

Medical Practice Trends In-Depth Podcast

“Emerging Trends in Robotics for Healthcare,”

with guest Claus Risager, CEO Blue Ocean Robotics

Dr. Peter Polack: This is Dr. Peter J. Polack, MD, with another Medical Practice Trends podcast. Our guest today is Claus Risager.

Did I pronounce it correctly?

Dr. Claus Risager: Absolutely. That was wonderful.

Peter: CEO of Blue Ocean Robotics, which is based in Denmark.

Hi, good day, velkomst.

Claus: Hi, Peter. Thank you for having me here.

Peter: Which city are you based in, actually?

Claus: Well, I’m based in Odense. It’s the third-largest city in Denmark, just an hour and a half outside of Copenhagen.

Peter: Great. Tell us a little bit about Blue Ocean Robotics, and your background in particular. How did the company start?

Claus: My background is, clearly enough, robotics. I started working with the robotics area in 1988, so it’s been quite some years. I have a mixed background in the sense that first, of course, I was a student at university. I got my master’s degree in robotics and AI.

Then I started in industry, working for a shipyard, where we made industrial robots for welding big container ships and big supertankers. I worked there for five years. During that period, I made an industrial PhD, as well, again in robotics and AI.

Then around 2000, I switched to Danish Technological Institute (DTI), which is a similar organization to Fraunhofer, in Germany, which many people know. The purpose of such an institute is to help local industry – in this case, local Danish industry – to actually take up robot technology and use it in an appropriate and effective way. It’s a little bit on consulting, but it’s also a lot of R&D, always with a focus on how this can get into the industry.

I started as a consultant around 2000. Over the years, I build up my own department. We were around 85 people or so when we came to 2012. In that entire period, I spent a lot of time also

on building up international contacts, something like 5,000 international contacts. I started up a company in Atlanta, and other companies as well. We worked a lot of with startup investments, venture capital, and those kind of things.

Then around 2012, I realized that time had changed. I felt there was a need for being much more directly involved in actually creating the robots and bringing these into the market. Rather than just gaining consultancy to others who should do that, I wanted to really get more my hands on that.

I decided to start up Blue Ocean Robotics. We started February 1, 2013. That was more or less my background and the way forward to starting up Blue Ocean Robotics. A few words about Blue Ocean Robotics is that the focus for the company is to create and commercialize robots. That's the essence.

That means we are very active in working with the intersection between the market and key players, key users in the market, and their needs and problems on the one hand. On the other hand, we work with academia. We work with high-tech robotic companies.

Then we have specialized in finding the good business opportunities, where you can create new robots that really are breakthrough in the market. You can actually make these products, given the latest technologies that are out there. You can make it successful when it comes to price and performance, and start up a business with these robots.

We really specialize in this way, in creating the robots and commercializing, in the sense of bringing them into the market. That is the essence.

Peter: These are public-private partnerships. Do you work with government, with the military applications as well?

Claus: Military is not an area where we have been active. We do have a few government contracts though, especially Horizon 2020 has been good for us. But 80% or more of the revenue in the company is actually based on private relations.

We have a methodology we call RoBi Design. It's short for Robot Business Design. It's a partnership program that we offer to key end users which, for strategic reasons, really need some robot or robotic system to disrupt their business so that they can really change and be competitive, or do something unique.

When they have these needs or problems, they are willing to co-invest, together with us, in creating these robots and creating the business around these robots. This is something we've done quite a lot now.

I think we have ten ongoing developments of our own robots. Since we are not that old – we are three years old – I think three of them have now resulted in spinoff companies.

Peter: It's really amazing, the amount of diversification that you have for a company that just started in 2013.

Claus: Yes. As I said, we have been very surprised about the growth we have had. If you want a little bit of the status, we are a little bit more than 100 people now. We have 18 companies in total. Many of these, of course, are startups in the very early stage. Many of them are less than a year old.

We are located in Denmark, where we have the headquarters. Then we have Norway, Sweden, Lithuania, Germany, Netherlands, Hong Kong, United States, and Australia.

Peter: Wow.

Claus: We are just about to open in Italy, Singapore, and France. They are next on the line. Things are escalating. I would say it's an exploding industry, but in a good sense. I feel that our business model is very strong when it comes to scaling. We can still manage, although we're growing like crazy.

Peter: What impact do you believe that robotic automation is having in the industrial workplace?

Claus: A lot. Where should we start? Robots have the capability of making small-series production very productive and profitable for those who invest in it. That's the promise, that you can have small-scale production, small series. This means that even SMEs can automate to a high degree.

It also means that you can have profitable local production. It will indirectly have a huge impact on the logistics in the world. Ten years ago and now, we have a lot of logistics going from Asia to the Western world. But this is going to change, in my view. We're going to see much more local production, combination of freely printing of parts, robots to do highly productive production of small series, and so on.

That's just on the manufacturing side. I also think that the collaborative robot is going to be the theme for the next ten years. "Collaborative" here means small, lightweight robots, easy to install, easy to program, easy to move around, easy to instruct into new operations or new work procedures. They are kind of an assistant to production workers, who fully control them and decide what to do with the robots.

This also has a huge impact, because you don't need the engineer anymore. You can have the workforce have their own robots and be more productive. I think it will also transform the workforce, because they can have higher wages, better working environments. They simply get much better conditions and the like.

I also think that robots in the service sector – like healthcare, schools, shopping malls, hotels, everywhere – robots are going to be, again, assistants for people: delivering goods, helping us with heavy or tedious work. Dull, dirty, dangerous, those kinds of jobs that are out there.

I've been in the industry for 28 years. What happened over the last five years is much more than what happened in the 23 years before then. I really see the robotics train is really moving fast now. It's still a small industry, compared to many other industries, but it's growing very rapidly.

Peter: That's a little counterintuitive for the factory worker, who sees the robotic automation as a direct threat to his livelihood then.

Claus: Yes. There has been a lot of discussions about whether robots are going to take jobs. All the studies that I have seen show two important things. There's both a good part and a bad part of this.

The good thing is when you're introduced to technology, including robots, over time it generates more and more jobs, actually. The reason is that it moves the workforce from using their hands to using their heads. When you do that, you open up for further development and innovation. That simply creates more jobs.

This is something that has been proven. I think one of the facts that simply proves that also is that if you count the number of jobs that exist in the world today, it is higher than ever before in history. The more technology you're introduced, the more creativeness you introduce and the more jobs you create. That's a global phenomenon that I think most people agree on.

But what challenges, the negative side of things, is that the new jobs that you create are different from the old ones. The challenge is for people who do not teach or learn the new technologies, people who don't want to use it or have decided that they don't want to get engaged with new technologies.

Peter: They may get left behind.

Claus: They get left behind. This is a big challenge. I think for individuals, it's a challenge, but it's also a challenge for industries, governments, and so on.

I think the escalation of technology, of introduction of technology, is going ever faster. Therefore, I really think that governments, industries, labor unions, and so on should have very intensive programs for helping people get trained for the new technologies all the time. If they do that, there will be no problem, because there will be more and more jobs.

Peter: It seems like Europe may be leading the way on this a little bit, in terms of the education and training of people in technical schools, apprenticeships, and things like that. I think that's very helpful, so people have an alternative to just going to a university.

Claus: Yes. We're not talking about people that have to acquire PhD degree before they can actually benefit from this industrial or technological revolution. We're simply talking about whatever level you're on, technology-wise, you should every year acquire a little bit more knowledge, a little bit more expertise in this technology area.

If you are labor workforce and you know nothing, then for the next year you should just have an agenda for yourself or a target, saying, "I want to learn how to operate a collaborative robot next year," a simple one for pick-and-place, for example. Then you can gradually acquire more and more skills.

These robots are actually built in such a way that people can use them. If you can use an iPhone and if you can use a tablet, you can also learn how to use these robots. I think it's not a huge education program for PhDs. It's something where you take a whole workforce – all of us – and add on 5% every year of our skill level. It's this kind of thinking which is going to be very useful. I think those countries that really bet on this kind of investment, they're going to win a lot. They're going to win *a lot*.

Again, on the overall, I think it's very promising with the technology, because it creates more jobs. Again, it's more productive and more local. The Western world gets production back from Asia. That's also positive. But if we don't educate the workforce, and if they individuals don't follow along, there will be problems on an individual level, or even on a country level.

Peter: Very interesting. I was looking up your current product line. You actually work with clients, as you said, to create and develop new robotic solutions for them. Is that what the RoBi-X program is? Can you explain how that works?

Claus: Exactly. The RoBi-X is the program that we offer to the strategic partners, where we team up and build the robots together. Typically, these are end users with a strategic need for a new robot. They don't know it's a robot perhaps, but they think that robotics could make a difference.

If we agree, we join this partnership and make both the robot and also the business. Business here means typically it would end up with a new joint-venture company between us, and with some other investors or partner. We have it as an independent business, running together. Yes, that's the kind of partnership we'll run.

Peter: Typically, these clients come to you and say, "We feel like we have a gap here, a need for robotic solution." Or based on some of the previous work and some of the clients you've worked with in the past, do you actually go out and go to these particular industries and say, "Hey, we think we may have a solution for you, if you can work with us on this"?

Claus: It goes both ways. The company is still very young, three years old. In the beginning, of course, we had to get the message out, but we had no references. From Blue Ocean Robotics, we had references from our former jobs, but we had no references in Blue Ocean Robotics. But we still had to flag that we were interested in this kind of thing.

Actually, the first RoBi design, RoBi-X, that we ever did was with a Scandinavian company called DEKO. They have 200 people. They are putting up glass walls in new office buildings, and gypsum walls and so on. The problem is really that these glass pieces, they are very heavy, like 100-120 kg.

These bodybuilders that they have to actually move these glass pieces around, when they are my age, around 45, they start talking about getting retired. It's a problem to get the workforce to actually do the job. It's very dangerous. It's dirty. It's dull. It's all of these things. It's heavy. You get sick of it.

Peter, who owns the company, came to us and said, "If you can create a robot that can pick up the glass, take all the weight, balance it, go up and down the stairs, move through narrow corridors, and work as kind of an assistant to one of my guys, then I would like to buy a lot of these. By the way, it's got to be very low cost."

Peter: Sure.

Claus: We were thinking about it. Then we started working with him. In the beginning, it was just sketching out rough ideas based on the technology that is out there, technology on collaborative robots. It took half a year before we actually got to the right idea.

Then Peter injected more money, and we injected more efforts and time in this. We got to the next stage, where we built a plastic model and played with it on the work ground, together with his people, and simulated that it was working real. We were observing how it would work. Then we made a lot of corrections.

Then we built the very first lab version. We could pick up the glass, and everyone was happy. Then we spun it out into a company. We got an extra investor on board and money. Then we hired a CEO, and we have the board. Now we have produced the first units, and we have the first two customers on board.

I think this is a classical way of the way we work. We are very, very focused on the application or the job to be done out there, and work strategically with these users. Then create it from there and make it a completely new business.

There are no competitors. There are a lot of devices for lifting glass, gypsum, and so on. But you cannot really use it when you get to the second and third floor, and so on, because they're too big or they have too big a footprint. There's a lot of promise with these. Here you have a robot as the first robot ever in this area. The market is really a blue ocean market.

Peter: That's amazing.

Claus: That's also how we decided to get the name.

Peter: Earlier, you mentioned healthcare applications. Can you give us some examples of solutions Blue Ocean is working on specific to healthcare?

Claus: Yes. The first one in healthcare where we built a robot was to use a UV light for disinfection of patient rooms in hospitals. There are some UV-based devices out there. There are actually a lot.

But the problem with them is that it's stationary. When you put the UV light source into the room, you have a lot of shadow effects on the walls and on the surfaces, which means that you don't really effectively kill the bacteria in these areas. If you want to kill bacteria very efficiently, after you have had the device there for some time, you have to go in again, move it to some other spot, go out, wait a while, go in again, move it a bit, and so on.

We have completely changed this by having a robot that can automatically – you can have it, for example, in the basement. It will automatically go to the patient room, go into the room, close the door, and start up the UV-based disinfection. It will move around in the room and guarantee that you cover all the surfaces in the right way.

Furthermore, there is a sensor on board which detects if there are some dirt, you can say on a larger scale, like blood or something like that. If you have remains of blood or other things that are in the room, you can't really disinfect it. You need someone to go and physically remove that thing before you can go and do the disinfection afterwards. There's a lot of software with the robot to do this kind of protection.

That's the long story. This is the first robot we built for this area. The sale of this is starting. The sales are going on now. The delivery of the first of these robots is going to happen in June. It's in quite thorough testing right now.

Peter: That's very exciting.

Claus: Two other robots in this area, we have made a robot for laparoscopy surgery. This is a robot where normally today, when you do laparoscopy surgery, you have three holes going into the patient. Two of them are for the device that the surgeon is using. The third one is for the camera.

Now, two doctors are working together here. One doctor is just holding the camera and taking orders from the other doctor about how to move the camera a little bit to the right, up, zoom out, and so on.

What we've done is replaced one of the doctors holding the camera. With eye control and voice control, the other doctor can control completely that camera and do it much faster. We can speed up the surgery with around 30-40% and actually save one surgeon. That's a lot of cost savings in there.

Another robot we make, we're just building right now, is for safe patient handling. Here, you can go with a robot into a room. Some patients are able to get up in the robot themselves from the bed. Other patients, if they are cognitively not capable, then some assistant or nurse can help them get up into the robot. They can get into the bathroom. They can get out again. You can move around with it, actually.

This is a new type of robot that we have just started developing. We have the design already, but we are now going to build the first prototype of this.

Peter: Very neat. Very neat. Changing subjects slightly, I wanted to get your opinion on this. A lot of people say that there are two camps, to use that term, in robotics. One is the anthropomorphic camp. One may look at examples from Japan, let's say, where robots are created in the likeness of humans to look and act like them. The other is the functional camp, more Western countries like the US, where there's less interest in cloning humans, but more interest in the function.

Do you agree with that? Do you think these are mutually exclusive?

Claus: I don't think they exclude each other, because you're actually depending on both. To make very successful robots, I think you need to merge the two. What is really interesting about the Korean, and especially the Japanese, approach to making robots humanlike is to have a very natural interaction.

I once worked with a project where we made a small AGV, small navigation robot. But we put a small face on it, which could show happy smile, a little bit disillusioned or confused, and a very sad smile. What it did was, very simple it moved around an event, a trade show, and found one pair of legs. If it did so, it moved towards the person, stood in front of it, and showed a very happy smile. If the person started walking, it would follow that person and still be very happy. After a few seconds, it would lose interest and find another person.

I can tell you, it had so much attention. It was a very low cost, like \$10,000, robot in total. We were exhibiting together with 20 other AGV producers. They had robots up to 1 million euro, million-dollar robots.

But this robot got all the attention, and there was only one reason: because it had a face and it expressed its emotion, its status, through an intuitive face. It got all the attention from the media and press, and people coming in, because they saw a robot. They got something they could relate to. This means a lot.

This is exactly what the Japanese are trying. They're trying to put the status or the understanding of the context into a natural way of expressing that to other people, to humans. This means that if it's done in the right way, you understand the robot quite directly.

You also see that in some industrial areas now, like with the Baxter robot made in the US, they have also tried to make a face on the robot so that the robot, through that face, can actually express what it's doing.

I think this has a great future. Where it gets not so successful is when you're trying to make robots real copies of humans, like androids. In some cases, you want to make kind of an android, or very humanlike. That counts, for example, when somebody is trying to make a sex robot, obviously, they have to make it look like a human. Otherwise, there's not very much point in it.

Peter: Sure.

Claus: There's a meaning there. But if they do it just because they want to do it, it makes no sense. It gets into this uncanny valley. That's not so good. But I really think that these two worlds will benefit a lot by learning from each other, absolutely.

Peter: Do you think that robots will always be subservient to humans? Or will we see some kind of convergence of robotic technology with humans, more of a cyborg type of scenario?

Claus: Talking about this in 2016 may get people to feel very awkward about this.

Peter: Uncomfortable.

Claus: Yeah. But all projections actually show that when we get into the '30s or so, it will be very popular to talk about replacing body parts with robotic body parts. They are faster. They are stronger. They can have a longer endurance. You can maintain a healthy body for a longer time, or a brain for a longer time.

Maybe you can have extra sensors, like if you can see in the dark, because you have implanted one of your eyes, for example, is a robotic eye. Or you can control it, but you have extra sensors inside. What kind of extra capability will that give to you?

This will certainly be something we will be discussing crazy, maybe in around ten years from now and ten years ahead. But I'm pretty sure it will be a very successful merge that people will start being very happy about these replacements of body parts.

I think it's like plastic surgery. When that came in in the '80s and '90s, it was a big discussion. But today, it's not being discussed at all. Some people do it. Some don't. It will be on the same level.

Peter: Mainstream.

Claus: Mainstream, yeah. It will end that way.

Peter: Now, do you share the fear of some industry experts of the rise of artificial intelligence?

Claus: I think this is the one point where we should think carefully. This is where there could be a transition of humans that have robots to do work for them and what will happen if the robot is actually smarter than us.

It's not so dangerous if smarter means that the robot can do mathematics faster than we can do it, and those kinds of things. That's still on the safe ground. But if we think about what intelligence is – problem solving, using our network to get things done, finding ways to solve even more complex problems – if robots get to that point (and all projections show that, with the AI, robots will get to that point), then I think it's something we should discuss a lot and think about carefully, how we're actually doing this.

Peter: There may need to be some sort of standards in the industry to maybe have Asimov's Three Laws of Robotics.

Claus: I think it's like with the drones, but just on a bigger scale. The drones came in a few years ago. There are a lot of good things you can do with drones, but there are certainly also a lot of bad things. Drones are just on a little scale what we will see with the AI, when that is rising.

The good thing with very bright AI is that some of the problems we're dealing with today – for example, all the terrorism stuff that we're dealing with – maybe an AI would be able to actually come up with a much better solution than what we humans can find out. That would be great. The perfect help. But the AI may also be a threat to us if, in some way, it's not our friend. "Our friend," what does that mean? Who is "our"? Is it the good people or the bad people?

Peter: True, true.

Claus: All these kinds of things are major topics to be discussed. I think we have around 10-15 years before we will see this kind of challenge. If you take a computer chip today, it's like a big insect or a mouse brain. For \$1,000 processing power, that's about a mouse brain. But in 12-13 years from now, it's like a human brain for the same price. It's that kind of change that we see over a decade. It's going to change some things, certainly.

Peter: I have one last question for you. Does the fact that the Lego company is based in Denmark give you an unfair advantage in recruiting talent?

Claus: It's never unfair, of course.

Peter: That's how our kids got started in robotics.

Claus: Yeah, you are right there. I'm pretty sure that we may have some advantage because of Lego and other great companies and technologies that come into the kindergarten and in the schools in that way, and get the young people motivated for this kind of engineering work or build-it-yourself work.

Yes, but it's not unfair. You have Google, and you have a lot of things in the States. You should not complain.

Peter: Yeah, that's true. Well, Claus, thanks so much for joining us. Hav en god dag [have a good day], and we look forward to seeing some of the exciting changes in the future.

Claus: Thank you so much for having me.