Market Hunt episode 06 Transcript -- C2MI

Thierry Harris: What is innovation? How do we plan for it? How do we integrate it into our manufacturing processes? Great ideas are everywhere, if only we could build them.

Norman Bourbonnais: That's the issue. People have all these great ideas, but most of the time, we just can't do it by itself.

Thierry: On this episode of *Market Hunt*, we sit down with Norman Bourbonnais at C2MI, a micro innovation collaborative center. His organization takes your ideas and shapes them into reality. Stay tuned.

Nick Quain: Entrepreneurship's hard, you need to have support there.

Thierry: Hopefully, it's going to be quick and painless today, maybe even a little bit enjoyable.

Norman: We don't have that major corporation that would be positioning Canada in the right way. By sharing your strategy with a partner, that partner can bring to the table a different view about how you could address that marketplace.

Thierry: We're coming up with some pretty interesting ideas.

Andrew Casey: solve it. Solve everything.

Thierry: We solve it all.

[music]

Hi folks, Thierry Harris here. On this episode of Market Hunt, we explore the innovation taking place in microelectronics manufacturing. Today, microelectronics are used everywhere, from sensors in our cars to our phones and in our kitchen appliances. The Internet of Things, coupled with artificial intelligence, is bringing about a new age of unprecedented connectivity. To create these connected machines, manufacturers must constantly tweak and adjust their manufacturing processes. They want to make their electronics more powerful, smaller, and at a more affordable price.

The microelectronics industry is primarily horizontally integrated with a set of SMEs competing with each other to produce components to feed into vertically-integrated multinationals, such as Apple or large telecom companies. These companies then assemble their components into a final product. Doing business with these multinationals requires manufacturing capacity and price certainty when developing the millions of units, which will integrate into their electronic systems.

Semiconductor startups are also entering the scene with accelerators emerging over the last few years to help foster their growth and inject new sources of capital investments.

How does one get from a bright idea to commercializing a microelectronics product? Enter the micro innovation collaborative center or C2MI. It's located in a small town in Bromont, just about an hour east of Montreal. C2MI is a product of unprecedented collaboration between industry, academia, and both provincial and federal governments. Its vocation is to advance microelectronics manufacturing research in order to accelerate the commercialization of microelectronic products.

Norman Bourbonnais: Regardless of what you need, if you want to integrate electronics into your product, C2MI is the right place to start.

Thierry: C2MI facilitates a collaboration between companies seeking microelectronic solutions to optimize their products. The founding industry partners of C2MI are Teledyne DALSA and IBM. Both have plants near C2MI's facility and own equipment inside of it, which they share with clients to help develop the microelectronic products. The center also has strong links to academia with the University of Sherbrooke as his academic founding partner. Starting off with around 10 employees, it has since grown to more than 50 full-time staff, many of them engineers specializing in operating the machinery needed to make these microelectronic products.

Norman: There's so much still to be done. You won't believe but anyway, you can grow from four people to 500 within a few years within a type of organization like the one we have which is really based on people competency and knowledge. It is just not possible because we don't have universities really that are, I would say, forming people into the field that we have, so we have to do on-the-job training for most of the people that we have.

Thierry: The difficulty in obtaining talent and the time it takes to train people to work on version 1.0 of the machine limits the growth potential of C2MI. Norman estimates C2MI to grow at a rate of 20 to 25% a year. The original idea behind C2MI was to have companies paying a membership to access their equipment and know-how. The model has since evolved.

Norman: At the beginning, we thought that people would come to C2MI and they would be using all the tools that we have in order for them to build their knowledge and be capable of doing their own development without any problem. Now, the toolset, the scientific equipment that we have is a lot more complex than we thought first. When we've tried to train people to use the toolset, they were really struggling, and trying to understand how the tool was working, how they could really be efficient in doing their own development.

We've started from four engineers and we're close to 50 people now working at C2MI and that's really the reason. We noticed that if we could offer the service of doing in collaboration with them the development work by operating the toolset, by doing the design of experiment with them all the time in collaboration, it would be a lot more efficient because we would be bringing on the table, not only the expertise that we've

built for them but the expertise that we've been building for all the other customers in the past.

What really made the big difference is the fact that these multinational that have invested millions of dollar with us at the incept where they have provided tools, they have provided option, they are paying for the operational costs in order for them to have access to this tool, not only they did that but at the same time, they shared their IP with us and for only one typical reason. It's difficult for a multinational to be interested in dealing with a startup. They are receiving 10s of calls per week and they just don't have the resources and the risk is just too important.

Major establish manufacturer will always take a look at a model that will give them an indication about their return of investment. They'll take a look at the risk in the project. That startup is coming with something a lot riskier so they don't know if they're going to have any return. Right there, they're a little bit more reluctant if you want to start a relationship with a startup. They will take a look at the availability of the market for that startup. Being a small SME might be difficult to be able to talk with Apple or to talk to Samsung because you're a startup.

Even though you have a wonderful idea, the chances are that they will not even listen to you short term. They will take a look at the time to money, how long will it take in order for them to have a return on their investment. If it's like more than two or three years, it might be just a bit too long. They will take a look at the level of revenue. It's interesting to deal with a startup but if the startup gives you only a hundred or $200,000 per year, the effort is just too important.

Thierry: When C2MI is approached by a multinational, it will often be to produce something unique that will give them an edge over their competitors.

Norman: Some of them are getting a technology that is so critical for them that they want the relationship that we have with them to keep secret. I won't be able to talk about these multinationals that are present into major fields, into telecommunication but you can try to take a look at who that could be. These guys are here to develop technologies in order for their product to be alone in their marketplace. We're pushing into microsystem sensors that will allow them to be alone in their marketplace that will be allowing them to offer something that would be unique. That's for multinational and these are coming from either US or from China or from Japan.

These guys know what they're talking about. Usually, they have their own design team and where they're really to support into the manufacturing of their ideas and see how they can become something that will become manufacturable because that's the issue. All the time people have all these great ideas but most of the time, we just can't do it by itself. You have to reinvent new material, you have to reinvent new processes but this is really what we do.

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Thierry: Multinationals will go to the C2MI to test out their manufacturing designs and revamp them for industrial production. If there is a solution already out there, C2MI facilitates contact with those companies who can execute to work. For SMEs, the job of validating what they need to build their products goes a step further. C2MI helps them deconstruct the manufacturing process and allows them to price each step to produce their microelectronic components.

Norman: We have many SMEs capable of doing part of it but needing a lot of effort in order to make sure that they do understand exactly what they need. We have these small startups, these are to me the most interesting one because their ideas are great, they believe that everything is easy to do and they need to be somehow coached.

Thierry: From multinationals to SMEs, to semiconductor startups, C2MI solves the manufacturing issues at all stages of production. Despite the benefits achieved through collaboration, some startups are still reluctant to share their strategies with C2MI. Norman elaborates.

Norman: We had that other small startup where it took us a year to convince them that they had to share with us their strategy. They were asking us all sort of stuff and we were like well, "Yes, guys, yes we can do it." You would see after a while that by sharing your strategy with a partner, that partner can bring to the table a different view about how you could address that marketplace and by doing that, you become a lot more efficient.

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Thierry: When C2MI is asked to design work with new materials or find new industrial applications, they will lean on their collaborations with universities to help service their clients.

Norman: We are an expert into how do you manufacture a product? We're not there to live up to new technology per se. When we need that new technology, that new material set, we work with universities. They're the best, they will be finding the perfect recipe for that. We are expert in taking these technologies or the pure science and we will be able to translate that into something that would be an asset for anyone that will become something that will help commercialization of their products.

Thierry: When the risk for multinationals to partner with startups is too high, they will ask C2MI to step in.

Norman: If they do not embark with them, they will be calling us and say, "C2MI, are you interested in doing the work in our behalf?" To a certain extent, they do not hire us as a development center for them but they will send us their potential customer and they will tell us, "Listen, if you do work with them, we'll be sharing the IP that we have so that you're going to gain time, you're going to gain effort. You won't be able to reinvent the wheel at the end of their time there."

If ever they're successful, when they reach a certain level of volume and a million dollar per year, that partner will be transferred back into the manufacturing partner. C2M1 is really based on a collaboration model where if the risk is too important for established manufacturers in Canada, these guys will be sending us the potential customer, they will be giving us a lot of the IP associated with the partner. We will be developing almost in their behalf the project and by doing that, we are removing most of the risks associated with a product. The only risk being the acceptance of the product in the marketplace.

For an investor looking at the startup, they see that they have access to IP, they have access to a state of the art center like C2MI with manufacturing tool, and they do have access to the supply chain as well.

Thierry: What an opportunity for you. I think that when we talked in 2016, if I'm not mistaken, there was maybe 10 people that were working at C2MI including Moez administrative folks and now you're up to 50 people and many more engineers that are developing what must be an amazing capability on state-of-the-art machines that are absolutely the 0.001 model of new machines to help you make these semiconductor chips. You're getting real-life industry problems that are coming from these multinationals that simply don't have either the time or the resources or the toolkit that allows them to develop these technologies.

What C2MI's role is evolving into is a place where you can de-risk these technologies as you were saying, that you can actually take on the project with the expertise that you're developing as you get more and more and more knowledge in terms of using the machines and optimizing their calibration to manufacture these products and then de-risk the commercialization process by being able to essentially say, "We can build a million of these. We can do it in this amount of time and here's what the cost is going to be." What an amazing resource and expertise that you're developing here, Norman. That's fantastic.

Norman: Part of the model is really providing some-- We need to remain relevant to the industry, so we are buying these new tools on a yearly basis. The tool that we are bringing are still brand-new tools, brand-new capabilities. We have invented some sort of a consortium, if you want, but people have started now giving us dollars to develop technologies that will be helpful for the future. That $15 million of new tools that we are bringing to C2MI this year will allow us to explore new technologies that we didn't have. We could double the surface here, we could invest another $100 million of new equipment in order to address new technologies. It's endless. The technology that people will need in the future because of Internet of Things, because of MedTech, because of AI, you can pursue that on a regular basis.

The model which is very interesting for manufacturers in Canada is the one where we buy these tools and we are developing a base process and they're coming with their new technologies or their new product where they want to implement these electronic

systems. Based on the experience that they have, they do do their investment after in their own shop.

Thierry: When developing manufacturing processes using C2MI's technology, companies can then replicate these processes, investing in their own facilities to optimize their manufacturing operations.

Norman: In a nutshell, they've been successful in developing their product and they are now increasing their manufacturing space form and they will be putting new equipment in order to replicate exactly what they've been having. I keep telling my board of directors, if I remain relevant to these manufacture in Canada, if I remain relevant to these great corporation that do have ideas about integrating embedded systems into their product to make their product connected to internet, to make their product even intelligent, to make their product generating data in order for AI to have a potential applications spec into their scope, people will keep coming to C2MI to develop their technologies.

Thierry: In 2019, the founding partners were able to work on close to 175 new microelectronic projects. For C2MIto remain relevant, it is key that they use state-of-the-art technologies on which they can develop tomorrow's microelectronics. Back to the conversation.

What does a C2MI provide in terms of potential for bringing some of this high-tech value-added manufacturing right here in North America? What's the potential there that you see looking forward in the future for C2MI?

Norman: It is interesting to see the perception that everything's being done in Asia. For microelectronic or sensors if you want, I would say close to 50% of all the output is being performing into Western countries. Just to start, there's a perception that everything's done in Asia, which is not the case. For one specific reason that is really not known by a lot of decision-maker, it's been years and years and years that electronic has been under tremendous pressure to improve productivity.

Thierry: The pressure to improve productivity on microelectronic devices is enormous. Every year, people want things smaller and more powerful. Norman outlines the impact of this pressure on the microelectronics industry.

Norman: When you visit corporation that are into microelectronics assembly, most of their manufacturing sites are fully automized. They're integrated. You don't see a lot of people on their line.

Thierry: These automated factories have allowed companies to retain their manufacturing sites in Western countries, limiting the impact of lower wages in Eastern countries. Now, let's look at what's happening in Quebec and Canada.

Norman: Now, looking at the industry here in Quebec, no one knows that this industry is as big as the aerospace industry. We have 45,000 people working into

microelectronics or sensors or microsystems. The GDP is about $5.5 billion so as big as the aerospace, but nobody knows that. Why? Because we don't have any product. We are embedded. People embark the electronics into a final product. If I would say, "Would you now see the flight simulator manufacturer in the West Island of Montreal? Everybody knows them. Do you think they are into the aerospace industry or the microelectronic industry?" Well, most of what they do is into electronics.

They do software, they do electronics, and they do have a few hydraulic piston for the flight simulator, but they are into the aerospace. People see them into the aerospace only. That's one of the challenges that we have because we don't have a final product per see. People see us as being not present at all. It's an important industry in Quebec. It's an important industry around the world as well. I have been looking into what has been done into investments worldwide into electronics and I would say 50% of all the major investment have been done into the Western countries as well.

Where Canada and Quebec are lacking is it to getting a manufacturing site for the electronic itself. We can do sensors, Teledyne Dalsa is the world leader as an independent foundry. We can do assembly of semiconductor, IBM has the largest site in North America. In Canada, we have Celestica which is one of the largest sites for product assembly at the subsystem level if you want. In Quebec, we have a few. We have Varitron, we have Gentec. We have a few of these that are capable of doing almost anything.

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Thierry: Quebec's electronics ecosystem is represented by ISEQ, a newly formed Association, merged from four groups spread out across the province. In Canada, it is represented by CMC Microsystems, a nonprofit representing Canada's national design network, or CNDN, a national network of 10,000 academic participants and over 1,000 companies developing innovations in micro nanotechnologies. CNDN is recognized as a major research facility and has been awarded funding from the Canada Foundation for innovation and the Major Science Initiatives program.

The problem is that there is no large manufacturer into which all of these microelectronic components filter into. Canada doesn't have an Apple or a Google or another large player that utilizes all of the electrical subcomponents and assembles them into a larger system.

Norman: All these guys are there and people see them because they do offer the end product into the supply chain. Now, it will be like a skyscraper, you see them there at the top. Have you ever seen a skyscraper without a huge foundation? AI without data is nothing. Application scope without data is nothing neither. We need the sensors to generate the data. You need the telecommunication, 5G, and LT to bring that data into the systems.

Only then you're capable of doing application or AI. Before that is just not possible. When people recognize that, they recognize that you cannot get AI without the microelectronic industry, and this is what we are offering.

We're offering that foundation, the basement of the skyscraper. Yes, it's cool. People see that, people talk about it, but at the same time without that major foundation that we are offering, nothing would exist. Electronics in Canada, 35% is in Quebec, 45% in Ontario, and the rest is scattered in BC, maybe Alberta as well but we are covering every single space market. As I was mentioning, transport, telecom, defense, security, MedTech, microelectronics is embedded everywhere.

When you take a look at the industry that we have, I would say that the 730 different corporations in Quebec are covering every single market segment and about the same level, 10-15% of them are covering each of the sectors.

Would we have to do more? If we want to be independent from other countries, the only thing that is lacking in Quebec or in Canada would be the electronic manufacturing that is lacking. We have none, unfortunately, and this is something I think we should be working on.

Thierry: The microelectronics industry is also developing applications targeting COVID-19.

Norman: When we're talking about COVID-19, up to now, Government of Canada has been working with different corporations to get the ventilators. Both of them have contacted us to get the pressure sensor needed for them. We're working with them. It's a long, long project because it requires a lot of development as well. If we want to be independent over some of these equipment, well, C2MI, Teledyne DALSA, could be part of the solution.

We're working as well on a biosensors as well to do COVID testing within minutes. We're working with universities and potentially a company that will be willing to commercialize that.

Thierry: The strain of COVID-19 exposed Canada's deficiencies in manufacturing. What does the country need to achieve independence in producing electronic products? Norman elaborates.

Norman: If we want to be capable of doing our own stuff, there will be some more investment that will be needed but we're close to an ecosystem that could provide almost anything to build any product that would be needed by Canada to be independent and capable of doing our own stuff in any marketplace.

Thierry: Wow. That's amazing and such a fundamental point that you're making here and thank you for sharing that inside information that as you say, we really overlook the importance of microelectronics feeding into industries of all different shapes and sizes. Fundamentally, that foundation, that plumbing when you strip down these skyscrapers

as you so eloquently say, there is that foundation there and nothing gets to top without a solid foundation.

It seems like what you're saying, and please correct me if I'm wrong, is that we have all these different elements as you were saying, from the Teledyne DALSAs to the Varitons, to the Celesticas, and all these different sort of separate components in the ecosystem. We still don't have to have that independence as that assembly, the overall assembly line to take all these different components, and then actually do that electronic manufacturing as an output with a single product in Quebec or in Canada.

Until we get to that stage, we're building ourselves towards getting to that stage but we're missing that final space where all of these different electronics components from the sensors to everything else that goes into creating microelectronics to go into a larger system, we still don't have that manufacturing capability yet. What does it look like? Just because again, we're hunting for markets, the show is called the *Market Hunt.* What kind of conditions would need to be in place for something like that to happen looking into the future?

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Norman: That's a good question. I've been thinking about what is missing, and I think it's the overall understanding of the capability that we have. I don't think it's being recognized by all the government up to now. The capabilities of this industry is very important. At the time where we had-- what was-- Nortel. When Nortel was present in Canada, Nortel was the flagship, the flagship that was capable of talking with the government, making sure that we were developing technology that would position Canada in the right location. That flagship, we don't have still. We don't have that major corporation that will be the driver of technology and making sure that Canada will follow the leader into something that would be positioning Canada in the appropriate way.

This is what we are, I think, missing in Canada. C2MI is starting to play, we are a flagship. We are a wonderful center. We have a state-of-the-art operation. We are the largest by far center in Canada. and I would tend to say that we are the largest even in North America. However, we are still into a growth period where we don't have the bandwidth to play that role for the moment. Why? Because I do have to reinvest on a regular basis into the facility, as I was mentioning, to remain relevant to our customers.

It's a question of whether we could spend millions of dollars into going across Canada and make sure that we are well-recognized by everyone or I can still be relevant to my customers and continue to grow to a 25% level until that size is so important that people recognize the impact of the semiconductor industry. Now, that being said, there's programs that do exist both in Canada and Quebec. One in Quebec is the innovation zone that you might have heard about. We're trying to position ourselves into such a zone. We have been successful, as I was mentioning, to recognize the industry as being a code of excellence by government of Quebec.

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Thierry: For more on innovation zones and centers of excellence, check out our episode notes on the ie-knowledgehub.ca website. Will Canada one day see the emergence of a national microelectronics manufacturing strategy?

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Norman: The strategy would be to connect to all these market segments. The aerospace industry, well-organized, but we have not really met with them. We have not sold them what the industry is capable of doing. You will be hearing me many times saying the industry C2MI, is part of the industry C2MI. We'll have success if the industry is successful. To me, the industry has to shine, the industry has to connect to all these verticals because we are horizontal.

Any technology that is being using into ground transportation and most likely be used into aerospace and most likely be used into telecom, technologies are very similar and you can reuse them from one market segment to the other. The basic aspect really is to make sure that the industry recognize the different capability that do exist and that the industry is cost-competitive at the same time.

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Thierry: Seeing what the issues that you have, I think you have put them out there in a concise manner and maybe somebody out there listening will answer the call and say, "Well, actually okay, that's exactly what needs to happen is an orchestra conductor." I think unfortunately, from what our learnings have been here at the IE-Knowledge Hub is that for so many sectors, we are dependent on revenues to be able to eat and survive in the short term.

As long as we're financing a part of the innovation but not the entire innovation, it's going to be hard to produce another Nortel-like company that is going to have the heft to be able to embed all these different separate components and then counterbalance the weights of the aerospace industry and the different manufacturing industries that are out there using all these components. It's just almost an impossible task for something like the C2MI to do, much less an independent SME or an organization that's Canadian-owned that can go ahead and fly by their own wings. Until that changes, until people recognize that, we're going to still be where we're at.

That's a good thing to know what the problem is and hopefully, we'll get people moving in the right direction because as we can all acknowledge, it is critical that Canada has that independence and that capability to be able to be self-sustainable as microelectronics become more and more and more important in all aspects of both our lifestyle, and for manufacturing, and for transportation, and for safety and security, and defense, and AI, and cyber tech, and everything else that goes with living in the 21st century and beyond.

[music]

Norman: I would change slightly what Mr. Pierre Elliott Trudeau said many, many years ago, I think it was in the '70s. Someone asked him while we had that crisis in Quebec where there was the *Front de Libération* du Quebec, whatever, we have the army. Someone asked him, "Would you really do that?" He said, "Just watch me." Based on what you said, I'm telling you, just watch us. I think we have a major project that is coming through and if we're successful, the electronic industry will be well-recognized by government of Quebec. The next step will be the Strategic Innovation Fund with the government of Canada, we've been talking with them as well. There's of interest.

I think people are starting to see that the electronic industry is strong and we need that in order to position Canada for the future. A crisis like this pandemic crisis will just open eyes to people and they will notice that, yes, we need mask, we need ventilators, we need other stuff and that other stuff is all being controlled by electronics so we do need that industry to be strong in order for Canada or for Quebec to be strong in the future as well.

Thierry: *Market Hunt* is produced by Cartouche Media in collaboration with Seratone Studios in Montreal and Pop Up Podcasting in Ottawa. *Market Hunt* is part of the IE-Knowledge Hub Network. Funding for this program comes from the Social Sciences Humanities Resource Council of Canada. Executive producers Hamid Etemad, McGill University, Desautels Faculty of Management and Hamed Motaghi, Université du Québec en Outaouais. Associate producer, Jose Orlando Montes, Université du Québec à Montréal. Technical producers, Simon Petraki Seratone Studio and Lisa Querido Pop Up Podcasting. Show consultant, JP Davidson. Artwork by Melissa Gendron. You can check out the IE-Knowledge Hub case study on C2MI as well as other cases at ie-knowledgehub.ca. For *Market Hunt*, I'm Thierry Harris. Thanks for listening.

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