Chapter 10

Micro-trajectories: Small Firm Strategies at Boundaries between Audiovisual and Health Care Sectors

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Abstract

This chapter focuses on the micro-contexts of cross-innovation between digital audiovisual media and the health care sector by examining two cases, both start-ups working on virtual reality-assisted rehabilitation solutions. Through a discussion of the two cases, this chapter aims to elucidate the broader dynamics of digital health care as experienced by innovators seeking to contribute to it. It addresses the challenges faced by innovators, including the lengthy and costly nature of medical licensing, the inflexibility and fragmentation of pertinent regulations, and health care institutions' and insurers' resistance to change. It also highlights the importance of networking and the emergence of digital health care as a distinct and increasingly visible epistemic community, while touching upon the tensions between the public and the private sectors as a target market for innovators.

Keywords: Digital health; e-healthcare; rehabilitation; virtual reality; telemedicine; cross-innovation

Introduction

Public and academic interest in the potentialities of screen media being used in health care has grown in recent years. At the same time, integrating digital and media-based solutions with the daily realities of health care still poses numerous technological, legal, and institutional challenges (Farahani et al., 2018; Schweiger,

Sunyaev, Leimeister, & Krcmar, 2007). While much of the research into digital health care (including Chapter 9 in this volume) has focused on its regional, national, and institutional dimensions, this chapter aims instead to shed light on the micro-level: the experiences of actual innovators who develop digital health care solutions and attempt to deploy them. To that end, it will focus on two cases, both covering virtual reality (VR)-based rehabilitation solutions that received seed funding through the Cross Motion project. The data for the cases have been collected through a series of interviews with two members of each team, spanning approximately seven months in each case. The concluding section at the end of the chapter will identify the differences and commonalities in the two cases and discuss their significance for the wider landscape of digital health care.

Case 1: Virtual Reality Rehabilitation in Elderly Care

Ming came to Finland to study Computer Science. Impressed by the country's wealth of opportunities for start-ups and innovative projects, she started attending various hackathons and conferences on innovation. It was during one of these events that an idea for her own project occurred to her. She learned that a friend's grandmother was having health problems and required regular exercise to recover. As a software engineer, Ming envisioned a technology-driven solution: a product that would help elderly people, especially those with limited mobility, exercise physically and mentally while immersed in relaxing VR environments. This would allow them to enjoy a more active lifestyle with lower risk of health complications. It would also keep track of users' performance and progress. This product, Ming thought, could be sold to nursing homes, while services such as training and consulting could make for additional income. Such a product might also have an appeal in Ming's native China, where millions of senior citizens are faced with the challenge of keeping fit and nursing homes are willing to adopt new technology to improve their effectiveness.

After pitching her idea at several events, Ming was approached by a doctor in a local hospital who was willing to help her test her product on elderly patients undergoing rehabilitation. At another hackathon in Helsinki where Ming presented her idea, she met Hanna, a marketing and sales specialist. Hanna was intrigued by the project, as she had an elderly relative of her own who she thought would benefit from it. She also had a long-standing interest in health care and felt that her then job in banking did not contribute to society in a meaningful enough way. Hanna also perceived a global pattern: while life expectancy across the globe was steadily increasing, there was still a shortage of good services for the elderly despite the rising demand. Ming's idea, in Hanna's view, could result in one such service. After several months of being in contact, Ming and Hanna decided to pursue the project full-time and founded a company to that end. They joined the Finnish VR Association and started user-testing and looking for funding opportunities, one of which happened to be Cross Motion.

Initial user-testing at a local hospital was encouraging, while also highlighting some considerations regarding content design. For example, elderly users seemed to respond better to 360-degree videos than they did to computer-generated 3D environments; they also preferred dimmer colors and less intense motion and activity. At the same time, Ming and Hanna worked with health care specialists to make sure the content was both useful and safe.

Soon, the company's business model began to take shape: as a small company with limited resources, they would focus on creating a platform, or an "ecosystem," rather than content. Individual exercise routines could be co-created together with third-party content providers and integrated with the ecosystem.

They would also seek to promote the product both in Finland and in China. This meant localization of the platform and the contents which went beyond mere translation, due to significant cultural differences between the intended users (it would also require additional user testing in China). While Hanna focused on talking to investors and clients in Finland (both because of her background and because she was a Finnish speaker), Ming would make trips to China and speak to interested parties there, trying to build connections, which are a prerequisite for market access there.

When I asked Ming and Hanna about the challenges they faced when working on the project, both mentioned cultural and linguistic differences within their own team. Ming felt that the duo's different cultural backgrounds sometimes made communication more difficult, while Hanna acknowledged that language issues could at times slow things down. While investors generally spoke English, many other partners in Finland preferred to communicate in Finnish, leaving Ming out of the conversation (although Hanna would provide summaries and translations afterwards). Conversely, having a native Finnish and a native Chinese speaker was also an advantage, enabling easier access to local markets, especially in China where it would be difficult for a foreigner to advance an idea without having relevant connections.

Other cultural factors were at play too. For example, Ming discovered that the personnel in Chinese nursing homes often had a fear of losing their jobs to technology, which made it difficult to discuss VR solutions with them. Another concern was that of information protection: Ming made sure to deal only with trusted partners, for fear of her idea being hijacked by copycats, which is a common issue in the region.

Working with elderly people presented its own set of challenges. Many test users had little experience with technology and needed training in using VR gear. This also meant it took many iterations of user testing to arrive at the level of usability and intuitiveness that would make the technology accessible to senior users. As Hanna pointed out, elderly people did not know what they wanted, so it was her and Ming's job to come up with ideas for them. This also meant that, in addition to the arguments used to promote the solution to nursing homes and clinics, a separate set of arguments needed to be developed in order to convince the elderly patients themselves of the benefits of the technology.

The limited resources at the team's disposal made it difficult to plan for the long term, due to the need to continuously look for funding. At the same time, the company needed to constantly monitor their competition, as VR and AR solutions for health care were emerging at an ever-faster rate.

It also became increasingly evident that Finland, or even Scandinavia, was too small to be a viable first-choice market (especially given that each of the Nordic countries has its own language and legislation, resulting in barriers to rapid expansion). The team thus decided to refocus on the Chinese market as their primary target.

When asked about the role of start-up incubators and projects like Cross Motion in the development of their product, Ming and Hanna stressed that apart from the funding, the importance of these events was as opportunities for networking. Connections to researchers, medical practitioners, potential investors, and other start-ups had been vital to their project's survival. While some of the training they had received had focused on such useful aspects as legislation and negotiation, Ming wished there had been more team-building exercises and match-making opportunities. She also felt that there was not enough discussion about how innovative projects such as theirs could enter "traditional" markets such as health care, where people and institutions remained hesitant to adopt new solutions.

Ultimately, after running out of funding, Ming and Hanna's project stalled, despite promising negotiations with potential partners and investors. The duo fell apart, with Hanna moving to a different job, also related to technology and health care. The company's social media accounts stopped being updated, and the website went down. While there is still hope for a reversal in fortunes (there does exist a functional prototype and more than one market to pitch it), the current plight of the project seems to typify the trajectory that many a promising start-up follows, undermined by a shortage of funding, staff volatility, and intense competition.

Case 2: Sports Rehabilitation Using Virtual Reality Technology

At about the same time as Ming and Hanna were busy honing their prototype and talking to investors, Taher, a recent medical school graduate in Germany, was conceptualizing his own VR rehabilitation solution.

Coming from a family of computer scientists, Taher had a long-standing interest in technology, which he wanted to use to improve people's lives. As a student in medical school, he felt that innovative technology could offer many improvements to both medical training and health care itself, but he also felt that the sector was not particularly quick to innovate. This perception deepened during a six-month stint at a local hospital following graduation, throughout which Taher tried to promote innovation in treatment to his superiors. The response he received did not, however, match his own enthusiasm, leading him to abandon his effort and, soon after, the hospital itself.

"I worked up to 60 hours a week and had little time for self-development," Taher explained. "And in any case, I felt I was an average doctor in conventional medicine. But I could be great at lifestyle medicine and alternative medicine."

Following his departure, Taher briefly tried running an acupuncture business (he had studied acupuncture for one year while working towards his conventional medical degree). While that undertaking did not pan out, it did help him learn some practicalities of business planning.

Ultimately, Taher decided to refocus his attention on a start-up idea that he had been conceptualizing for several years and that was inspired by his personal experience. When Taher was 16, he ruptured his knee tendon during a football game, leading to a short spell in rehabilitation. It then transpired that his insurance only covered a few weeks of rehabilitation sessions in the hospital, which was a much shorter span of time than what was needed for a full recovery. When his insurance coverage ran out, Taher had to continue to exercise and train without much supervision, at the risk of overexerting and aggravating his injury, until eventually he reached full recovery. This experience was what sparked his interest in medicine in the first place, and sports medicine in particular. During his studies, Taher even undertook an internship at a famous knee clinic in Switzerland.

Now, as a free agent, Taher wanted to create a solution to improve patients' rehabilitation experience by tracking their progress, providing guidance, and compiling data on their performance. The solution would use VR and track the user's body position and movement, offering a set of exercises with real-time feedback on key factors ranging from body balance to whether the exercise is performed correctly. Importantly, the solution could be used at home and would involve no operating costs. This, Taher believed, could help ease the burden on both hospitals and insurance companies.

Confident in his idea and buoyed by his existing project experience (he had worked on two student projects, one focusing on reducing anxiety associated with public speaking and the other offering free health checks to the homeless), Taher set about finding partners who could help the project. He attended numerous start-up events. At one of them he met a recent university graduate with a background in business, who agreed to come on board as a co-founder and business consultant. At another event he approached the representatives of a technology company with experience in VR development, who expressed their interest in collaborating on the project. His networking efforts paid off further when he met the chief doctor of a major German football club, who had been looking into ways to optimize footballers' post-injury rehabilitation. The doctor was immediately intrigued by Taher's project and introduced him to the club's medical facilities. Through this encounter, Taher found both another co-founder and a potential customer.

As his team was taking shape, Taher also managed to procure funding for initial development, offered by the Hamburg Film Fund as part of Cross Motion. Following their moderately successful experience with an AR application focused on film tourism (as described in Chapter 14), the Fund began looking to extend their sphere of influence beyond cinema — a trend started by a few

other German film funds — and Taher's project seemed sufficiently innovative, promising, and local for the Fund to offer its support.

Taher, in the meantime, continued to promote his idea at various events and reached out to clinics in the area, several of which agreed to cooperate on clinical studies of the product. He also managed to recruit a former Microsoft executive and a renowned professor to the advisory board of the project. The project also landed a top three spot at the Hamburg Innovation Awards, although Taher was quick to play down the competitive dimension of his work.

While Taher's experience in general seems to have been smoother than that of Ming and Hanna, it was not without its challenges and stumbling blocks. Halfway through discussions with hospitals and the football club, the co-founder of the project announced his departure, choosing to pursue a graduate degree abroad. This meant Taher had little time for adjustment and was thrust into learning to deal with the business aspects that he had previously relied on his co-founder's expertise for.

Bringing the project's vision to life also hinged on the team being able to overcome several challenges posed by the innovative nature of the project's use of VR. It was crucial that the app's tracking of the user's movements was highly accurate, and its feedback was easily comprehensible: if either condition were not fulfilled, the patient could end up aggravating their injury instead of healing. Due to the scarcity of existing expertise in the field, there was no other way to accomplish that than through a thoughtful collaboration of a heterogeneous team of medical professionals, designers, and developers, supported by multiple iterations of user testing.

A longer-term problem was obtaining the medical certification necessary to operate in the German health care market and gain recognition from insurance companies. Even after conducting the clinical studies, the certification normally takes two to three years and is very costly, especially for a start-up with limited funding. At one point, the challenges involved in the certification process nearly led the project to drop out of Cross Motion and dissolve. However, the timely encounter with the football club doctor helped Taher realize there was another business model and another target audience to pursue. Instead of a business-to-customer model aimed at the general public or a business-to-business model focusing on hospitals or insurance companies, Taher decided (at least initially) to target professional sports clubs and gyms and expand the focus of the product to preventive care. Not only would the changed focus help work around the challenge of obtaining certification, but it could also help the solution expand beyond the German market, which would otherwise be difficult due to the different regulatory and legislative frameworks even within the European Union. And such international expansion was part of Taher's future vision, since, as he put it "everyone loves German products."

Operating in a fast-developing and competitive industry produced an additional pressure to keep the scope limited and focus on going to market as soon as possible. "Speed is king," summarized Taher, reflecting on both the need to be ahead of the competition and the limited resources, including time, that a recently conceived start-up has at its disposal. At the same time, Taher was eager to emphasize that competition is not necessarily a bad thing and can be constructive for the parties involved, pushing them to deliver more innovative and functional products faster.

Conclusion

For all the differences in the two projects' circumstances, Ming and Hanna's story also shares many commonalities with Taher's experience. Despite being an "insider" to the health care sector by virtue of his training and work experience, Taher, much like Ming, perceived the sector's institutional resistance to change. Promoting innovative audiovisual (AV) technology, at least at the level of individual hospitals was, in his experience, a challenging endeavor. This mirrors existing research on implementing technological advancements in health care, which has indicated that such endeavors are necessarily long-term projects whose success hinges on an accompanying "technology legitimation project that addresses the new technology's legitimacy with different project stakeholder groups" (Bitektine, 2008, p. 28). This challenge can be exacerbated, as discussed in Chapter 9, by the "club mentality" of large institutions and players, which makes it difficult for an up-and-coming start-up to approach and negotiate with them. A further challenge arises when the innovative technology is likely to lead to a change in the existing professional roles, putting it at odds with existing "scripts" and thus leading to suspicion (Margulies, 1992), which is what Ming experienced first-hand when observing Chinese nurses' fear of media technology overtaking their jobs.

The difficulty of promoting digital and screen media-based innovative solutions in health care underscores the importance of interpersonal and interorganizational networks, which provide access points to institutions and connect innovators to resources and pools of talent necessary to accomplish their projects (Barnett, Vasileiou, Djemil, Brooks, & Young, 2011; Pittaway, Robertson, Munir, Denyer, & Neely, 2004). Ming, Hanna, and Taher all emphasized the importance of networking with health care professionals, investors, and fellow innovators. Opportunities to interact with a diverse body of peers are crucial, as access to heterogeneous knowledge networks leads to increased possibility of recombination, which can result in further innovation (Hargadon & Sutton, 1997; Simard & West, 2006); at the same time, it provides an opportunity to keep an eye on the competition (Pittaway et al., 2004).

A major sector-specific challenge lies in the lengthy and often costly process of medical certification and licensing, which can significantly slow down a product's path to market, which is already slower than in other sectors due to the need for clinical studies. In the ultra-competitive, rapidly evolving and volatile market for technological innovation, the years it takes to bring a product to market could prove the greatest hurdle in the way of health care-orientated solutions.

In addition, despite the increased legal recognition of digital apps and media-based solutions apps as medical devices (Boulos, Brewer, Karimkhani, Buller, & Dellavalle, 2014), the regulatory frameworks surrounding medical technology are still often perceived by innovators as restrictive (Cresswell, Cunningham-Burley, & Sheikh, 2017). Furthermore, regulations pertaining to medical technology and health products are different across nations, and even in economic blocs that harmonise medical technology approval such as the European Union, the member nations' health care systems function independently and display considerable specificity (Legido-Quigley et al., 2008), making it difficult to

rapidly expand into international markets. While this is particularly problematic for smaller markets such as Finland, where it may lead innovators to target bigger markets (as happened in Ming's case), larger countries such as Germany can pose their own challenges due to the varying regional regulations and practices.

At the same time, the health care sector has become increasingly receptive to innovation. This can manifest in different ways: from companies pitching their innovative solutions to medical institutions, as in the cases described above; to health care institutions themselves approaching the information and communication technology and media sectors (see, e.g., the discussion of the Estonian case in Chapter 9). The proliferation of health care-related innovation has also led to the emergence of a distinct epistemic community around it, whose members expressly identify as working at the intersection of health care and digital/AV technologies, particularly VR. Building on the existing history of telemedicine, this community is increasingly institutionalised and culturally visible, as evidenced by the numerous events dedicated to VR in health care, growing media coverage, and even the emergence of academic journals such as *Digital Health* and degree programs, such as the BSc in Healthcare Technology Engineering offered by Aarhus University in Denmark.

As previous research (e.g., DePasse, Chen, Sawyer, Jethwani, & Sim, 2014) indicates, several medical centres around the globe have sought to engage with the digital health community, paving the way for its further integration into the landscape of institutional health care. Taher clearly identified as a member of that community, seeking to establish a presence in it and contribute to its activities. Hanna and Ming, on the other hand, seemed to identify more with the wider VR scene, being indeed members of the Finnish VR Association. They did not appear to be aware of a larger digital health organisation in Finland, pointing to a possibility that in smaller nations such a community has not yet taken root.

Importantly, despite the growing importance of digital health solutions, there are no global, universally adopted platforms on the market at the moment. Unlike other sectors such as tourism, where major digital platforms such as Airbnb and TripAdvisor have consolidated a large part of the market, digital health, perhaps by virtue of the very challenges outlined above (and the inherent complexity and diversity of the field itself), has remained segmented and open to new solutions, offering opportunities for the likes of Ming, Hanna and Taher to realise their own visions. Yet, increasingly, the top global platforms are also investing in health media and analytics, and innovators and innovation systems in small countries need to prepare for this prospect.

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