Interview: Maikel Beerens – Founder and CEO, Xilloc, The Netherlands

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Maikel Beerens, CEO and founder of Xilloc, a promising Dutch company that designs patient-specific implants, anatomical models and surgical guides for bone reconstruction or augmentation with the help of 3-D printing, explains how his company aims to provide patients worldwide with the tailor-made implants they deserve while reducing the overall socio-economic cost of surgeries.

As an introduction to our international readers, could you provide us with an overview of Xilloc's key milestones and its recent developments?

I started Xilloc as an extension of my thesis work at the Maastricht University Hospital, as I was developing a methodology to pre-operatively design and produce patient-specific implants, based on a computer tomography scan of the patient. Based on the competences acquired during this academic journey, I officially founded Xilloc in 2011 to make patient-specific products available to surgeons from all around the world. In the same year we were awarded the prize of "most innovative startup in the Netherlands", which was the first of many other business awards that we received during the following years.

In 2013, we established our strategy to become the global market leader for patient-specific products by 2025. To achieve this long-term objective, we needed to build a manufacturing capacity including at least 15 cutting-edge 3-D printers. Nevertheless, considering the extremely

high costs of these printers and the low revenues inherent to all emerging startups, my first mission was to gather the requested funding that would truly allow for transforming this objective into a reality. It was also important for me to stay in the Limburg area, which is currently recovering from its industrial era. I knocked on many doors and explained how investing in Xilloc would allow the region to truly embark on the technology of the future that is 3-D printing. Finally, thanks to the support of the Brightlands Chemelot Campus where Xilloc is now headquartered, we have been already able to acquire five printers, with five more to be delivered in the upcoming months and the final five by 2016. We now know for sure that we will soon have the manufacturing capacity that will allow us to fulfill our ambition.

While keeping our initial medical focus, we have also recently diversified our activities by creating an industrial-service branch. Thanks to the quality standards we implemented for our patient-specific implants and our growing recognition all over Europe, an increasing number of industrial companies started to contact us to benefit from our 3-D printing expertise. To make the most of our expertise developed in the implantology field, we thus offer 3-D printing and consulting services to industrial clients in various industries such as automotive manufacturers or even the aviation and aerospace industries. These endorsements truly underscore the unique expertise Xilloc has been able to develop in the 3-D printing industry, both in terms of organizational management and of process design. This diversification will allow us to increase our revenues and sustain the development of our medical branch.

Regarding our historical medical branch, we are currently cooperating with more than 30 hospitals all around Europe, with a strong focus on the Netherlands, Belgium, the UK, Spain, Italy and Germany. We wanted to build a robust partnerships' base within Europe, and I can proudly say that we are very close to reaching this objective. For the upcoming years, we are now looking at developing our international network. Our first objective will be to reach the United States within a year and to get FDA approval for our products, before probably moving to other continents.

What specific advantages of patient-specific implants should force surgeons to adopt this technology instead of standard products that have been the norm for decades?

First of all, we are already able to produce patient-specific implants for all parts of the human skeleton. When we started Xilloc, we were mostly focusing on skull, mandible or cheekbone implants, but we also developed a particularly praised offering of tailor-made surgical cutting guides. These cutting-guides allow the surgeon to accurately perform the surgery by following a virtual surgery plan, while they can also help reduce the number of operations a patient will have

to endure. For instance, we receive a lot of requests for treating patients suffering from a meningioma (tumor) in the head, which historically required two surgeries: a first one to take out the tumor, and then a second one six months later to do the skull reconstruction. We thus created a personalized cutting-guide system that can be directly placed on the tumor, and, thanks to these guides, surgeons can precisely take out the tumor and place the patient-specific implant in the resulting defect in only one surgery.

We have now broadened our portfolio from the skull to the rest of the human skeleton, while all our products truly remain specifically designed for each patient. Basically, thanks to 3-D printing, we are able to produce a bone implant that is the exact physical copy of the surgeon's vision. This is obviously a revolution, as the standard-implant industry was essentially based on a business model mainly characterized by "one-size-fits-all" products, while the patient's bone was adjusted to fit with the implant!

Even if surgeons have been historically trained to use standard products, they are now increasingly and really quickly embarking on this new way to treat patients. Adopting patient-specific implants instead of standard ones certainly increases the early stage work needed to design the implants, but surgeons are unanimous: this effort is worthwhile! Thanks to implants that have been extremely precisely designed to fit with the anatomy of the patient, surgeons are able to do faster and better reconstructions and above all to avoid multiple surgeries, hence reducing the risk of complications.

The medical advantage provided by patient-specific implants in comparison to standard implants is so obvious that the word-of-mouth between surgeons has probably been our main growth driver so far! Nevertheless, we also want to raise patient awareness around the key advantages of our implants, to ensure patients can request them to their surgeons, and we already receive many emails from patients and their relatives who contact us to find out how they can get access to our products.

In the cost-containment context that most healthcare systems in Europe are facing, how can your company's solutions help hospitals and insurers save money?

Patient-specific implants can undoubtedly bolster our healthcare systems' ability to streamline costs. Healthcare insurers will nevertheless have to change their approach to care and shift from a short to a long-term approach to fully appreciate why patient-specific implants should become an interesting option to promote. Patient-specific implants can for instance prevent patients from being operated on several times, as is currently still necessary for bone cement operations.

Furthermore, reducing the number of surgeries could avoid multiple recovery and reeducation periods, while reducing tremendously the risk of implant rejection. Healthcare stakeholders have however to consider the overall cost of a surgery, including not only the price of the implant, but also the overall time spent in hospitals, the risk and costs of eventual complications and rejections, as well as the socio-economic impact of a surgery if a patient is not able to work or is psychologically affected by surgical failure or complication. In this vein, in the case of a skull surgery for instance, bone defects that remain after craniotomies create emotional, functional, physical and aesthetic disturbances that disastrously impact patients' lives.

Nevertheless, I think that the current economic crisis will foster this technological shift, as stakeholders are more open to implementing cost-effective innovations, even if patient-specific implants will tremendously transform the surgical landscape and the overall approach of this discipline. A few years ago, insurers didn't seem ready to embrace such a revolution that would however allow the saving of thousands of euros at each surgery. However, we now feel an increasing interest from these same healthcare insurers, and, paradoxically, the cost-containment context could dramatically help us to increase patient access to these cutting-edge implants. In the Netherlands, three hospitals already reimbursed our products, and we will obviously strive to increase this number in the upcoming years.

As a promising and ambitious company, how do you plan to cope with an expected increase of your customers and products while ensuring your individual products can still be delivered on time?

When I was working on my academic thesis, I had the opportunity to visit each surgeon and design together each implant. Nevertheless, to follow the company's growth, we decided to develop a web-based portal through which we currently receive 99% of our requests. We are thus able to work at a distance with the surgeons, and as soon as a 3-D design is approved, we can produce it and send it to the surgeons. We are moreover improving the design process to make it as autonomous and automatic as possible, in order to soon be able to conceive the implant's design practically without the help of a surgeon or engineer.

Our 15-printer manufacturing facility will allow us to print more than 60 implants in one batch on one machine, while all of them will have different shapes and be designed for different patients. It is probably one of the key advantages of 3-D printing. Furthermore, the overall production capacity will also be compatible with our growth objectives. Nevertheless, we are carefully monitoring and

steadily improving both our manufacturing capacity and design process to ensure that in the near future, it will be easier for a surgeon to order one of our patient-specific products than manually adapting current standard products. We will probably need a few years to reach this target, but we are clearly concentrating our efforts on this objective.

Given your own experience and the fact that you took that leap of faith to start your own company, what piece of advice would you give to young entrepreneurs looking to do the same thing?

My best advice to students who would like to start their own company would be to stop dreaming and to start realizing. Achievements, whether they turn out to be a success or a failure, will increase your ability to succeed in the future and to reach your next objectives. Furthermore, it is also extremely important to look for all the support that could be available as early as possible, either at the academic or regional level. Finally, something that is clearly underestimated by young entrepreneurs nowadays is the necessity to stay informed and to read books written by other entrepreneurs: there is so much to learn from others' successes and mistakes!

Finally, one of my proudest achievements so far is undoubtedly the team that I have been able to gather around me. They truly are the company! As the CEO and founder of Xilloc, I have obviously to bring the vision and to set up the objectives, but I think that building a company mainly means pulling together the team that will be able to drive the company to new heights.

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