MARKET HUNT EPISODE 09 - PHOTON ETC. TRANSCRIPT

[music]

Thierry Harris: Hi, folks. Thierry Harris here. In their quest for conquering new markets, most companies seek to develop consistent, repeatable products in order to solve clear and well-defined problems. Others follow a different path. They seek out obscure, unique problems, understand them and attempt to solve them. Photon etc. is one of these companies.

Sébastien Blais-Ouellette: Photon is looking for trouble. We try to have as much problems that are relevant for us that we can potentially solve.

Thierry: On this episode of *Market Hunt*, we go looking for trouble and explore that journey from science to entrepreneurship, and invention to innovation. Stay tuned.

[intro music]

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

Thierry: Is that what you're saying, Sébastien?

Sébastien: No, not at all.

[laughter]

Thierry: Ok please so correct me, thank you. Because I don't want to have the wrong assumption. I often am completely wrong, so it's helpful for you to enlighten me.

You were a scientist before, as you mentioned, you went into the dark arts of business.

We're coming up with some pretty interesting ideas here. [crosstalk]

Andrew Casey: We solve it. We solved everything.

Thierry: We solved it all.

[end intro music]

Thierry: Meet Sébastien Blais-Ouellette founder and CEO of Photon etc. Photon etc. is a high-tech instruments manufacturer specializing in optical instruments for nanotechnology material science, life sciences, and industrial applications. The company assembles components and integrates them into their cameras, microscopes, and other optical solutions in order to help their clients solve the problems they're facing.

The company's foundational technology stems from the work Sébastien completed while studying at the California Institute of Technology. There, he invented and patented

an optical tunable filter that can capture and scan through all the wavelengths in an optical spectrum. Think of a hyper-powerful sensor, able to capture the essence of a material, be it human-made or biological, allowing the viewer to accurately identify what they are looking at. [music]

Sébastien: People make cameras that look like an eye, it sees three colors, RGB. Our cameras can see hundreds of different colors like frequencies, in these cases. It's more like hearing the way that the light, than seeing the light. You can really see what is the note and the tones and with the same level than you do with music, but we do that with light. [music]

Thierry: Tremendous potential, but how does Sébastien translate his invention into a business opportunity? I asked him how Photon etc. initially hunts for new markets. [music]

Sébastien: When you have technologies like cameras, our camera can see what is the matter made off, so basically said. You can imagine how many applications and in how many fields you can have when you have a camera that can say, "Hey, this is that type of plastic art. This is the oxygen content and the skin that I'm looking at." Imagine you have that kind of camera, and you can have thousands of different markets.

The first criteria, which is not a criteria, in fact, it's just to know these markets, to know the possibilities. I alluded to the Photon is looking for trouble. This is our first phase, we try to have as much problems that are relevant for us and that we can potentially solve, then the criteria are quite standard. You need a problem that is shared by enough people that have enough means to afford a solution. This, altogether brings you potential and sustainable business for a few years, because it's a lot of investments. Sometimes we'll develop a solution.

Basically, we don't have a secret sauce for choosing a market, because this is shared by many businesses. You want just a big market where you have a lot of people with the means, but where we have a secret sauce is really to find, to cast the net wide enough so that we can capture these markets where our technology is relevant, which is not obvious from the start.

This is where people sometimes in business don't-- or people in the general community, in public don't realize is that when you invent something, you don't necessarily know what it is good for beyond your lab and can be somewhere else completely. [music]

So basically, we cast it wide. We filtered out.

We have a funnel process where we invest, we try to eliminate what is obviously not relevant. Invest a bit of time in studying each of the other ones, select a few ones. Invest more times for the five, 10 that we selected and then select just one or two to really develop prototypes. That's basically our process, but we assess the market early on the size it is and how we will absorb our technology. [music]

Thierry: Yes. That all makes sense. This is something that is always ongoing and something that you're always looking and pursuing because of your sort of pillar of working with fundamental science, advancing science as well. Not always, like you say, commercialized opportunities there, but the work has been done and who knows when it's going to be useful at some point in time.

Photon wants to be able to seize that opportunity by being able to have that vision. Your job is to talk, like you said, to as many people as possible and to really get to the bottom of things in an efficient manner. [music]

In the interview, I mentioned talking to people. What Sébastien actually does a lot of, is listening to people. The way Photon has been listening has evolved over time, Sébastien elaborates.

Sébastien: Listening is really trying not to-- The first lesson learned is we do not have in our immediate knowledge all the needs or we don't know them. We don't know all the needs that are out there. When you have a technology like that, the first thing is really to establish a dialogue with as many knowledgeable people as you can outside your field so that you can have access to real problems in the world. Because as individuals, we have all the consumer problems in mind, we know them.

Businesses, industries, scientists in life science and material science and the pharmas and medical doctors, they all have problems that we don't know about. It's just by establishing these conversations that we'll know about them and start to think about what we can do for them with our technologies. The lesson that we learn is really to get out there and talk to these people and we barely not go to Photonics shows and conferences anymore. We just go in something else conferences, so that we are in contact with these challenges. [music]

Thierry: By attending other conferences outside the Photonics field, Sébastien can seek to understand the issues faced by potential clients. He might not be able to accomplish this at a traditional Photonics conference. To understand the core jobs that need to be solved he needs to dig a little bit deeper and peel a few more layers off the onion. From Warren, job's theory, pick up a copy of Harvard professor Clayton M. Christensen's book *Competing Against Luck*. [music]

This pivot away from seeking clients in the photonics field is a recent one. Sébastien recalls some of the teachable moments he's had over the years to find new markets for his technologies. [music]

Sébastien: I made a lot of mistakes, and we collectively, and Photon made some mistakes. These were necessary mistakes. We had to pick some markets, we have to try to follow our hunch, to try to follow what we had and we imagined could be a solution to a problem. Something that I would probably tell Sébastien from 10, 15 years ago, would be to insist a bit more, to focus a bit longer. Not to focus until death, like so many people are doing in the industry, because we're being told to focus by investors, by business, teachers and mentors.

We have to focus, but we have to follow opportunities. When you have an inventor business as you focus, as you dig and I think your image of the onion is great for that, because when you dig into our market at the beginning, you said, “Oh, yes, I think we have something. We do have a solution for this problem.” You do dig a bit and you find out that it is a great problem for four or five people in the world. Then you sell one or two systems, in our case, these are big systems so it’s fine. It can feed a few people for a few months. [laughs] Then you have another opportunity and you say, “Oh, that’s much bigger,” so you go there.

What you don’t know is sometime if you dig a bit deeper and you start to understand that field of application, which can be biology. I’m a physicist. I don’t know all the problems, but if you start and meet the people there and start to investigate that market a bit more, they are very similar problems that could be solved with just a slight transformation of your offer, your product. You would have access to a much bigger market. [music]

Thierry: Digging deeper, it is tough to do while scanning for trouble from a bird’s-eye view. Sébastien elaborates on the challenges of executing this mission and how sometimes it means spitting off new companies from the main corporation. [music]

Sébastien: Having a new approach in a new field, it’s always a lot of resources. You have to allocate a lot of resources to that new field, not only to develop a product, but to understand that field, just like I mentioned a bit earlier. It’s a process that can take a long time when the field is really remote or really different from what you know. Some fields like medical tools, the diagnostic fields are even harder because you have all these regulations from Health Canada, or FDA, or others.

Once you have a solution that can be applicable to a field that has a very different business model than what you’re used to. You can either create a division, create a new entity inside the company and pay people to dig into that market and hire people that are already expert in this field. If you don’t have to mean to do that, which was our case often, you can find people that are more entrepreneurs than vice-presidents [laughs] and say, “Hey, here’s the technology. What would you do with that? Could you address that field and have these people build a company.”

That’s when a spin-off company is really interesting, you’ll manage to address a field, but somebody that you will just trust saying, “Hey, that’s your baby now. Take the ball and run.” That’s the two options I see when you have very different fields. That’s when we created spinoffs.

Sometimes it comes from the inside. We had case where intrapreneurs, like people in our company said, “This technology that you don’t take care of, you don’t foster this technology enough, you don’t invest in that technology. It’s there on the shelves.” Sometimes they have developed this technology internally, but we don’t have either the means, the market, the vision for that product or that technology.

It happened that people inside the company said, “I’d like to start a company with that.” We just said, “Yes, that’s a great idea,” and made a deal so that at the beginning worked together a bit and then they fly with their own company. Sometimes it’s not even something that we wanted to develop. It’s an opportunity that other people can see inside our portfolio of technologies.

That was early on when we didn’t have so much to mean to develop a new field. Nowadays, we have more choices because we have a bit more means. We can really think about developing a new division of Photon, for example, but it’s a question of philosophy and focus. We decided that three pillars is enough. [laughs] It’s already a lot. We have all these high-end science instruments, we have the industrial and we have the life science pillars.

That’s already spread in terms of-- for a small business. If we have somebody that comes in a different field or a very specific application using our technology for medical imaging, for example, we would be tempted to tap on the expertise of somebody else, Optina Diagnostics is a good example. It’s one of our spin-offs that does Alzheimer early detection, early diagnosis of Alzheimer disease through retinal scan of the eye, hyperspectral scan of the eye. We developed that technology for eye disease, not for Alzheimer. [music]

Thierry: For technologies to market surf from one application to another, it sometimes takes a fresh pair of eyes. In Photons case, this happened with the pivot of measuring eye disease towards spotting the early onset of Alzheimer’s. Let’s continue.

Sébastien: We don’t know anything about FDA, and it’s a different type of investor, a different type of partnering and development that we do in other fields. When I hired David Lapointe, who was the CEO of Optina Diagnostics now, and he just completely changed the business model so that it addresses a real need, so Alzheimer in this case. They found out that the technology could do that, they checked.

I would never have had that gut feeling or maybe some, but even inside Photon, we don’t have that expertise. That was a case where it was a great decision. Now they are closing series A, they got good funding up to now, and it’s amazing the results they have. Creating spin-off add expertise directly to your team and not the burden of trying to find investors and partners to develop a new line of product in a new field. [music]

Thierry: You notice how Sébastien mentioned that creating spin-offs adds expertise to your team, even though he’s speaking of a completely different company, he still considers it as part of the Photon team and why not? They are using the technology developed at Photon, and it seems that Photon is happy to see these companies fly on their own all the while retaining some of the financial benefits through a royalty or a licensing deal. What else? [music]

Sébastien: We keep partnerships. Sometimes we can be the supplier to them, or can be a customer for their cameras, so we can keep a relation. The added value is really

that we can focus on our internal goals at the company without sacrificing all of the value of this new application on these new markets. [music]

Thierry: It's important to understand here what Sébastien is saying. By spinning off a technology company, he is able to capitalize on the market potential of that technology without diluting Photons' own resources to develop it. When Photon does decide to develop a new product line, it needs to ensure that it has both the capacity to develop and maintain a technological edge. How does Photon measure and maintain this edge? [music]

Sébastien: We have a secret. Because we all come from science inside a company, there's a lot of people now outside science, but all the first employees and the pillars of the company, many of them were researchers somehow and work in research. Most of the time business are quite separate from the academic world.

They only meet each other when either a researcher starts a company and try to learn how to do that or a company needs a tech and go out to the university and try to make a partnership and to develop new technology. Our position, what we choose to do at the beginning became our secret, became a big strength in our portfolio development in how we keep an edge compared to all of these bigger companies that we are competing with.

We sell instruments. One of our pillars is to sell solutions to researchers. Researchers are the most demanding customers in terms of performance technology. Basically, a researcher wants to do something that nobody else has done before. When they call you, they say, "I want this camera, but I want it to be the best in the world and unique." An industrial will want something that is proven, that it is working, and this is demanding in its own way, but a researcher will always push you to push your technology to something new. [music]

Thierry: Let's be clear here. The hypothesis is the following, by servicing fundamental research science, Photon is able to advance its own innovation. The trick is then to attempt to translate that technology into a product which can serve a broader industrial market. If Photon had only focused on industrial problems, they might not be able to come up with the optimal solution and maintain their technological edge to deliver that solution. Let's continue.

Sébastien: They will even have ideas for you. They will even say, "Why don't you do that?" Then you'll be like, "Okay, that's an idea." Because they want for their own research something unique.

Building always something unique is not good business. It allows you to survive, it allows Photon to survive in many droughts in the past. [laughs] The best businesses are businesses where you find solutions for many people, not a unique solution for every single one because we kept that pillar. Most of the bigger companies, at some point in their life, they say, "Okay, now that we have big markets, it's too complicated to do business with researchers."

They have a small team to do that. It's super expensive. We say, "No. We try to charge the minimum we can to the researchers for this custom work. Because it allows us to think outside the box." We keep an edge on that. We do have inside R&D, inside the company, not in relation to researchers. I would say the bulk of the advancement of our technology is because we deal with people who just challenge us all the time. These are university and academic researchers or in research centers. [music]

Thierry: I believe this statement truly reveals the mindset of Photon etc. and its CEO Sébastien Blais-Ouellette. It's almost as if Sébastien, who started off as a pure scientist and then became an entrepreneur needs to keep a foot in the fundamental science field in order to stimulate the innovation to help fuel his company. It's a challenging thing to do, and it's not for everybody, but in Photon etc.'s, case, it seems to have paid off.

One of the most powerful products Photon etc. has developed was done in collaboration with scientists at the National Research Council of Canada or NRC, Canada's largest research and development organization. The IR VIVO hyperspectral camera is the outcome of this collaboration. [music]

Sébastien: We are doing infrared or IR. In VIVO, we have developed this small animal imaging system, the first commercial one to use infrared light and infrared cameras to look at small animals in the context of pre-clinical studies. We saw some publications and some research using that in the few labs in the world. People were starting to request infrared cameras from us but we just lounged and developed-- The first one was from Dan Heller at MSKCC in New York. [music]

Thierry: Clarifications, Sébastien is referring to Daniel Heller, research scientist at the Memorial Sloan Kettering Institute in New York City. For more on this, you can check out the Photon etc. case on the ie-knowledgehub.ca website. Back to Sébastien. [music]

Sébastien: At the time we thought it was a very exotic machine to look at nanotechnologies in mice. Finally, we found out that it can have a much more general and generic application in molecular imaging with some colleagues and collaborators at the NRC in Ottawa that have one of our machines. They showed that using a very, very standard dye that is used in medical imaging all the time, also some emission, some fluorescence in the infrared and the images were just fantastic. You could see through the mouse, just like if you were-- not X-ray exactly but the tissues are translucent in the infrared. [music]

Thierry: If you want to check out the video of this application, you can go to Photon etc.'s website, and have a look at the IR VIVO video on their product page. Back to Sébastien. [music]

Sébastien: We showed that to the community, to the preclinical imaging community, and they awarded us with the Innovation of the Year at their last show. [laughs] It was unexpected because we thought it was a bit of a niche system, but it turned out that it can have a much more general application because it's like you can see inside a tumor,

inside the bodies, the mice body. Infrared light penetrates a few centimeters in the body so it has a lot of applications that we didn't think of before talking to all these people in this community. That was great news.

This product is aimed at new drug development, cancer research, neurological research. Because you can see inside mouse body, rat's body. These are great models in many diseases, so that we can try to see what kind of molecule affects tumor growth or you can look at heart beating in the tissue. You can look at vascular circulations.

All the biologists that are developing new diagnostics and new drugs are fond of these technologies. They use MRI. They use PET scan, they use X-ray. They use just visible cameras and now they have a new imaging modality, which doesn't happen in every day, developing a new modality. That's what we did and it's a great feeling. I think the feeling of the market is great also. [music]

Thierry: Through their pursuit of collaborating with fundamental research, Photon was able to develop a unique application with tremendous potential. Let's continue with the interview to understand how Photon goes from invention to innovation. [music]

Invention is about creating something new, while innovation introduces the concept of use or of an idea or a method, i.e., what's the job that the innovation is going to do? What is this fundamental invention going to apply itself toward? What we want to try to understand is how does Photon, in your work processes, you innovate technologies to bring them from an invention to solving your client's problems. What does that process look like at Photon etc.?

Sébastien: That's a very interesting question because there's a big difference between an invention and innovation. Universities and the science departments and elsewhere they're full of inventions. People invent. If people develop new concepts and that's our job, other departments at the university, business schools, they teach how to build the business case. It always starts with a need.

You don't start with an invention, you never do that. You shouldn't, but a lot of companies are born out of inventions. Because the normal process is you have a need, you say, "I think a lot of people would pay if I can find a solution to that need." You can have other motivations than being paid, but basically, if you want to build a business case, that's the motivation.

You try to find a solution. You try to find a technology to answer that needs and then you say, "Okay, you have this technology or maybe not, I'm going around in universities." Other tech people say, "How could we solve that and address that need?" Then you develop that solution and you try to address the market and you develop the business to do it. That's the normal process.

All these scientists, and I used to be one, it is our mandate, and we have this new technology that can be applicable in so many fields. The needs, if they exist, sometimes completely outside your field of expertise. This invention business model cannot follow

the same route than the normal business case. The first thing is you have to find a need to make this invention and innovation. It's just when you couple that need and you already have a big part of the solution because you already have this great invention. The needs can be all over the map.

You have to dig and dig and dig, and this is what we do. We have a bit of a slogan or a path, it's called, "Photons looking for trouble." Photon is looking for trouble means just give me your trouble, give me your challenges, your problems. Maybe you think that an optical system or some kind of sensor would solve. Of course, you can come up with all sorts of challenges, including curing cancer and reducing greenhouse gas' emissions.

Most of them, you don't have a match for the technology, but if you listen enough and you spread your antennas enough, you will have a few of these needs that will match what your technology can do. It's a reverse process compared to the normal process, but once you have that match, and you do have these two components, again, the need and the solution, your solution is extremely unique. You're in a very good position, but finding that need can be very, very hard and take a lot of resources and time.

That's why we try to speed up that, but there's no magic. You have to listen. You have to be imaginative, not in how to solve a problem but in what kind of problem could be solved by your technology. This is talking to people and having a dialogue with people outside our primary field of expertise, and have people try to walk toward each other, saying, "Hey, can you solve that?" "No, but we can solve that." "But could you do that instead?" "Oh, yes, we could do that." "Hey, you could do that?" "Yes." "Okay." [laughs]

We have this. This is how we develop products, either in the life science world or industrial applications. [music]

Thierry: The foundation of innovation of Photon etc. stems from the relationships formed with fundamental research and seeking to get outside of their comfort zone, looking for trouble and problems to solve. This culture of collaboration with universities almost makes Photon etc. an extension of the research arms of these institutions. It's a fruitful partnership. [music]

Sébastien: We have established partnerships with University of Montreal, Laval, McGill. We just won partnership award for our work with the Université Laval. Because, in Quebec, in Canada the tools are so great to establish partnerships. We have so much support from the government to establish partnerships with the academics and research centers. We really took advantage of that and it's a big part of our technological success.

Thierry: Why is Quebec a good place? Because you said something that absolutely floored me during our first interview a few years ago. It wasn't last year, it was a couple of years ago, time flies.

You told me and you said, "Look at America, United States is a more socialist country in certain aspects." Because you can develop the technology and never really have to

make a sale on it and keep the IP and you can keep 100% of that. Whereas over here, you can get funding for up to 75% of your R&D, but 25% of your stuff, you have to sell something in order to feed yourself. That absolutely took me for a ride and it blew my mind that you actually said that.

You're saying that Quebec now is a place that you can actually develop long-term growth without having to worry about short-term revenues and make something happen? Is that what you're saying, Sébastien?

Sébastien: No, not at all. [laughs]

Thierry: Please, correct me. Thank you because I don't have the wrong assumption. I often completely wrong, so it's helpful for you to enlighten me.

Sébastien: You're right. It is still the case in terms of grant structures in the US and in Europe. The US there's a lot of what they call the SBIRs, SBIR companies. [music]

Thierry: SBIR, it stands for Small Business Innovation and Research program. It provides grants and contracts for companies in order to help them develop their technologies. Sébastien elaborates.

Sébastien: SBIR companies that are fully funded by smaller grants and then bigger grants. I exclude all the defense stuff in the US, which is just-- They subsidized tech companies with a defense contract. There's a lot of money for small, for SMEs in the US, where you can get contracts or grants that cover all your costs. [music]

Thierry: Terrific. What about in Canada? [music]

Sébastien: In Canada and in Quebec, you have the subsidies and the other grants. Subsidies are always based on leveraging the money that you have already. You invest 25% and you get 75%. You invest even 20%, you get 80% from the government, but you always need that seed money, which is a challenge at the beginning.

That's why we were lucky and that's why we chose to go to the academia, to research center first because they could-- Mont Mégantic in fact, the observatory there, bought our first instrument and then some university bought another one. That made us this seed money that we could leverage with the SR&ED and IRAP and all the subsidies that we can get in Canada and in Quebec.

Thierry: IRAP stands for Industrial Research Assistance Program. It's a program developed by the National Research Council of Canada. Remember, this is the same organization whose scientists helped Photon etc. develop their IR VIVO camera.

IRAP provides technical and business innovation advising, financial assistance and industry connections to over 10,000 firms annually. The Scientific Research and Experimental Development Program pronounced 'SRED' is a tax incentive provided by the Government of Canada to companies of all sizes and all industries to conduct

scientific research and experimental developments. It provides more than three billion in tax incentives to approximately 20,000 companies annually. [music]

Sébastien: The fact that you have such good leverage, though, on the money you get, enables you to make partnerships because then I can take that $20,000 turned into $100,000 if I work with universities, if I work with researchers or other companies.

Partnering, you can make five times your investment just because you're partnering. That was the goal of the government that we partner. It's still a great place to do that. I'm trying to do that in the US, you don't have these kinds of partnership grants so much. You do have some of them, but it's not as strong as here that you have, either with NSERC and even the research grants that you have. In universities, they also want them to partner with business.

That's why in Canada and Quebec, we have that structure that allows you to make these partnerships. If you are from the research community, it's even easier because you understand each other, you understand how they work. You don't have this cultural clash that you will have if you are really a more business-oriented company without too much link with academia, and then you come up and say, "Hey, I have this problem, can you solve it?" It will be a culture clash.

Thierry: It's important for our audience to understand exactly where you come from. There is obviously a pedigree there that has that fundamental research. You were a scientist before, as you mentioned, you went into the dark arts of business.

Sébastien: Yes, dark side.

[laughter]

Sébastien: From dark matter to the dark side. Dark Matter was my subject.

[laughter]

Thierry: Ironically enough, it was your subject. Sébastien is referring to his time at the California Institute of Technology, where he earned his PhD studying Dark Matter in space. No wonder he developed the tunable optical filter to study light and its wavelengths, but let's get back to *Market Hunting*. What position is Photon etc. in now? [music]

Sébastien: We have enough markets and even concrete opportunities to develop new products with partners that are ready to pay for more than we are capable of in terms of bandwidth. Things have reversed even from a couple of years ago. Now, we need to pick up just the markets and the development that are more aligned with our strategy that it will strengthen what we already know. Our strengths and our expertise, where we can tap on our current expertise because we could develop things in 10 different directions with people that want us to develop a product for them.

The economy is world wide, still booming in terms of-- there's a lot of capital out there, there's a lot of money available. Recruiting people, finding the space and the bandwidth to pursue these opportunities is probably a bigger challenge for last year than finding these markets, though. It's completely different. I've been talking the way I'm talking to you for the last 10 years in terms of-- I refined a bit my knowledge, but the challenges were always the same.

And for the last couple years, it's like, "Okay, now we have all these markets. We're producing systems for bigger and bigger markets and people want us to develop this application, this application, this application." Now, it's more a question of how to execute that plan of really growing in many different markets, trying to optimize that process without just dispersing ourselves too thin and spreading ourselves too thin in many directions. Maybe more spin-off. [laughs] That's one way, and certainly more people. [music]

Thierry: In the near future Photonic etc. is betting on a marriage of AI with hyperspectral imaging. Sébastien elaborates. [music]

Sébastien: Next 24 months will be very, very intense in terms of industrial applications. Because there's something that people are really aware of and it's all the artificial intelligence and government insists a lot on having new manufacturing process with the manufacturing 4.0.

Artificial intelligence is really intelligent when it has a lot of data. Beyond that, they won't assess, they won't have a gut feeling too much. It just needs a lot of data. It crunches it and then gives you some interesting answers and things that you wouldn't have seen with your human brain. This data is available for consumer product, behaviors, things that are online on, but not in manufacturing process.

You don't have so much data if you have a new fabrication process, if you assort food, if you want to recycle, if you want to assess drill cores, minor electrical content in a mine site. You don't have that data. You have images. [music]

We have some contracts with geologists and for the mining industry to really have a complete mapping of drill cores of this case at wavelengths from the UV to the far infrared. To develop the hyperspectral view of the mineralogy in drill course, but this is applicable to all industrial fields, and this is massive data, massive enough that brain cannot process that.

We can say, we can try to see, "Yes, this potato is rotten, so we can see the spectrum is this, this, and this way. We can try to find an algorithm that will sort rotten potatoes and non-rotten potatoes." If you just let an AI dig through the data and have it analyze massive data that hyperspectral can produce, then you may end up with new solutions that you wouldn't have thought of before.

In the next couple of years, this is something we'll endeavour. We'll have a bench here, I mean building it, so that people can come and test, anything that they sort, that they

transform, so that we can produce massive data on it, study it with AI and produce unique solutions that our human intelligence, current, our intelligence that wouldn't have seen. It will change. It will make really, really manufacturing 4.0, not only because you connect things together, but because you produce massive data on things that you want to produce or sort. [music]

Thierry: Wow, how exciting. This episode of *Market Hunt* explored the journey from science to entrepreneurship. Companies are not only collaborating at a deeper level with university and fundamental research, but they are, As in Photon etc.'s case, basing their innovations out of inventions developed at the fundamental research level.

By looking for trouble and attempting to solve these problems, Photon etc. has been able to keep a technological edge and introduce new products on the market. It's rare to see a 16-year-old company engage in this type of activity on Photon's level. They, in some ways, act like a farm harvesting the best university research ideas in their field and commercializing them in new markets.

We have also learned that the path from invention to innovation can take different forms depending on which regulatory area you're located in. In the United States, firms profit from the SBIR program. In Canada, the IRAP and SR&ED program.

Finally, we've explored different criteria for spinning off companies and taking a look into the future of manufacturing. Here, a mix of hyperspectral imaging combined with machine learning and the power of artificial intelligence will bring about fundamental changes to the way we make, sort and count things in a manufacturing field.

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You can check out the, ie-Knowledge Hub Case on Photon etc., as well as other cases @ ie-knowledgehub.ca. For *Market Hunt*, I'm Thierry Harris. Thanks for listening.