place. Curiously, however, in the case of Alberta we find optimism and a focus on human capital in the immediate aftermath of the demise of NovAtel. Nattalia reports:

“But many of the Novatel expatriates have found new life, formed their own companies and report success. Ian Lydiatt’s Intertel Ltd. is supplying telecommunications equipment on an international basis. Andy McGirr and Murray Tough formed Murandi Communications Ltd., specialising in radio telemetry. Martin Alcock, who employs another ex – Novatel employee Ron Busch, founded Digital Synthesis Research Inc., specialising in digital signal processing. “There’s considerable respect for technology strengths developed at NovAtel” says Sharman, who attributes his firm’s success, in part, to the entrepreneurial attitude of his former employer.” (Nattalia, 1993, p.1)

While there was some early optimism that NovAtel might re-emerge, it never did come back from the dead, but as for critical mass – that did accumulate through small businesses as well as the anchoring role of Nortel (more on this later). Following the collapse of NovAtel, there appears to have been little appetite for industrial policy
intervention and with oil prices strengthening again there was no apparent need to ‘worry’ anymore.

As one interviewee summarised the situation.

“I am a great believer in the policy of very little government and very little overt financial handouts to private enterprise. On the other hand there are not so many provinces or states that are so rigorous about it as Alberta tends to be. I think there is some risk building as other parts of the country try to duplicate what Alberta has done and start to put in place some of the incentive programs that Alberta did 20 years ago, that we might start to see some of the critical mass sucked away and when the success of your industry is based on oil in the ground, it cannot move away very well. When the success of your industry is based on people it can be very stable and it can also dissolve away very quickly.” (27 July 2001)

For further discussion on this period of Calgary’s wireless cluster development Langford et al. (2003) provides important details on firm evolution patterns.

4.2.1 Products

With the boom in the telecommunications industry during the 1990s, wireless sales by the region’s biggest technology company, Nortel, had grown to about $1.3 billion from its Calgary operations (Brehl, 1996). Sales continued to grow. By 1998 wireless sales from Nortel’s three Calgary manufacturing plants was around $2 billion. At that time Nortel was rated as the third largest producer of wireless products behind Ericsson and Motorola (Crawford, 1998). During this period Nortel employment grew from 2400 (Duvall, 1995) in manufacturing with several hundred more in research to nearly 4000 (Lewis, 2000).

This can be placed in the context of the observations of another wireless industry executive.

“Sure, [product category xxx] is becoming a commodity product now. Its becoming smaller, lower cost, it’s going to be going into every cell phone in the world. So it’s hard for us being a small company in Canada to compete in price. We have to stay in the niche markets and add an edge somewhere and that’s always a challenge.”

This latter observation should not be a surprise. The study by Bresnahan (2001) of emerging IT regions, “notably in Ireland, India, Israel, Taiwan along with more advanced areas like Northern Virginia in the USA, Cambridge, UK, the Scandinavian countries and the Silicon Valley of 40 years ago” (p.835) found that regions with advantages in complimentary rather than competing products performed better.

4.2.2 Policy issues

During the period in question the Alberta government was not particularly proactive in promoting industrial diversification. Many interviewees were clear that the government had a negligible role. Curiously, however, there were mixed views on the types of government policies needed. The emphasis was against too much industrial policy, executives and engineers preferring a low tax environment, which emphasised risk and entrepreneurship. However, in line with the emphasis on people expressed by many interviewees the policy environment could have been enhanced by a focus on place-based policies. As one executive commented, “I’d like to see better healthcare and improved roads so it’s easier to draw employees”. With the withdrawal of the Alberta Government
from industrial diversification, the main innovation programs for business were the Federal Government programs of the Industrial Research Assistance Program (IRAP) that emphasises skill and knowledge transfer through people and innovation financing risk sharing and the Scientific Research and Experimental Development (SR&ED) tax incentive program to reduce the costs of conducting R&D.

One entrepreneur made this suggestion for policy strategies.

“I think that that people thing is what we have to do and we have to look even internally here I look at all the engineers who work really hard and there is a lot of stress and as a company we are always looking to find ways to reward them obviously financially and also with ways to make them feel good. I think that one thing that makes a big difference in Calgary is that activities are geared to the engineering population. What do we do as a group to entertain engineers and give them a chance to network at their level so that they say – we do not ever want to leave. Of course they have their own networks but there do not seem to be sponsored programs that I am aware of that try to get engineers to feel good about Calgary professionally. And that is the strength right there and it can go away so quick.” (27 July 2001)

This policy perspective is reinforced by the views of another executive that emphasised that Calgary’s infrastructure was not bricks and mortar but its people.

“I’ll start sort of historically from my experience in Calgary. I started with Novatel in 1991, Novatel Communications Systems. Still sort of a publicly funded company. The purpose of that it was a diversification project from the Alberta government. Really that was the beginning of creating the wireless infrastructure here and creating a team of engineers. What happens when you do that is more than just the obvious with the engineer department there are a lot of support companies that get created, companies that make electronic packaging, machine shops, mold houses, PCB manufacturers, and component distributors and reps and all the technical support for these different companies that came out. That entire infrastructure starts building around there ... That’s why Nortel created their wireless centre out here because they bought the NovAtel base station group.”

When parts of NovAtel were sold to what was later called Nortel Networks for $38 m (Duvall, 1995), it was presented as a complete waste of effort. However, not all contemporaries were as negative towards the impact of Novatel as Salmon, seeing substantial opportunities for new industry development. Industry policy that focused on the advantages of Calgary and developing its human capital pool could have improved the situation for the next phase of development.


At the start of 2000 there was great optimism for the continued growth of telecommunications related devices and equipment. Unfortunately, within months the exuberance of the 1990s turned to ashes and the 2000s have not been kind to companies in the wireless industry. Although the global market has grown moderately through the 2000s, the competitive environment has become much tougher (Sabat, 2002; Pagani and Fine, 2008).

In March 2000 the NASDAQ (the so called technology stock index) collapsed. The dot.com bubble exploded not just exposing many e-commerce start ups as frauds but also highlighting the flawed growth and business model assumptions of many, even the
more technology savvy organisations such as Nortel. Figure 3 shows the extent to which the NASDAQ grew and declined across a short time period.

**Figure 3** NASDAQ composite index 1999–2009

![NASDAQ Composite Index 1999–2009](image)

*Source: Data accessed from www.nasdaq.com created 16 August 2009*

The stock figures are somewhat mirrored in the export data for Alberta in the manufactured goods components of the *general ICT* sector. This is more than just wireless, but Table 5 reveals that Alberta’s exports of ICT related manufactures grew strongly through the 1990s and then has experienced a prolonged fall off through the 2000s. Manufacturing employment (Figure 4) fell through the 2000s.

**Figure 4** Manufacturing employment (see online version for colours)

![Manufacturing Employment 1997–2005](image)

*Source: Industry Canada (2007a)*

At the height of the ‘new economy’ euphoria Nortel Networks, the leading Canadian technology company had market capitalisation of $375b, but by the end of the bust (2002–2003) it was valued at $3b (Johnston, 2003). Between 2000 and 2004 Nortel sold all of its global manufacturing capacity to companies such as Solectron, a major global
outsourcing manufacturer (see National Post, 2000; Evans, 2004). Nortel was following a strategy of focusing on unbundling their R&D from manufacturing (see Ketokivi and Ali-Yrkkö, 2009, for discussion of such strategies) to become a knowledge company.

Table 5 Alberta exports (current dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Goods Exports</th>
<th>Total ICT Sector</th>
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<tbody>
<tr>
<td>1997</td>
<td>1,500,000</td>
<td>1,388.2</td>
</tr>
<tr>
<td>1998</td>
<td>1,696.5</td>
<td>2,089.5</td>
</tr>
<tr>
<td>1999</td>
<td>2,089.5</td>
<td>4,657.4</td>
</tr>
<tr>
<td>2000</td>
<td>2,861.2</td>
<td>2,254.3</td>
</tr>
<tr>
<td>2001</td>
<td>1,617.9</td>
<td>1,591.9</td>
</tr>
<tr>
<td>2002</td>
<td>1,028.3</td>
<td>1,043.9</td>
</tr>
<tr>
<td>2003</td>
<td>1,895</td>
<td>1,345.9</td>
</tr>
<tr>
<td>2004</td>
<td>1,345.9</td>
<td>1,130.5</td>
</tr>
<tr>
<td>2005</td>
<td>1,130.5</td>
<td>1,060</td>
</tr>
<tr>
<td>2006</td>
<td>1,060</td>
<td>1,010</td>
</tr>
<tr>
<td>2007</td>
<td>1,010</td>
<td>1,020</td>
</tr>
<tr>
<td>2008</td>
<td>1,020</td>
<td>1,030</td>
</tr>
</tbody>
</table>

Source: Industry Canada (2007a, 2009a)
It is not clear from newspaper reports whether the Calgary manufacturing was off-shored or closed for lack of markets. But the larger pattern of outsourcing away from high income economies is an important debate in academia, a strategic dilemma for corporations and a challenge for regional governments. The trend to outsource manufactures is clear and can be understood as a cost necessity, or an extension of the need for a diverse range of inputs arising from product complexity (Wixted, 2009) or a strategic mistake by corporations and regions alike (Ketokivi and Ali-Yrkkö, 2009). The trend probably also reflects the shift in wireless value from handsets to software and applications (see Steinbock, 2003; Sabat, 2002; Pagani and Fine, 2008; Li and Whalley, 2002).

However, by continuing to do it’s R&D in Canada, Nortel and other companies exhibited a classic preference for a particular innovation system. Despite its shift to outsource but not offshore its manufacturing Nortel began construction of a $54M research centre in Calgary – (National Post, 2000). Although Nortel was an anchor firm during the 1990s the decline precipitated by the 2000 crash continued through the 2000s, with the company being wound up in 2009. Still, recorded ICT R&D expenditure in Alberta (that includes the Prairies\(^\text{[14]}\)) has held up surprisingly well, rising through the first half of the 2000s, with the latest available data revealing that in current dollars it is still higher than it was at the turn of the millennium (Table 6).

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Alberta &amp; prairies</td>
<td>201.8</td>
<td>254.3</td>
<td>236.3</td>
<td>242.6</td>
<td>255.1</td>
<td>267.6</td>
<td>276.0</td>
<td>320.1</td>
<td>244.1</td>
<td>260.1</td>
</tr>
</tbody>
</table>

Source: Industry Canada (2007a, 2009b)

While many of the companies that are included in the ICT and even the wireless industry in Calgary are the usual telecommunications carriers and related organisations, approximately 141 of 253 firms documented by Calgary Economic Development (undated) in 2007 were focused on manufacturing or services/applications. The majority of these firms are young and small.

Although according to one survey (KPMG, 2005), policy is only a minor concern of the Calgary companies, recruiting skilled staff is a major concern, equal to accessing markets and only slightly less than the need to stay at the technological edge. Given the origins of the cluster and the trajectory it has developed along with workers moving between companies and creating start-ups, it is suggestive of both policy alternatives as well as challenges ahead for the cluster.

5 Discussion

The introduction to this collection outlines four sets of questions for this project on state interventions into industry development.

First: Successful state intervention follows an evolutionary path. Both the level and role of state intervention will change in response to industry needs and market conditions. Sustained effort through a learning curve is required.
“The complete lack of policy specifically for innovation in Alberta makes it difficult to comment on this hypothesis, but interviewees were seeking some additional supports although it was not exactly clear what form those policies should take. The Alberta Government would clearly not have supported proposals for industry policies that would have been at the cost of a neo-liberal approach to entrepreneurship. Nevertheless a greater emphasis on the attributes and infrastructures of Calgary to aid in attracting talent seem to have an ever greater logic.”

Second: States work hand-in-hand with key leading national companies to try to develop sectors. The level of success depends upon the timing of entry into a product and innovation cycle that is at a starting phase. State support must be intensive in the infant industry stage, and consistent and appropriate throughout the development of the national sector. In general, the levels of intervention and support will decrease over time as the sector/firm evolves, but intervention may also rise in response to particular crises.

“What we have learnt from the Alberta case is that indeed timing is apparently quite important. Alberta entered the wireless market very early in the system’s development, in fact it established the first commercial mobile service in North America. The intervention into the market was timely, and experimental at an early stage, it just was not continued. The period during which Nortel was unraveling (the 2000s) does seem to have to have been a period that could have benefited from particular future oriented policies to stabilise the situation.”

Third: States use a wide variety of tools from setting up an innovation system to cluster-specific activity at the regional and sectoral level to firm-specific policies. The particular level of intervention will depend on the combination of national, sector, and firm-specific details as well as the level of development of the sector/firm both in the product/innovation cycle and nationally.

“It is a curiosity of the Alberta case that the initial exploratory work into mobile services was supported by two public utilities. One expert on the Alberta case has suggested that while it was not directed by overt policy it was probably encouraged. However, it is the role of utilities with stable incomes and looking for growth that is significant. Both utilities were later privatised and became less interested in innovation. Interviewees clearly identify the cluster as important – it is the people that are important and the people stay for a number of lifestyle reasons.”

Fourth: Overly heavy state intervention, where the state becomes primarily responsible for outcomes), in stifling the private sector, will lead to failure. Inadequate levels of intervention or using tools of intervention that stifle a sector/firm at a particular point in its development can also stifle development of the sector/firm.

“Alberta by following neo-liberal policies while not supporting the industry except through low tax rates and public research support at least did not get in the way of the industry by stifling it by being too directional or by overtly supporting a different industry.”

But this case of Alberta has also hinted at some other policy ideas.

5.1 21st century ‘experience economy’ policies

The framework for this project was to focus on finance, product development, personnel and strategy. What we can learn is that even when governments encourage business development in advanced economies; finance, product development and strategy can be
beyond the capacity of governments to effectively influence. Regional governments do not have the deep pockets necessary for serious intervention in financing or product development and speed of change in global industries can be challenging to respond to when there are expectations of "regional" outcomes. Following the perceived failure of NovAtel, the Alberta Government withdrew from any interventionist industry policies, except perhaps in oil and gas. For most of the last 20 years Alberta has relied on market forces supported by neo-liberal polices such as tax measures.

However, the issue of personnel offers a very different insight into the possible roles of government in regional and industry development for the future. If we look closely, there are lessons from the case presented here. Alberta was fortunate that it had a technological advantage when it first established NovAtel. Better still there was a match between the lifecycle of the cluster and the lifecycle of the industry itself. NovAtel led unexpectedly to a deep pool of skilled labour. This deep labour pool proved to be the key advantage of Calgary. ‘NovAtel University’ as it has been called, educated employees in production and research and development, but probably more importantly in entrepreneurship and market realities. But all of this was unintended and largely unpredicted.

What of today? The market has matured and global competition more fierce, particularly as Asia provides an ever greater strength in manufacturing. Alberta has largely tread water during the 2000s. Manufacturing has declined while R&D has done a little better than plateau. It seems reasonable to suggest that it is time for a re-appraisal. Calgary’s success has been surprising but that is no reason to believe that with the challenges the sector faces it can be assumed that cluster will continue. As the technological lifecycle moves ahead to a new stage, it is worth re-considering policies, which reinforce the lessons already learned. The combination of very specific skills with a geographic focus is probably critical for future gains.

If we can accept that the inheritance model of cluster development which places an emphasis on the role of founding firm employees founding there own business is often reasonable – particularly in more isolated but attractive locations (see Klepper, 2001), the policy emphasis needs to be placed not just on training but on experience. What seems to really matter is that people get the opportunity to combine training with hands on learning. This combines with other evidence emerging on the question of where value lies for graduate students. Holbrook et al. (2009) have shown preliminary evidence that graduate students that get experience working on an externally funded research project (i.e., not just their own thesis project) can market that experience to employers latter on with a higher starting salary.

This policy orientation would move policies away from just funding university or technical training or assisting with R&D costs (SRED) and closer towards IRAP models that give practical assistance to firms while encouraging networking and capacity development. Even though governments are increasingly shy of investing in technology industries in times of recession and billions are expended rapidly on infrastructure, policies for future growth (human capital) are ignored or put on hold. However, in economies where increasing numbers of the population are employed in industries that in a supply chain framework are untouched by construction (i.e., manufacturing etc is increasingly occurring offshore) new policies for knowledge based activities (R&D, design, product architecture and product-service integration) require the policy attention of governments. As Potts (2009, p.34) notes there is an important difference between “static efficiency of minimising the misuse of public resources and the dynamic efficiency
of experimentation”. What is clear here is that experimentation with particular outputs can lead to big dividends.

More formally, it can be concluded from this study that while official government policy has never been central to the success of the Alberta wireless cluster, the government framework was crucial for the cluster start-up. The cluster itself was an unintended consequence (the hope was for a single large corporation). However, the continued success of the cluster is being challenged by the 2008 global financial crisis and it would be unwise for governments to believe their luck from an investment that ended more than 20 years ago will continue. Policy by regional governments in advanced economies can make a difference in innovation outcomes and needs to be focused on the advantages of particular places and human capital.

Acknowledgements

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References


Notes

1Steinbock (2003) illustrates how the value system has fragmented.

2Different companies may have different specifications but a factory making particular parts could easily customise production for different final assemblages.

3The term semi-periphery originates with the work of Immanuel Wallerstein (see Terlouw, 1993) and the subsequent world systems literature. While there have been controversy over the identity of the semi-periphery it is important to note a few key points. It focuses on nation states not regions (Terlouw, 1993; Synder and Kick, 1979). Further, it focuses on a range of socio-economic categories such as class and wages etc. (see Boreham et al., 1989 in particular). However, while Terlouw (1993) and Synder and Kick (1979) exclude most advanced economies (nation states from their lists of the semi-periphery, Wallerstein (1976) includes Australia, Canada and both the northern, eastern and southern fringes of Europe with Boreham et al. (1989) focussing on Australia, New Zealand and Canada. In this chapter, the term is used to denote the economic/geographic position of Alberta with regard to the concentrations of North American economic activity to the East and the South West USA.


5http://phx.corporate-ir.net/External.File?item=UGFxZV50SUQ9MTc1NTZ8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1 (Accessed 7 January 2010).


8Linden et al. (2009) claim that although much of the IPod is manufactured in East Asia, wages captured by US workers are about twice that of all others. Given the similarity of the technology I would make the claim that the analysis probably extends to the IPhone.

9A famous example is Fairchild in Silicon Valley, a case also where there was considerable spin-off activity by employees (Klepper, 2001). Such start-ups Klepper argues might not be unusual and is initiating what he calls a ‘heritage theory of clusters (see e.g., Buenstorf and Klepper, 2009).


11NovAtel also lent money to potential rural service providers in the hope that some would get the licences to operate and buy their equipment.

12Motorola website.

13Personal communication with Professor Robert Mansell 21 December 2009.

14For statistical confidentiality reasons.

15It appears from other emerging evidence from studies of knowledge clusters in British Columbia that a harmonising of the local and global industry clusters and technological lifecycles has local advantages (Wixted and Holbrook, forthcoming).
A similar pattern can be observed in the Case of Alberta’s neighbour – British Columbia where Glenayre, MDI and MPR were the incubators of talent.

http://www.cra-arc.gc.ca/sred/

Website