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**Commercialization Success Factors
In
British Columbia's
Wireless Industry**

Final Report

**To
National Research Council of Canada
Industrial Research Assistance Program
And
BC Advanced Systems Institute**

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Commercialization Success Factors In British Columbia's Wireless Industry

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1 Summary – Key Success Factors, Issues and Suggestions

- **A Complete Complement of Management Skills is Essential for Startups** – It is critical that startups get all the necessary management capabilities on board as soon as possible, especially for finance and marketing, often missing with technically-oriented founders. The only way these skills can be obtained is by getting people with previous practical management experience in these areas.
- **Large Company Management Skills Needed for Significant Growth** - there is a shortage in BC of people with the skills necessary to grow large companies, because this can only come from having done it before and BC has few such companies, especially in the wireless sector. This is one reason for the lack of anchor companies in BC.
- **Need for “Anchor” Companies** - BC has lost a number of companies that had the critical mass to be called “Anchor” companies. MDA is an example of an Anchor company, as for many years it has been a source of technology and experienced management for other companies. Local anchor candidates should be given tax incentives to stay and large foreign companies should be given tax incentives to set up anchor operations here, not just R&D shops. Many of BC’s former Wireless Anchor companies are no longer here because control went elsewhere and the foreign managers decided not to invest further in their BC operations.
- **Financing a Challenge for both Start-up and Growth**– Financing for startups is difficult because of a mismatch between the time frames of VCs and the time it takes to develop a product and sales. Also, it is hard for BC companies to get amounts over \$ 5 million. Government should give tax incentives for investors to make large (say over \$5 million) investments in companies that will stay and grow with full operations in BC. Local VCs should be encouraged to be less conservative.
- **Difficulties Obtaining First Customer** - Innovative BC companies have difficulty with commercialization, because Canadian governments and large companies are not the first to buy their products. Having a first customer in BC or even in Ottawa would be much easier than having to sell first to customers offshore, which is a very difficult way to get into business. The old Unsolicited Proposal of the Federal Government should be revived and extended to Provincial and Municipal Governments, Crown Corporations - and even to large corporations by providing tax incentives.
- **Wireless Companies Must Sell Globally** - Although companies should seek a local first customer, their business strategy must be global in scope from the beginning. The largest and highest growth-rate opportunities are offshore in countries such as China, India and Nigeria and even in Europe more so than in North America. The federal government provides excellent resources for helping companies get started in export markets and entrepreneurs should take full advantage of them.
- **Industry Associations** – By far the most effective industry association for the Wireless Sector is the Canada West Telecom Group (CWTG), because its members actively help each other by sharing costs, personnel and referrals for their international marketing. Monte Jade is good for contacts for doing business in China and TIE appears to have promise for doing business in India. Some Interviewees said they would like WINBC meetings to be more directly useful for generating sales.
- **Deep Market Knowledge, Contacts and Vigilant Monitoring are Critical to Success** - Successful companies have had significant customer engagement prior to designing their products and many have sold the product to a customer before building it, to ensure they will have a market.
- **Marketing Strategy – Timing, Focus, Product Definition and Partnering** - Marketing strategy is a challenge because market demand and timing is uncertain and subject to the whims of governments and small numbers of large companies. The large telecom operators and manufacturers (OEMs) are very conservative. Sophisticated partnering and business development are required.
- **Government Support for Commercialization** – Selling and providing a product to a first customer is actually the final and critical step in product development. There is no substitute for having to meet the real requirements of a paying customer in his environment. Interviewees liked the goals of this project and suggested NRC do less pure R&D funding and do more to support commercialization.

2 Introduction

The BC Advanced Systems Institute (ASI) and the National Research Council's Industrial Research Assistance Program (NRC IRAP) contracted Noulan Bowker, P.Eng., CMC, Principal of N. Bowker Inc. during March and April 2004 to investigate and report on information and ideas that will help companies in BC's Wireless Sector to be more successful in commercializing innovative technologies. The goal of the project is to produce a list of practical suggestions for both entrepreneurs in the sector and for organizations which support companies in BC's Wireless Sector.

This report includes:

- The terms of reference and objectives for the project, as refined in the first days of the project.
- An outline of the project methodology and activities.
- Findings, Conclusions and Suggestions.
- An Appendix listing the project information sources, including the names of interviewees.

3 Project Objectives, Methodology and Activities

3.1 Project Terms of Reference and Objectives

The overall purpose of the project is given in the Mission Statement for the Project provided by NRC. A copy of this statement is provided in the Appendix. A summary of the project objectives and the information and input sought in the interviews is provided in the template of the letter used to solicit the interviews, a copy of which is also provided in the Appendix.

3.2 Project Methodology and Activities

Upon project start-up, representatives from the following organizations were consulted, so as to refine the goals, objectives and activities of the project.

- ASI - BC Advanced Systems Institute (ASI merged with the Science Council of BC in April, 2004 during this project to form the BC Innovation Council).
 - CIMI – Canadian Institute for Market Intelligence.
 - NRC IRAP – National Research Council Industrial Research Assistance Program.
 - WINBC – Wireless Innovation Network of BC.
 - Rocket Builders, Commercialization Project Manager for ASI.
 - Other consultants covering other sectors of the overall ASI-NRC Commercialization Project, who had some overlap with the wireless sector.
- The writer examined the inventory of reports available at WINBC and CIMI having information of potential relevance to the BC Wireless Industry. One objective of this project

was to avoid duplicating the content of other reports analyzing BC's Wireless Sector that have already been completed or are in progress.

- The writer utilized industry directories and anecdotal information to identify either individuals or companies who had experienced success in the industry and who would be likely to provide useful information and views for the project.
- Letters introducing the project and the writer were faxed or emailed to candidate interviewees. A template of this letter is provided in the Appendix.
- The approach in this project has been to conduct a smaller number of in-depth interviews rather than a larger number of less intensive interviews. The fact is, there are not many companies in BC's Wireless Industry that could be called successful. Each interview ran from about one to two hours in duration and most were conducted in-person in the interviewee's office, although a couple had to be conducted by telephone.
- The writer focused only on companies that had been founded in BC and have their headquarters here. Although the BC branches of companies such as Nokia and Vtech employ significant numbers of people here and help develop the industry's technical capabilities, their success was made elsewhere and their operations here focus mainly on R&D. Their BC operations are not independent enough or large enough for them to be thought of as "Anchor" companies for BC. Also, such branch operations of foreign multinationals are very few in number here, compared to the number of BC based firms.
- A list of the seventeen people interviewed is provided in the Appendix.
- The writer has also utilized information and opinion relevant to this project that he has collected from a great deal of published material and many interviews conducted by him in the Wireless industry across North America, Europe and Asia between June, 2002 and the present. A summary of these information sources is provided in the Appendix.

3.3 Interview Agenda and Questions

The letter to the interviewees introduced the project and asked the following questions. The writer repeated them all at the beginning of each interview as a means of setting the agenda:

1. The purpose of the project is to produce a report that will help entrepreneurs in BC's Wireless industry to be more successful in commercializing their technologies.
2. I am interviewing senior management people in BC Wireless companies who can be considered to be "successful" to learn how they have done it.
3. What were the key opportunities and obstacles that you encountered?
4. What were the most important strategies or decisions you adopted for moving forward?
5. What did they learn from the process and with this hindsight, how would you do it again?
6. Please tell me the story of the founding and development of your business, so I can pass on the benefit of what you have learned to other entrepreneurs.

After discussing the above, the writer asked the interviewees if, in view of the importance of customer engagement and having the first customer as close to home as possible, did they think that the Unsolicited Proposal Program that was in effect in the 1970s should be revived, in order to help high tech companies more easily get their first customer in Canada. As very few of the interviewees knew about this program, the writer first had to describe it to them.

4 Findings from the Interviews

4.1 BC Wireless Industry Support for This Project

Out of the 21 senior executives contacted in the industry, 20 agreed to be interviewed. Of the 17 actually interviewed, all gave the writer between one and two hours of their time.

- They support NRC's move from mainly supporting R&D in startups to providing Commercialization as well as R&D help for companies that have demonstrated an ability to do real business.
- They like the idea of a report that provides practical business suggestions to Wireless Entrepreneurs based on success stories in the industry.
- Many of the interviewees said they would like a copy of the report.

4.2 Overview of the Key Themes from the Interviews

The following were the main success factor themes that came out of the interviews, not necessarily in order of importance. It is fair to say the subject of government support and funding assistance programs was not high on anyone's list of success factors. The two main issues around government were requests for tax incentives of several types that would support the industry and the request that all levels of government in Canada support the industry by buying more of its products.

- Management Issues
 - Need Management Team with all the required skills early in a startup
 - Importance of good advisory group
 - Market and Industry experience of the founders
 - Change in leadership from founders to experienced business managers
 - Big company management experience is needed to grow large companies
- Financial Issues and Strategies
 - Financing Obstacles, Opportunities and Strategies
 - Partnering as a source of financing
- Marketing Issues and Strategies
 - Market Knowledge and Contacts
 - Wireless Market Timing, Changes in Market Needs
 - Complexity of the Wireless Market
 - Partnering as a product and/or marketing strategy - the need, issues, strategies
 - Customer engagement prior to product design
 - Importance of the first customer
 - Marketing and Product Strategy
 - Need to address global market early
 - Conservative nature of the large telecom Operator and manufacturer (OEM) markets
- Comments on the BC and Canadian Wireless Industry
 - History and Current Makeup of the Industry
 - Positive Factors
 - Negative Factors

- Wireless Industry Support Environment
 - Inadequate local (Canadian) market for the industry
 - Inadequacy of local venture capital situation
 - Feedback on and suggestions for Government and non-government supporting organizations and programs
 - Suggestions for government
 - Reaction to the suggestion of reviving the Unsolicited Proposal Program

4.3 Management Issues

4.3.1 All Key Management Skills Needed for Startups

- Many of those interviewed said that getting a management team with all the necessary skills at an early stage was perhaps the most important success factor. In particular, technically-oriented founders did not have adequate marketing or financial skills and these were critically needed right from the beginning. Also, it was noted that at a certain point of growth, large company management skills are needed to grow a company and when this is required it is very important to get them. Unfortunately, there are not many people with such skills in BC, as there are currently very few large high tech companies, especially in the wireless sector.
- When this was not taken care of soon after founding of the company, lack of adequate management skills later became an issue for some and it was painful to deal with.

4.3.2 Advisory Groups

Related to the assembly of a management team was the importance of obtaining a good people for an advisory group. This should comprise successful entrepreneurs and senior people from large companies in the industry. In the past the practice was to ask such people to join the board of directors of the company. Now that the liabilities for directors and the associated insurance premiums have become so onerous, most companies are putting together a separate “advisory board” as a means of assembling a team of advisors.

4.3.3 Dealing with “Founderitis”

One of the main obstacles to putting the necessary management team in place is a problem one of the interviewees called “Founderitis”, a condition several talked about in various ways. “Founderitis” is a disease in which one or more of the founders of a company believe that the company belongs to them and they need to keep it under their direct control. Getting a company funded through outside investment is like having a child leave home. You have to let go and recognize that it has a right to a life of its own and you cannot and should not continue to control it. Also, founders tend to fall in love with their original ideas and have difficulty changing course, even when it becomes clear that their original idea is not working.

4.3.4 Prior Market and Industry Experience of the Founders

Many of those interviewed had acquired a deep knowledge of their target market and had developed a network of contacts they could access, prior to starting the product-oriented venture. Typically this came from either their work with a previous company or from first entering the market on a consulting or distributorship basis.

4.4 Financial Issues and Strategies

Overcoming financial obstacles, prudent financial management and strategies for financing were identified by most as being very important. Interviewee comments included:

- Getting their first real paying customer was a key event for all, for many reasons, including financial
- One experienced CEO who had managed large companies and gotten involved in at least one startup as a sideline said that it was very important for a company to live within its means. A small start-up should not have fancy offices and fancy cars for its management – he said he sees too much of this. Shareholders would prefer to see their money being spent wisely.
- Market Entry Timing, which is discussed in the section on Marketing Strategy, is not only a marketing issue but also a serious financial issue.
- One major issue is that the venture capital community in BC likes to get a return on its investment within 3 years. All the CEOs who brought up the subject of the local VCs (Venture Capitalists) agreed that this appeared to be true and simply was not a realistic or useful time frame for any wireless company that needs the investment for product development. It takes at least two to three years to develop a real product, at least two additional years to begin to develop serious sales and then at least another two for the company to reach a size and growth rate that could reasonably earn the investor the return they require from selling their shares. This is a total of seven years, not three.
- The time it takes to develop a product varies greatly with the type of company you are and this factor is important in deciding on your financing strategy. One interviewee said he sees two types of Wireless Company. They have very different financing needs and require different financing and business strategies:
 1. Companies that develop deep Intellectual Property that may be patentable need more time to develop their technologies and then their commercial products. They require patient investors who understand this. They also have to prove the viability of their technology to potential investors and customers and this takes time. Companies in this category then benefit from having a sustained competitive advantage. There are only a few such companies in the BC Wireless Industry.
 2. Companies that are essentially integrators or users of available technology can develop a commercial product more quickly. Providers of application-oriented systems, hardware or software would typically be in this category. Product development typically takes less time and technical credibility is less of an issue. Most of the companies in the BC Wireless Sector in BC are in this category.

The above-mentioned interviewee said his company was in the first category and his solution to obtaining more patient investors was to get financed by a VCC (“Venture Capital Corporation” as defined by the BC government for tax purposes), because this provincial tax credit leveraged type of investment has a minimum five-year holding period.

- Several companies started out as consulting firms and so were financed by their revenues while they were developing their product ideas, learning about the market and developing relationships and credibility with future product customers. Some used consulting revenue to survive the bust following the telecom boom and have only recently begun to seek equity financing.
- One company interviewed started out as a distributor and was thereby able to get into business building a customer base and learning the application, without having to first develop a product. They then began to add value by providing consulting and integrating purchased products into systems. They had also obtained a license to their principal’s technology and were then able to develop and produce their own products using it. They later developed their own technology for their products and used little of the licensed technology. However, there were two problems with this approach: first, the business of selling other people’s products provides less margin to finance growth and product development and second, it was painful making the changes to the business model.
- One company interviewed faced difficulties early on because some investors had planned on divesting within only a few years and so management had to take time to find a buyer for their shares. The solution selected was to do an IPO (“Initial Public Offering” – that is, “going public”, the first financing as a public company). This created a lot of overhead for a small company and caused additional problems for raising additional money, because as the investors sold, the share price went down sharply. The writer has heard this type of story many times before.
- One CEO interviewed has been quite cautious about financial management and although he has, by his own admission, missed some opportunities for growth, he has survived the ups and downs of the telecom and financial markets and continues to be well placed to exploit his niche market. From the beginning he always got his customers to pay up front to fund product development. He pointed out that if you keep your expenses in line with your revenues and stay profitable, you cannot fail. He had decided to grow his company purely on earnings from revenues and not take any outside investment. Only recently has he started to take government money. In the case of SRED tax credits, he wishes he had known about this earlier, because he has missed the opportunity to claim for past R&D expenses. He has also applied for his first NRC IRAP grant but he said after using up \$7k of billable time in applying for it, he still has not obtained his IRAP grant for \$15k. He said he was not sure if he should continue to pursue this or pull the plug on it.
- More than one company interviewed had obtained financing from a “strategic partner”, a large Multinational Corporation that was in the same industry. This is a good source of financing where the product is technically sophisticated and the product and market development cycles are long. Unlike most VCs (Venture Capital firms), such investors really do understand the technology, the product and the market well and have the patience and the deep pockets to provide the funds needed over the required time period.
- Also, in many cases, outright purchase by this partner is often the ultimate goal of both the strategic partner and the shareholders of the company in question. Many cellular operating companies and OEMs (Original Equipment Manufacturers) in the industry have venture capital organizations, whose mandate it is to find and support companies that have

technologies of strategic interest to them by investing in them, even at quite an early stage. Over the last few years, especially while the IPO market has been out of favour, this has been considered to be an attractive financing and exit strategy for investors in small technical companies.

4.5 Partnering

- Several companies interviewed have partnered with larger companies in the industry for a number of reasons, including:
 - To obtain financing (see above, in the financing section).
 - To obtain a source of valuable industry advisors.
 - To gain credibility for selling to large telecom operators or OEMs.
 - For supplying components of the product.
 - For marketing – a channel for sale and distribution of the product to end users.
- Large telecom operators (e.g. Telus, Bell) are quite conservative about adopting new products and services, especially if they will have the potential to put their operations or reputations at risk. Telecom equipment OEMs (e.g. Nortel, Ericsson) are interested in new technologies but are very cautious about adopting them, especially if they are mission-critical and can cause a network to fail. For this reason, they are reluctant to buy from small companies that may not be around in a few years to continue to supply and support their product and provide follow-up products. In the case of one interviewee, a prospective telecom OEM customer persuaded PMC Sierra to buy his company, because the OEM wanted the product and PMC was already a qualified supplier.
- A small semiconductor company interviewed obtained a large semiconductor company as a partner which added proprietary software to the chip product and acted as the front for the small company to the OEMs, thus solving the vendor credibility problem.
- One interviewee described the sales task for his company as being more like “business development” than simply selling to customers, because it involved creating and managing an “ecosystem of relationships”. He had several partnerships, some very close and more formal and several that were more ad-hoc.
- Two interviewees reported having serious difficulties with partnerships that almost sank their companies. One said it was important to not confuse partners with customers. Partners are important but they are not your ultimate source of revenues – end user customers are. In a couple of cases the companies were relying heavily on particular large partner companies for revenues and access to their markets and they did not find out about serious difficulties with sales or the plans of the partner until it was almost too late to do anything to change course. Both companies decided thereafter to obtain and maintain close contact with their end-user markets, to ensure visibility for input to product development and marketing strategy.
- A couple of interviewees suggested that one good type of partnership for wireless application software companies is one with an “Aggregator”, as they are known in North America or a “WASP” (Wireless Application Service Provider), as known in some other places (e.g. in China). These companies bundle cellular end-user applications from several small companies and offer them as a package of services for the cellular operator to sell to its end-users. This is useful for smaller applications providers because the large cellular

operators are difficult to deal with and the business of the Aggregators is to solve this problem for both the small companies and the telecom operators.

- Another form of partner may be a first customer, who is willing to take the risk of purchasing your product for strategic reasons. Many large telecom companies, both operators and OEMs have programs to facilitate this. A key factor with such an arrangement is that they may require some type of exclusivity which may limit your ability to sell to their competitors. Another danger is with one customer being of such importance to you, there is a risk that they will squeeze you on price so much that you have little ability to profit from the deal and finance diversification of your business.
- One risk in obtaining a corporate partner as an investor is that VCs may then be reluctant to invest, as they feel they would be in an inferior bargaining position. Also a VC's investment mandate may not allow it to invest in company having such a strategic partner, as in a sense it would be indirectly investing in the large partner.
- One provider of application software said that it was important to sell to two levels in the cellular operating companies: - first, to the central application groups, who "certify" the applications and do the marketing work to support their sales force and sales channels and second to individual salespeople in the cellular operators' organizations who sell to enterprises in the applicable target markets.

4.6 The Market – Opportunities, Issues and Strategies

4.6.1 Market Knowledge and Contacts

- Some important prerequisites for success in the wireless industry are: deep market knowledge, access to people in your target markets who will help you and credibility with people and organizations in those target markets.
- Companies that started up with founders having the above resources had a head start and those that did not had to work hard to get them in order to be successful.
- Companies tended to first sell to markets and customers with which their founders were most familiar. In a surprising number of cases, their first, if not most of their first few customers were mainly in offshore markets, such as China, the Middle East, or Africa. These are not countries one might normally chose for your first sale and installation of a technically complex new product. However, two reasons were given for this decision:
 1. They sold to customers in those countries where they had the best contacts from previous experience, and where they first saw the market need. Also, in the case of China, it is where they saw the greatest future potential.
 2. They were not able to sell the product in Canada either at all or until later, because Canadian customers did not want to be the first to buy it.
- It was clear from the interviews that companies were successful by having a very good understanding of their target market and its dynamics, by maintaining a close watch on changes and acting to alter strategy as required.

4.6.2 Importance of Credibility - and How to Get It

- Credibility is a key factor in this industry, especially for those companies addressing the common carrier markets, because for an operator or a large equipment OEM, the consequences of a product failing are expensive and can damage hard-earned corporate reliability records with the public.
- Key success factors are:
 - Having enough credibility at start-up, most often through previous personal connections.
 - Building credibility as required throughout the business development process.
- Individual credibility with a potential customer arises from being remembered or known through referral as having been a significant player in a previous success story. This can come from having worked for another company that delivered a successful product or perhaps from having previously done satisfactory work on a consulting basis for this customer.
- The new team also has to earn credibility, by demonstrating that it is capable of delivering the product as promised. Potential customers typically ask for considerable proof of the product viability prior to buying or they structure a design-construct contract with milestones, so that credibility is earned as the product is being developed.
- A key requirement is credibility as a supplier and this is a hurdle that may not be achievable by a small company alone. Vendor qualification in the telecom industry can be a formidable process. It may be necessary to have a large company as partner to guarantee your performance.
- The best credibility factor is having existing satisfied customers for your product that your next prospective customer sees as being not only credible, but relevant to him. Successful delivery to the first paying customer is the most important credibility-building milestone for a company.
- A key credibility qualifier for a VC investment is the company's already having sold and delivered the product to at least one paying customer.
- Progress milestones in "Customer Engagement" prior to making the first sale are important credibility builders, both with potential customers and investors.
- A key milestone with customer engagement is to enter into an NDA (Non-Disclosure Agreement), which provides some level of mutual comfort that neither you nor your customer will pass on important information to the other's competition. This allows your customer to give you technical and market information you need to design your product and it allows you to provide technical information they need to fully appreciate the value of your product and its competitive advantages.
- The next important type of customer engagement is of course for them to actually give you some cash, perhaps a down payment for a prototype, purchase of samples or for you to provide to them a substantial demonstration of your technology. One of the interviewers called this "Earnest Money", because its significance is more in its evidence of commitment from the customer rather than its being a significant chunk of revenue.
- One thing to realize is that it costs large companies a great deal to engage with and qualify potential vendors, both in up-front costs and then on an on-going basis. Thus, even with the NDA level of engagement, the customer is beginning to invest real money in the relationship. In the end, what the customer actually pays to you for your sell price may well

be a relatively small fraction of what it costs them to actually incorporate one of your products into their business.

4.6.3 Customer Engagement for Product Design

- In all the success stories, deep customer engagement was critical for defining the product before it was designed, to ensure that there would be customers for it when it was built. Also, more than one interviewee emphasized the need to maintain close contact with customers throughout the development process, as market conditions, customer needs and the competitive situation can change rapidly and radically during the development process.
- Although few companies interviewed were able to get a first sale in Canada, a number were able to get the cooperation of local representatives of their target markets, such as Telus, Bell or BC Hydro which provided test and demonstration facilities to help them develop their products and achieve some level of credibility. These resources were greatly appreciated but actual purchase of the products in question would have been a great deal more valuable.

4.6.4 Importance of Getting the First Customer

- A number of interviewees said they did not and would not start developing a product until they had actually obtained a hard purchase commitment from a customer – which in most cases meant receiving some portion of the price in cash upon signing the contract and then perhaps progress payments based on delivery or development milestones.
- Making that first sale is the defining event that turns an organization into a commercial business. It is a very important milestone for the following reasons:
 - Financial
 - Revenue is certainly the best source of working capital and if one can get paid partly in advance it is the best form of financing for product development or production.
 - Risk reduction
 - Proof of technical viability.
 - Proof of product concept.
 - First demonstration of Market Acceptance.
 - First demonstration of the viability of the Business Model.
 - Completes the product development.
 - Debugging of complete supply chain.
 - Working out the roles of product component partners or distribution channels.
 - Credibility
 - Gain a track record from actually delivering the product and satisfying a customer.
 - Learn how the customers in your market actually do business.
 - May be key requirement to getting venture financing.
 - Confirmation that the technology actually works – removes technical risk.
 - Reference for prospective customers.
- Improved Market Knowledge by discovering customer's real needs in depth.

4.6.5 Need to Address the Global Market Early

- Many of the companies interviewed said they did not hesitate to jump into the offshore market, as they said that is where the big opportunity is. One or two said: “If you know your market is offshore, just do it.” It is fair to say that all those who said that had previously had extensive experience with the customers and markets in question. However, it is true that the big opportunity is offshore and it is with cellular. North America is a cellular backwater in terms of market penetration and sophistication of its users. Wireless LAN (802.11x) is certainly a big opportunity in North America and it will likely spread offshore, but by any measure it is small compared to the cellular market.
- While the writer advocates that BC companies should try to obtain their first customer in Canada, their plan should definitely be to design for customers outside Canada and to have an export marketing strategy and plan right from the beginning.

4.6.6 Marketing Strategy - Leading the Target

A key strategy suggested by more than one interviewee is to start developing a product now for a market that will only be available in the future. This is particularly applicable to the wireless market, where many products depend on the availability of a common carrier infrastructure. Although this has been a risky proposition recently, one can theoretically forecast when a capability such as 2.5 G cellular infrastructure will be available and have end user products available when the network is available. Key to making this strategy work are the following:

- Understand how long it will take you to fully develop and be able to supply a complete product that takes advantage of your technical competitive advantage.
- Research and predict what the market will need in that time frame.
- Design the product to meet that future need.
- Do the business development necessary for successfully selling it at that time.
- Implement a financial strategy that will allow you to fund R&D and business development, production, product support and other company operations, until you receive sufficient revenue from sale of the product to be cash-flow positive.
- Continuously monitor any changes in the market and the industry that may make it necessary to adjust your plan or change it altogether.

4.6.7 Marketing Strategy – Addressing *Latent Needs*

- According to one interviewee, “Good Marketing” is asking a customer what they need and then delivering a product that exactly meets that need. However, “Great Marketing” is uncovering *latent* needs, important needs that they are not currently aware of and then supplying a product that meets that latent need when they become aware of it.
- Examples of this are cell phones. In the 1970s no-one knew they needed a radiotelephone they could carry around in their pocket. Twenty years later they are considered by many to be necessities, not luxuries.

4.6.8 Time Factors – Industry, Product and Market Timing

- It likely takes about two years to three years from a functioning technology and a product idea to develop a prototype product that can be demonstrated to a customer. If all goes well, it likely takes an additional three years to complete the product and start getting meaningful sales revenues from it. For a successful commercial launch these internal time factors have to be closely synchronized with the availability of the market and ones financing plan.
- One CEO said that the time to “go for it” is when the market is buying, not before. This has been a big problem particularly in the wireless industry, where every “next year” for the last 20 years was going to be “the year of wireless”.
- In addition, the disconnect in timing expectations between the companies in the wireless industry and conventional venture capitalists is a seen as a serious problem. This issue is discussed in more detail in the section on Financing.
- Many companies have failed in this industry by investing heavily in product development and marketing only to find that the infrastructure required to support their product doesn’t materialize or the end-user market demand simply does not appear for some reason, even though it logically should.
- Theoretically market timing should be relatively straightforward for a common carrier related businesses, because the standards are established well in advance, spectrum licenses are issued and the licensees have to provide certain levels of service within certain time frames. As we have seen with the deployment of 3G cellular, it has not been so straightforward and many hopeful suppliers were either too early or are now too late in developing and launching infrastructure and end-user products.
- “Data-Over-Radio” (Wireless) applications have remained a niche market phenomenon until very recently, even though the viable enabling technologies have been available for many years. “Next Year” has been the “Year of Wireless” for the last 10, if not last 20 years. Locally, MDA developed the first efficient data-over-radio modem in the late 1970s and this technology was the basis of MDI’s success in the 1980’s. Text messaging with paging started to become popular, but was limited mainly to business use and was quickly replaced outside North America by SMS (the short message service available with GSM cellular). SMS was probably the first mass-market success story for data-over-radio and this has been very popular in Europe and Asia for a few years now.
- Ironically, many believe that this year, with the very recent popularity of “2.5G” CDMA 1X and GSM GPRS cellular applications, such as camera phones, actually will be the “Year of Wireless” for North America, when the mass market embraces data-over-radio technology.

4.7 Interviewees Comments on BC’s Wireless Industry

- Several people made comments to the effect that BC has great pool of technical talent with lots of great ideas, it is a wonderful place to live, the quality of people is high and it is a great place to attract good people to do R&D. A few commented that Vancouver benefited from the availability of immigrants from many cultures and countries and this was a resource of knowledge and contacts that should be tapped. Vancouver’s multicultural acceptance was noted as a real asset.
- However, several people noted that the venture community, governments and large corporations here are quite risk-averse. One recent immigrant to Canada, with

entrepreneurial experience in a number of countries, clearly articulated a number of points that other interviewees alluded to and that the writer has heard on a number of occasions in his travels outside Canada. (although perhaps somewhat controversial, these points are useful to consider)

- This interviewee said that Canadians appear to have an inferiority complex – they are so incredibly conservative and risk averse, that this is not the place to try and grow a large company. It is a good place to start up a company with innovative technology that perhaps can dominate a niche market without having to grow to be very big. He said this is a cultural thing and is not likely to change – so entrepreneurs and stakeholders should work with it rather than try to emulate Silicon Valley and other high-flying tech hot spots, which BC will never become.
- He said he observed that a lot of BC companies get sold to larger companies outside BC before they get very large and then the new parent companies appear to not want to try to grow the company here.
- Government and large companies like Telus did not appear to be very interested in dealing with small companies and he found their big RFP's ("Requests for Proposal") to be too time-consuming and expensive to handle. He said that he finds the US to be different in this respect. Governments and large companies will give smaller companies a go, by purchasing their innovative products.
- He thought Canadian companies have too much dependence on government.
- In different ways, a number of interviewees commented on the fact that governments and large organizations in Canada seemed to be reluctant to buy innovative products from small Canadian companies and so they had to obtain their first customers elsewhere, even though it seemed logical that certain Canadian customers should have been the first to buy.
- Although in a number of cases, government-owned organizations and telecom companies had offered their facilities as test sites and thereby verified the viability of the products, they did not actually buy them.

4.8 Government Support

The following government programs were mentioned in the interviews as having been useful. They are not listed in any order of priority. One comment the writer heard from several interviewees was that it was hard to find out about all the government and non-government organizations and programs that were available and applicable to their needs.

4.8.1 SR & ED Tax Credits

Scientific Research and Experimental Development (SR & ED) Federal tax credits are probably the single best single source government funding assistance for companies doing R&D in Canada. It is surprising how many companies either do not know about this program or do not take full advantage of it. It is one of the main reasons that foreign companies want to have R&D facilities in Canada.

4.8.2 Trade Offices in Canadian Embassies and Consulates

A few interviewees mentioned that they found the Canadian Embassies and Consulates to be helpful. My personal experience is that the trade commissioners and especially the locally retained Commercial Officers or Business Development officers in Canada's foreign posts comprise one of the most important sources of information and introductions for companies engaging in export business development. The writer has used this resource many times over the last 30 years with excellent results, especially including his recent international work in the Wireless Industry.

4.8.3 NRC IRAP Trade Missions to Asia

A number of interviewees participated in or knew about the NRC trade missions to Asia. They said they liked them because they were particularly well targeted for Wireless and put them in touch with relevant local technology organizations. In particular it also helped them make contacts that were more appropriate for smaller Canadian companies.

4.8.4 NRC IRAP R&D Project Funding Assistance

- Many of the interviewees had utilized IRAP funding for R&D. Many of the Interviewees commented that they thought a lot of IRAP money was wasted on companies that never did anything with the technology. They would like to see this money be directed more to companies that would use it to actually succeed in developing and selling real products. They also said that it would be better to fund product development and commercialization as well as R&D, as this is the funding gap that needs to be filled.
- One interviewee said that the main benefit he sees from the small R&D grants of up to \$40k is that they can be used for a project to qualify potential technology ideas to see if they are viable. Except perhaps for a small two man operation in a garage, this level of funding is not enough to do serious development.
- One interviewee commented that a key problem he sees with the IRAP grant system is that if he already has a customer who has committed to buying the product, then he is disqualified from obtaining NRC funding. He said that this seems backwards, as NRC should be funding development that has commercial potential. For a start-up in particular, the company should be getting a customer before it starts development, to ensure that there will be a market for the product.

4.8.5 NRC IRAP Market Assessment Funding Assistance

At least a couple of interviewees had utilized this program and found it to be useful. As a consultant who has done a number of market assessments over the last 13 years, the writer considers it to be a particularly useful program, as it provides practical commercialization help. It either helps a company disqualify a poor market business proposition or it helps management fully understand a good business opportunity and create a marketing strategy to exploit it.

4.8.6 PEMD (Program for Export Market Development)

The PEMD (Program for Export Market Development) program of Industry Canada, which funds half of airfares for export business development, plus some additional expenses, is particularly helpful when business development requires that a number of people make repeated trips to develop business in an offshore market. This, of course, is typical in the wireless market, where one must engage deeply at the technical level, early-on in the business development program. It also supports additional expenses for attending conferences and participating in trade shows.

4.8.7 Industry Canada Trade Missions

The trade missions are particularly useful if you do your homework ahead of time to have clear business development objectives and a good idea of who you want to see. The mission activities are also useful for gaining local market information and for networking opportunities.

4.8.8 Canadian Embassy Events Associated with Trade Shows

Interviewees said that the most valuable part of the trade show support is the collection of activities organized by the local Canadian Embassy or Consulate in connection with the show. The Canada West Telecom Group makes particularly good use of Industry Canada help to leverage its effectiveness in these trade shows and the related events.

4.8.9 TR Labs (and NEWT) in Alberta

Considering that TR Labs was set up in Alberta to assist the telecom industry and particularly the wireless industry in Western Canada, it is a little surprising that one does not hear a lot about it in Vancouver - and this also came out in the Interviews. One company interviewed has sold a development system to NEWT, a division of TR Labs. It seems that this is a resource that could be further exploited by the BC Wireless Industry. It does not take much time or money to visit Alberta from BC

4.8.10 CRC (Communication Research Center)

Only one company interviewed mentioned the Communication Research Center in Ottawa (CRC), probably because its R&D activities are now quite narrowly focused. It can be a good source of information and referrals for some wireless technologies and market niches.

4.8.11 Revival of the Federal “Unsolicited Proposal (“UP”) Program”

- It was apparent that getting that first customer was an important milestone for every company. However this seemed to be a bigger hurdle than it should be, because many of the companies had their first sales offshore in places that had to have been very difficult to sell to and especially difficult to successfully install the product for the first time.
- The writer has been involved in a number of introductions of a new product to its first customer; both offshore and in Canada and it is fair to say that it is most definitely easier to

have your first sale and product installation as close to home as you possibly can, from both distance and cultural difference points of view. With technical products, there are usually significant product debugging, installation, training and support issues to be resolved at any first real customer site and this is difficult and expensive enough to deal with close to home, without compounding the difficulties and expense of dealing with a customer in an unfamiliar environment offshore, many time zones away.

- All the interviewees who were asked if they thought it would be better if a Canadian organization had been their first customer agreed that it definitely would have been preferable. However, very few of them had been able to sell their product in Canada and if they had, it had not been their first customer. They said Canadian customers were generally reluctant to be first to buy.
- The writer then explained the Canadian Government's former "Unsolicited Proposal ("UP") Program" and asked if a similar program would be useful if it would help them make their first sale of a new innovative product in Canada, instead of their having to go offshore first. The response from the all the interviewees was universally positive.
- The writer recalls that this program was active in the 1970's but believes it was discontinued some time in the 1980's. MDA (MacDonald Dettwiler and Associates) used this program to good advantage in the 1970's to help AES (Canadian Atmospheric Environment Service – i.e., Weather Service) buy its innovative weather satellite picture receiving station. MDA proposed to develop and sell the first such station to AES. AES wanted to buy the system, but did not have budget for it. Under the "UP" program the Department of Supply and Services (DSS) had a pool of money that a government department could use to pay a Canadian high tech company to develop and supply to them an innovative product that they would benefit greatly from, but for which they did not have budget. This was a particularly powerful government program and many people have told the writer that they wish it was still in existence: The benefits were as follows:
 - Development of a new product was completely financed.
 - The government customer worked with the vendor to ensure that it met the real operational requirements of the department.
 - The company ended up with a complete product design, ready to sell elsewhere.
 - It gained an excellent reference customer – the Canadian government.
- A condition of the program was that the company commercially exploit the product in the export market (MDA was subsequently very successful in commercializing this product line internationally).
- Based on the previous success of this program and the positive reception obtained in the interviews, the writer would recommend that this program be reinstated in some form and moreover, that it should be extended to the provincial government, municipal governments and all Crown corporations.
- The government could also extend this to supporting industrial and commercial customers, especially larger companies, to be lead customers of small companies. They could receive a tax break as an incentive.
- It seems that the best commercialization support we could give our wireless industry would be to help them get into business by helping them get a real customer. This would be much more valuable than giving them money for R&D, which provides only part of the solution.

4.9 Wireless Industry Association Support

4.9.1 Canada West Telecom Group (CWTG)

- By far the greatest praise from the interviewees was for the Canada West Telecom Group (CWTG), which now has an enthusiastic membership of about 22 companies. The CWTG has been in existence for about 10 years. It is different from other industry associations, in that the members actively use it as a vehicle to share sales costs and personnel, as well as information and sales leads, for developing export markets. They have a CWTG trade show booth in which all the companies are represented and small groups of members form to take turns manning the booth on behalf of all the members. They will have the CWTG booth at about 12 trade shows this coming year.
- The CWTG cooperative marketing program gives small companies export marketing exposure that they individually could not afford. The people who come to the CWTG meetings tend to be the senior people in the member companies who are actually involved in exporting. The membership acts as a strong network for referrals and introductions for each other. The writer has experienced notable referral results, just from attending a couple of CWTG meetings as a guest.
- The CWTG members also have the goal of forming a consortium to actually put together a joint product to sell, but so far that has not come together. They would welcome additional members and believe that a greater selection of participating companies and products, the chances for this type of cooperation increase. One member reportedly has suggested that perhaps a good way for this to get started would be for the Canadian government to buy the first such consortium product and thereby fund its development.

4.9.2 WINBC (Wireless Innovation Network of BC)

WINBC (Wireless Innovation Network of BC) was formed specifically to support the BC Wireless Industry. Several interviewees said that they thought the meetings would be more useful if they were of practical help for making sales, as is the case with the CWTG meetings.

4.9.3 Monte Jade

Monte Jade is an international organization that was formed by entrepreneurs in Silicon Valley of Chinese origin to facilitate high tech business between North America and Asia, in particular with Taiwan, China, Hong Kong and Singapore. It has a Vancouver Chapter. From attending a couple of Monte Jade events and from the interviews, it appears that attending their meetings can be useful for finding people who can help one do business in these markets. One interviewee made his first product sale through a Chinese representative that he met as a direct result of a referral he obtained from someone he met at a Vancouver Monte Jade meeting.

4.9.4 TIE (The Indus Entrepreneurs)

TIE is similar to Monte Jade, except that it was formed by entrepreneurs in Silicon Valley of Indian origin for the same purpose. It also has a Chapter in Vancouver and appears to be useful for Canadian companies that would like to do business in India. From attending a couple of meetings here and in California the writer would say it could be useful for wireless companies, as India appears to represent the next big cellular opportunity after China.

4.9.5 Others

Other industry organizations in BC that are generally applicable to most high tech sectors include the BCTIA (BC Technology Industry Association), the VEF (Vancouver Enterprise Forum) and the CME (Canadian Manufacturers and Exporters). Although they certainly can be resources for BC Wireless companies, they were not directly mentioned in the interviews.

5 Consultant's Observations on BC's Wireless Industry

- Compared to other sectors of BC's High Tech Industry, the history of BC's Wireless Industry has been particularly volatile. This volatility appears to have adversely affected the health and growth of this industry.
 - The loss to BC of wireless companies such as MDI/Motorola, Nexus/Scientific Atlanta, Glenayre, Alcatel and MPR has hurt the industry.
 - It appears that the closing of these organizations in BC is associated with loss of their control to organizations outside of BC.
 - Such "Anchor" companies are important for the health of the industry and it would be useful to consider how BC can end up with a growing number of such Anchor companies in the future.
- A certain amount of local demand for Wireless products is a great help for seeding the growth of a Wireless sector (e.g. the Alberta Wireless cluster is largely a result of its oil industry – the Ottawa cluster arose from Federal Government customers). Early Wireless companies in BC served the fishing and forestry industries. This existence of a particular local demand factor is not evident or at least obvious in BC at present.
- Unfortunately the market for many current wireless products in BC is small, if it exists here at all.
- Also, there is a shortage of management personnel in BC that has experience in growing and operating larger companies.
- The wireless industry in BC, like that of the whole high tech sector, appears to be fundamentally different from that in Eastern Canada. The BC industry has a much greater proportion of its employees in very small and very young companies. By far, most wireless companies in BC were founded in BC. By contrast, much of the industry in Eastern Canada either is or has come from well-funded subsidiaries of large, foreign multinational companies.

- Successful Wireless firms in BC may be grouped into the following non-mutually exclusive, but quite different categories:
 1. The First Type comprises companies that have a product or service that is intended to be utilized by the large common carrier telecom companies or the very large OEMs that supply them. Although the North American wireless market of this type (cellular) is sizable, the far larger and faster growing market is offshore. The telecom companies and their main OEM suppliers are very large and complex organizations to deal with. In the case of the OEMs, one might have to visit several groups in several countries within each company. Both the carriers and the large OEMs are very conservative and it takes superior credibility, a lot of work and a long time to get them to seriously consider and then accept a product from a small company. This is a very tough business proposition for small start-up company. One key to success in this business is to get the sponsorship of a friendly large company that is already selling to your potential customers. Selling in this environment typically involves setting up and nurturing a number of complex business relationships over a long time. An industry partner is a viable and likely a superior alternative to conventional venture capital firm financing for this business model, because it understands the business and the time frames involved.
 2. The Second Type comprises those that have a niche product or service or system that can be sold initially on a smaller scale to a niche market of smaller commercial, government or industrial customers - this is a formula for a business with a quicker, lower risk and lower capital start-up. It also typically lacks the sizzle and billion dollar market potential required by Venture Capitalists.
 3. The Third Type comprises those companies that started out as consulting firms, providing highly valued expertise to leading common carrier operators and equipment OEMs around the world. Some operated as consultancies for many years, prior to starting a product business and some used consulting as a short term startup strategy while they developed their product technology. Some used consulting as a means of surviving the bubble burst and recently resumed their product-oriented growth plans. There are a number of individual consultants and small consulting firms that will likely remain as consultants.
 4. The Fourth Type develops wireless consumer products and sells them through distributor networks. Typically a consumer hardware product business requires more up-front capital investment to develop a product for high-volume production than does a non-consumer product business. Perhaps more importantly, commercializing a consumer product requires a considerable amount of cash to implement a distribution and marketing campaign that has enough critical mass to be successful. On the plus side, market acceptance and sales revenues can be obtained much more rapidly with consumer products.
- BC has examples of companies that have been successful with each of the above business models.
- The story of BC's wireless industry is much more about the key people who are in it, than about the companies that come and go. BC's wireless industry has been particularly volatile, with several companies that have grown to a significant size, but now are no longer around. In many cases, founders or other shareholders have enjoyed success with these companies and this has been good for the industry, because they have used the capital they gained to start new ventures or become angel investors. Also, while the companies were

here, they provided valuable experience for those who worked for them. Many people have worked for a succession of such companies.

- For the purposes of this project, it is useful to look at why BC's larger wireless companies like Glenayre became successful and then why they were not able to sustain this success and declined to the point that they no longer employed British Columbians. Other companies, such as MDI, were successful in that they grew and were acquired with considerable financial rewards for shareholders, but now they cease to exist and the acquiring company (Motorola) closed down operation in BC – with the same result as Glenayre – no longer an employer in BC. The same happened with Nexus, which was acquired by Scientific Atlanta and then closed down. For BC then, were Glenayre, MDI and Nexus successes or failures? What can we learn from these examples?
- It seems the wireless industry enjoyed a period of success from the mid 1980's to the mid 1990's and then declined. The writer found it interesting to note that not many of those asked were aware of the "National Wireless Association" that was formed in the late 1980's or early 1990's. According to John Mele, the president, whom the writer met in 1994, the intention was for it to represent the industry nationally. Around 1995, it closed down for lack of industry support, when government funding support for it ceased.
- Why do BC companies sell out to large foreign companies? Possible answers:
 - Founders cash in.
 - Investors cash in.
 - Company cannot access sufficient capital for growth as a BC company.
 - The Company cannot access enough large company management expertise in BC.
- Consequences for the companies that sell a controlling shareholding to non-BC purchasers:
 - Ultimate management control moves out of BC.
 - Maintaining control in BC is at risk if the company goes public, because ultimately the shareholding from additional investment, and therefore share control, shifts out of BC and a takeover is a strong possibility - especially if the company is successful.
 - In most cases, the BC part of the company reverts to a branch R&D center, with marketing and management being handled by the parent company.
 - In many cases, during a down cycle in the industry, the BC R&D branch is one of the first to be downsized or closed down, as critical R&D is kept close to headquarters.
- Consequences for the BC Wireless Industry
 - Currently there is only one more or less stable Anchor Wireless Company in BC – MDA, whose business is now only partly in the wireless sector.
 - Infosat is stable and large by BC standards, but is not really big enough to be considered an Anchor company.
- Sierra Wireless is large and successful by BC standards and has the goal of becoming a long-term anchor company in BC. However, it has yet to become large enough and stable enough to be in this category.

6 Appendix

6.1 Terms of Reference - Project Mission Statement

The following is the Mission Statement for the Project as provided by Michael Alldritt of NRC:

“A study to address the commercialization challenges associated with early stage technology development and exploitation by SME's. Through experience and success stories the study will identify working examples of creative solutions to determine best practices in the process of growing technologically innovative companies through their formative years.

Federal and provincially funded University research is primarily focused on fundamental research and Universities are a great source of scientific breakthroughs. However a much smaller percentage of federal grants are allotted to further developing breakthrough technologies and reducing commercial risk. At the same time, investing in the development of early stage technology is often too risky for established companies, thereby stagnating the innovation process by trapping technologies in a gap between funding sources. This gap is often referred to as the "valley of death". In an effort to bridge the "valley of death" thereby reducing commercial risk this study will review and analyse existing models of the commercialization process.”

The focus of the interviews will be to determine best practices in the commercialization process for the benefit of IRAP and its clients and lies within the mandate of the National Research Council.”

6.2 List of the Project's Interviewees

ASI Wireless Project	First Name	Last Name	Position
Noulan Bowker's Interview List			
From Wireless Industry Companies			
FatPort Corporation	Sean	O'Mahony	President and CEO
Contec Innovations Inc. (and Glenayre)	Perry	Quan	President
Infosat Telecommunications (and Unity)	John	Robertson	President
Flowfinity Wireless Inc.	Dmitry	Mikalhov	CEO (founder)
Cogent ChipWare, PMC Sierra, Datum Telegraphic, Glenayre, MPR	Steve	Bennett	Director of Engineering
Sierra Wireless	Andrew	Harries	VP Marketing
Colligo Networks Inc (& Spectrum Signal Processing)	Barry	Jinks	CEO
Dyaptive Systems Inc	Walter	Stein	President
Xybec Solutions Inc.	Clive	Wright	President
Corinex Global	Eric	Barker	VP Marketing
WebTech Wireless Inc.	Cameron	Fraser	CTO (founder)
TELOS Technology	Jack	Mar	President
Tantalus Systems Corp.	Keith	Martin	President and CTO
Canada West Telecom Group (CWTG)	Michael	Lee	Director
Unity Wireless (and CWTG)	Chris	Neumann	VP Sales
Cogent ChipWare	Gary	Albach	President
Datum Telegraphic (sold to PMC Sierra)	Laurie	Wallace	VP Marketing
Others			
Rocketbuilders	Reg	Nordman	
Rocketbuilders	David	Thomas	
Rocketbuilders	Geoff	Hansen	
ASI	Victor	Jones	
ASI	Gordon	Bird	
WINBC (and CIMI)	Caroline	Lewco	
WINBC	Victoria	Lohvin	
NRC-IRAP	Michael	Alldritt	
NRC-IRAP	Julia	Rylands	
NRC-IRAP	Nick	Fong	
Aeolus Projects Limited	Malcolm	Collings	
Crucil Consulting	Catherine	Crucil	

6.3 Letter Used to Request Interviews

The following is the general form of letter used to ask for interviews for this project:

Dear Prospective Interviewee:

(Mr./Ms. Referral Source) has suggested I ask for your input for an NRC sponsored project I am conducting. I am an independent marketing consultant and I have recently been asked by the BC Advanced Systems Institute and NRC to produce a report over the next month that will help entrepreneurs in BC's Wireless industry to be more successful in commercializing their technologies.

I am interviewing senior management people in BC Wireless companies who can be considered to be "successful" to learn how they have done it. What were the key opportunities and obstacles they encountered and what were the most important strategies or decisions they adopted for moving forward? What did they learn from the process and with this hindsight, how would they do it again? I am looking for those common themes and particular examples that may be of most practical help to other entrepreneurs to realize the commercial potential of their ventures.

I would very much appreciate the opportunity to meet with you for around an hour, at a time that would be convenient for you. If possible, I would like to be able to do this by the end of next week, but after that would also be fine. If you cannot be available, perhaps you could refer me to one of the other senior people in your organization, who could provide the insight I am looking for. I will phone you shortly to ask for an appointment. Alternatively, you may wish to reply by email (noulan@strategynavigator.com) to suggest a time. Information on me and my background may be most easily accessed on my website at www.strategynavigator.com.

I look forward to the possibility of talking with you and thank you in advance for your consideration.

Best regards,

Noulan Bowker, P.Eng., CMC

6.4 Prior Relevant Information Sources

The following are additional sources of information relevant to this project that the writer has accessed since June 2002, but prior to the start of this project in March, 2004:

- Technology Forecast 2001-2003 Mobile Internet: Unleashing the Power of Wireless – PriceWaterhouseCoopers
- Incorporation of relevant information from extensive interview notes from similar interviews conducted by the writer mainly in person between June 2002 and October 2003, with senior people in the wireless industry in BC, Rest of Canada, US, Europe and China
- Incorporation of extensive market research data on the industry obtained during the same time frame
- Information gained specifically from:
 - Attendance at PT Expo Comm China in Beijing in November, 2002
 - Attendance at 3GSM Conference and Trade Show in Cannes, France in February, 2003
 - Participation in Canadian Government “Nordic Wireless Trade Mission” to Denmark, Sweden and Finland in April, 2003
 - Participation in the OBSAI (Open Base Station Architecture Initiative) meeting in Vancouver in October, 2003
 - Experience in developing business for Cogent ChipWare from July, 2002 to March 2004 through intensive visits with several people in each of the Tier One and Tier Two Cellular Base Station OEMs in Europe, North America and in Asia (Nortel, Motorola, Lucent, Alcatel, Siemens, Ericsson, Nokia, Samsung, LG, NEC, Fujitsu, Hua Wei, ZTE, UT Starcom)
 - Attendance at Venture Forums in Vancouver, Seattle and San Jose

6.5 About the Author – Noulan Bowker, “Strategy Navigator”

All the work of this project was personally conducted by Noulan Bowker, P.Eng., CMC, during March and April of 2004.

Noulan is a Certified Management Consultant and Professional Engineer with over 33 of years experience in 27 countries in the international commercialization of many advanced technologies for a variety of applications and markets.



Much of his work has been in areas of relevance to the Wireless Industry, including considerable experience in the Electronics, Computer and Wireless Sectors.

Since 1990, Noulan has served entrepreneurs, CEOs and senior management teams in BC’s advanced technology industry as a full-time, independent management consultant who specializes in technical and international marketing.

Noulan’s practical experience in Wireless started in 1961, when he got his Amateur (“Ham”) Radio License. More recently, from July 2002 to October, 2003 he devoted a considerable portion of his professional time to serving as Director of Business Development for Cogent Chipware Inc., a BC based company that had developed a high performance multiprocessor DSP chip for use in “3G” (third generation) cellular telephone base station equipment.

Additional information on his qualifications, experience and management consulting practice is most easily accessed on his Website at www.strategynavigator.com