Chapter 6

Micro-trajectories: Small Firm Struggles at Boundaries between Audiovisual and Education Sectors

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Abstract

This chapter examines the micro-level dynamics of cross-innovation involving audiovisual and educational expertise through the prism of two cases: an augmented reality-based chemistry learning app developed in Estonia and a 360-degree short film project aimed at documenting and raising awareness about historical buildings in Lithuania. Based on the two cases, the chapter outlines several trends: the broadening of the notion of education beyond institutional education; the growing interest in public−private partnerships; and the emergence of heterogeneous networks feeding into the larger epistemic community of educational innovators. It also highlights a number of challenges that members of this community may face, including institutional resistance to change, schools' lack of resources, teachers' and administrators' reluctance to use new technology and emerging technologies' lack of maturity.

Keywords: Educational innovation; augmented reality; virtual reality; public−private partnerships; lifelong learning; cross-innovation

Introduction

Discussion of educational innovation related to audiovisual (AV) media has been a mainstay of both institutional education and academic research since at least the 1910s (see the discussion in Chapter 4). Regarding digital forms of

media, universities were among the earliest adopters of computers, followed by public schools in the 1980s, and the advent of the home computer in the same period was also in part connected to its promise as a learning tool (Epstein, 1985). And yet, despite the ongoing talk about the potential that technological innovation has to revolutionise the landscape of education, that revolution has only occurred slowly in the classroom (Buckingham, 2013).

More recently, the emergence of such technologies as virtual reality (VR) and augmented reality (AR) has reinvigorated the sphere of educational innovation, triggering further discussion of how new technology can benefit teachers' work and students' experiences. Coupled with the increased support for public–private partnerships in education, this has led many innovators to develop educational products for the classroom and beyond. But what has their experience been like and what challenges have they faced?

This chapter will introduce two cases: an AR app for learning chemistry originating from Estonia and a Lithuanian 360-degree film project aimed at digitally documenting historic buildings to educate the public about them. The accounts of the respective cases were constructed based on a series of interviews and communications with the project teams, spanning a period between March and November 2017 for the former and between March and October 2018 for the latter. The discussion will highlight the commonalities, as well as the differences in the two teams' experiences, ultimately linking them to the broader landscape of AV innovation in education, as outlined in Chapter 5.

Case 1: Augmented Reality Chemistry Learning Solution

The idea for a chemistry-teaching game occurred to Roksolana owing to her younger sister's struggles with the discipline. Roksolana wondered if a more visual, hands-on way of learning chemistry could make it more fun and if her sister, a junior high school pupil, could benefit from that. At the time, Roksolana was a Bachelor's student at a university in Tallinn and was already taking part in hackathons and looking for an idea of her own to pitch.

An AR educational game seemed to be a promising option. The game would consist of playing cards corresponding to chemical elements. The cards could be arranged together, allowing participants to experiment with element bonding and play with chemical equations. A smartphone or a tablet would be used to visualise chemical processes and the atomic structure of different elements. An optional element of competition would be added, pitting players against each other for additional incentive. At the same time, the product would also function as a learning app that could be used as a reference by chemistry learners.

When Roksolana and her newly formed team presented the idea at Skype University Hackathon in April 2017, the team ended up winning and drawing in new members in the process. This boosted the team's hopes of bringing the project to fruition and led them to participate in a number of other start-up incubators and hackathons, including Cross Motion, which was where the team found a lead developer, a computer science student called Roman, to join their ranks.

Each subsequent event would help them hone their vision, fine-tune their pitch and receive feedback from experienced mentors. The team was also able to receive funding for the initial development of both the mobile application and the card game.

Roksolana and her teammates set up a company, even as they juggled their start-up work with university studies, and, in the case of Roksolana and one more team member, a full-time job. Three of the six members of the team were able to channel their experience with MoleQL (as the product was eventually called) into Master's or Bachelor's theses at their universities.

The team came into contact with a high school chemistry teacher in Tartu, Estonia's second-biggest city, who was willing to collaborate with them and help test their product in an actual classroom. This, however, presented something of a challenge: the game needed translating into Estonian, and half of the team's six members were not Estonian speakers (the team used English to communicate). The team also mulled over their future plans; once they finished their current project, could they use the same platform to create another product for learning another discipline, such as physics? Or could they build on their experience with AR to venture beyond the sphere of education and develop other solutions based on this technology?

In August 2017, the MoleQL team went to the European Innovation Academy in Lisbon, a prestigious three-week entrepreneurship programme, with the costs covered through a grant they had won at a start-up event in Tallinn. Even before the visit, there was some frustration among the team: their ranks were short owing to one member having decided to leave and focus on her day job, and only three of the remaining members were initially able to receive funding for the trip. When in Lisbon, things did not get off to a smooth start either; as Roman, lead developer, explained, 'some people were there to work and some were there to party', leading to tensions within the team. Ultimately, however, the team ended up bonding. Roksolana attributed this to the shared experience the group had 'outside their comfort zone' and the opportunities the trip provided for non-work-related interactions. Having parted ways with one teammate prior to the trip, the team attracted new collaborators: two psychology teachers from the UK. The involvement of native English speakers helped jumpstart negotiations with American investors. The team also discussed collaboration options with other institutions, including a public university in Lisbon.

Ultimately, the shared experience led the group to realise that they wanted to continue working together as a team even after their current project was finished ('the team became the priority, not the product'). At the same time, they concluded that the education sector was too restrictive and not yet ready for AR solutions. At least, this was the case in Estonia, owing to its tiny market and school teachers' often wary responses to the new technology; some did not consider AR beneficial, while others felt the technology was not developed enough, and still others did not like the idea of students openly using their smartphones in the classroom. Several teachers also pointed out to them that the curricula and teaching methods were ultimately decided by school councils and that public schools typically lacked the money to purchase innovative teaching solutions.

Thus, it was decided that even as the team would build upon the expertise acquired while working on MoleQL, their future work would involve a departure from education and an openness to other fields.

Roksolana and her team's story speaks to the many experiences, anxieties and needs a start-up in the education sector is likely to face. One of these is the experience of participating in start-up accelerators, incubators and trainings aimed at promoting innovation. These events, as Roksolana explained, provide opportunities for networking, helping to negotiate opportunities for collaboration and recruit new members. Roman, who joined MoleQL at the first Cross Motion event after he was intrigued by the team's presentation (and after his own VR game project had fallen through due to funding issues), also stressed the importance of start-up events in terms of networking. Additionally, Roksolana recalled how hearing mentors' and previous participants' success stories bolstered the team's confidence in their ability to succeed. Some of the events also helped team members improve their skills in a particular area, such as, in Roksolana's case, accounting.

At the same time, Roman argued that the vast majority of the events MoleQL participated in were too business-oriented, providing few opportunities for developers such as himself, who do not deal with the business side, to improve their technical skills. Roksolana concurred, saying that many events she had attended overly focused on finding a business model and securing private investment, leaving little room for discussing other financing models, including ones more typical of public−private partnerships in education. Even the networking opportunities offered at start-up events may not cover all the needs of a team interested in the education market, who often require access to a real classroom for testing purposes and guidance from a practising teacher.

A central challenge the MoleQL team had to deal with was finding funding to keep the project going. As funding, especially in the earlier stages of development, is often procured in small instalments from a range of sources, this caused a lot of anxiety in the team over the long-term sustainability of the project. Roksolana and Roman also lamented the communication problems with some of their partners in the public sector, leading, among other things, to delayed funding and jeopardising the project's progress.

Establishing team relations and an efficient work process was also a challenge for MoleQL. When the team were just beginning to work on the project, it took them an entire week to decide on their name. The lack of stability in the team in those early days meant frequent hiccups in the project's development: for example, when a web designer left the team, the remaining members had to create a new website using a free website builder, as no one had the competences required to update the old one (a new web designer has since joined the team). Both Roksolana and Roman wished events their team had taken part in during the early stages of its existence had involved more team-building exercises, although their trip to Portugal did ultimately help the group gel together.

The ultimate concern for Roksolana, however, was her team's future. Education appeared to her to be a niche market for AR solutions, most likely not big enough to remain the team's sole focus if their ambition was long-term

survival. This concern was fuelled by a number of factors. One of these was the fact that Estonia, with its population of 1.3 million, is just too small a market to operate in. Expanding beyond that market, however, poses the issues of differing school curricula in different nations, as well as language barriers – not to mention the lack of contacts needed to gain access to actual schools.

At the same time, Roksolana did begin to note a gradual increase in teachers' awareness of and receptiveness towards AR. Some of the teachers she spoke to had even tried it in the classroom, and others were willing to. But many also pointed out that the responsibility for adopting new teaching methods did not lie with them, but rather with school councils, which still tended to be fairly conservative. Ultimately, Roksolana sensed that the education system, at least in Estonia, was slow to transform and, by and large, not yet ready to adopt AR technology on a mass scale without a push from outside. Added to this was the anxiety that such a push could come from one of the transnational tech giants such as Microsoft and Google, which had begun to display an increasing interest in education. To Roksolana, this meant that a similar solution with a disproportionately larger budget and visibility could appear at any given moment, jeopardising her company's future. And even beyond such a David-and-Goliath scenario, the rapid proliferation of AR solutions elsewhere meant that the existing market for AR was rapidly becoming competitive, forcing the team to keep track of their competition while making their own focus more versatile.

This story highlights a risk for innovation in the education sector, especially when smaller private companies are involved: at the moment, applying the same skill set to other sectors such as entertainment may appear to be a safer and more sustainable survival strategy, leading to 'brain drain' from this particular cross-innovation area and promising projects never seeing full-scale adoption. In some parts of the world, however, the education sector has responded to this challenge by offering centralised institutional support to innovators (see Chapter 5 for examples from Sweden and Finland).

Case 2: 360-Degree Film for Virtual Preservation of Historic Buildings

While innovators crossing over into entertainment may pose a challenge to the education sector, it may also be an opportunity. 'Edutainment' has long established itself as a meeting point between entertaining and educating the public (see Chapter 4); and many educational apps and projects in recent years have relied on the business-to-client model, sidestepping interactions with the formal education system.

However, when cooperation with the public sector does occur, it does not have to be limited to dedicated educational institutions. Education, in various ways, has become an important part of the agenda of many museums, theatres, zoos, civil organisations and other public institutions.

Consider the story of Ruta, a producer at the Baltic office of a transnational media production company based in the Nebula Cluster, a cross-media cluster

comprising a variety of companies and start-ups working on AV and digital projects in Vilnius, Lithuania. When Ruta learned of the plans to reconstruct the Lithuanian National Drama Theatre, in Vilnius she was concerned that the building's distinct Soviet architecture would not be preserved in the process. The cultural context is important here; the Communist past is something that Lithuania, occupied by the Soviet Union in 1940, has been eager to sever symbolic ties with; thus, preserving Soviet-era architecture is hardly a priority for a state otherwise concerned with protecting its diverse architectural influences. Similar tendencies can be observed in other post-Soviet states, where notable Communist-era buildings have been demolished or reconstructed due to not being protected as cultural heritage.

To Ruta and many Lithuanians young and old, however, the National Drama Theatre has come to symbolise the city of Vilnius itself, with its rich cultural life and complex history. Losing the distinct grandeur of the building, which Ruta semi-jokingly compared to the Grand Budapest Hotel from Wes Anderson's eponymous film, would indeed be a blow for the city. And yet, the fact remained that the building was in need of reconstruction but the chances of preserving its distinct style following that were slim. Moreover, there was a host of Soviet-era buildings with similarly unclear futures in Lithuania and across the Baltic states.

Ruta began thinking about the theatre's predicament and what could be done to preserve it in some form. While 'virtual preservation' of historic sites has been a popular trend worldwide, Ruta thought that many such projects failed to attract public attention and often ended in obscurity. Instead of merely documenting every square inch of the building, she reasoned, she could attract public interest by framing the Drama Theatre as more than a historic building: as a setting for a story.

Together with her colleagues and experts at other companies in the Nebula Cluster, Ruta devised a project that would revolve around shooting a 360-degree fiction film set in historic buildings in Lithuania and beyond, starting with the National Drama Theatre. The film would not focus explicitly on the buildings; rather, it would feature an independent storyline that would take part in different parts of the buildings, guiding viewers around them as the story unfolded. While this approach may seem to make the buildings themselves incidental to the entertainment, Ruta, after extensive deliberation with her collaborators, came to the conclusion that a captivating story set in a building with a unique character was the best way to motivate viewers to learn more about the building itself; and the project would include transmedia resources to that end. Ruta thus saw her project as education through entertainment.

Through a friend who worked as a stage director at the National Drama Theatre, Ruta pitched the idea to the theatre and received an enthusiastic response. Her position in the Nebula Cluster was an asset, as the companies in the cluster covered a diverse range of skills – which was exactly what the project needed – and frequently collaborated, rather than competed, with each other. Ruta was also able to find the funding to start working on the production, including from Cross Motion.

The production, however, posed a number of challenges, some of which were novel to Ruta despite her experience and connections. There was little expertise

in Lithuania or elsewhere in the world when it came to non-documentary 360-degree films. From the technical side, the ability to look around afforded to viewers meant that no additional equipment could be used, as it would be visible in the film. Filming in 360 degrees also meant a radically unconventional approach to scene composition, which was no longer limited to a single shot at a time; viewers would need both the freedom to look around and to be able to follow the progress of the story.

Writing a screenplay that would lend itself well to this format was a further challenge, as few screenwriters had the necessary expertise. It did not help that, according to Ruta, there were only a handful of international-level screenwriters in Lithuania in the first place, and all of them had their schedules planned for years in advance. It was decided then to turn to professionals from abroad, with proposals submitted by screenwriters from Japan and the US.

Once the screenplay was selected and approved (a comedy focusing on the misfortunes of an actor who forgets their lines mid-performance), the filming had to commence almost immediately, so as to wrap up before the reconstruction started a month later. The time pressure meant that Ruta and the team had to make things up as they went, but ultimately the production concluded on time.

The challenges Ruta faced were of a rather different kind from those experienced by Roksolana. As the project had been conceived from the beginning as oriented towards the entertainment sector, things like integrating its contents with school curricula or studying its learning effects were never a consideration; neither did a shortage of resources or lack of public interest pose a problem. As the market for entertainment is larger and more diversified, Ruta's team were not too worried about the prospect of a similar solution appearing elsewhere: there was likely enough space in the market, as consuming one product did not preclude the target audience from purchasing another one. (This is a different logic from that of, for example, learning platforms, whereupon an institution's choice to purchase one platform typically means that it will not also buy other solutions with similar functionality.) Moreover, unlike Roksolana who launched a start-up, Ruta was based at an established production company with an existing team and professional experience, so team volatility was not a concern.

However, much like Roksolana's account, Ruta's story also highlights the importance of networking. Experienced as her team were, they had little prior expertise with VR and 360-degree videos. Luckily, these technical skills could be found elsewhere in the Nebula Cluster. Ruta's studio, in fact, had a history of cooperating with development companies and sound design studios in the cluster. Ruta's friendship with a stage director based at the National Drama Theatre also provided an early point of entry, making it easier to approach the theatre for collaboration.

Applying innovative technology to a new setting still inevitably meant a significant element of trial and error and made it difficult to find talent with relevant expertise, especially as no formal training was yet available in cinematographic 360-degree filmmaking. The avenues for disseminating such work were also somewhat limited; however, the situation was beginning to

change with an increasing number of film festivals organising 360-degree screenings as part of their programmes.

Ultimately, Ruta's account makes a case for public−private educational cooperation beyond formal education itself. At the same time, the way her team was able to leverage the potential of both networking and collaboration points to an opportunity for institutions of formal educations as well: formation of, or integration with, clusters of diverse stakeholders involved in AV and digital projects could help streamline educational innovation at large.

Conclusion

The two cases discussed above point to a number of considerations pertinent to the current status and future potentialities of educational innovation. One of these, stressed by both Roksolana and Ruta, is the primacy of networking, which serves the threefold function of finding collaborators, keeping abreast of the competition and gaining access to actual educational institutions for testing and potential adoption of the innovative technology. This is similar to the healthcare sector (see the whole of Section III of this volume), which is also characterised by relative difficulty of access; more generally, this speaks to the established understanding that networking is crucial for innovation owing to its role in 'obtaining access to new markets and technologies; speeding products to market; pooling complementary skills; safeguarding property rights /-/; and /-/obtaining access to external knowledge' (Pittaway, Robertson, Munir, Denyer, & Neely, 2004, p. 137).

Roksolana's account highlights a recurrent tension in institutional education: on the one hand, there is growing recognition of and interest in innovative technologies; on the other hand, there is institutional resistance to change. Digital technology, after all, has been touted as being about to change the face of education for decades now, without producing much tangible change − even as it has become an ever more integral part of young people's lives (Buckingham, 2007). This is not to say that change does not occur in schools: as Cuban (2013) pointed out, school education across the globe has been subject to frequent structural and curricular changes, but more often than not they have not yielded far-reaching results.

Several factors have played into this status quo. On the one hand are a number of extrinsic barriers; teachers find it difficult to productively integrate new technology into their classrooms because they 'lack time, training, professional development, access to sufficient hardware and software, and support' of administrators and officials (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013, p. 311). Roksolana encountered many of these barriers when introducing her team's project to Estonian school teachers. On the other hand, teachers' own mentalities and attitudes towards technology can pose a hurdle (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013, p. 312), as in the case of the teachers who were not comfortable with the idea of students using their phones in the classroom, even if for learning purposes.

In recent years, however, recognition of the importance and potential of technology has started to translate into more systemic and sustained efforts to

integrate technological innovation into school practices. This has coincided with a resurgence of interest in public−private partnerships in education (Robertson, Mundy, Verger, & Menashy, 2012, p. 5), with private AV and digital content producers providing the skills and resources needed for innovation, which public institutions of education often lack. Such collaborations are not unprecedented, with television and radio historically playing an important role in providing educational content (Saettler, 1968), but they are now opening doors for technological innovation in the classroom and beyond. This is exemplified by such projects as Learning City Espoo in Espoo, Finland, which is a dedicated effort aimed at bringing AV and digital companies together with educational organisations and policymakers (returning us, thus, to the importance of networking; see also Chapter 5). Such projects indicate an ongoing convergence process and the emergence of an epistemic community at the intersection of education, technology and AV representation/ storytelling. The increasing visibility of this community should contribute to a change in administrators', educators' and students' perceptions, which is crucial as positive effects in educational innovation demonstrate a strong correlation with positive belief in such effects (Blackwell et al., 2013). At the same time, it is important that public−private partnerships eventually spread beyond dedicated 'islands of innovation' into wider educational innovation systems, in order to have an impact on society at large (Avidov-Ungar & Eshet-Alkakay, 2011), a process that also needs to be supported by well-thought-out policy (Lubienski, 2009).

Ruta's story exemplifies another shift: a move beyond institutional education. An increasing number of public and private institutions, including museums, libraries, zoos, NGOs and, in Ruta's case, theatres, are recognising the importance of educating their public about their own activities and the wider societal issues relevant to their work. This results in higher engagement and deeper contextualisation of learning content in the realities of society beyond the classroom (Dillon, 2012). This shift also means greater opportunities for innovators, as learning and educational solutions are sought not only by schools and universities, but also by a wide range of institutions, as well as individual learners. Under this paradigm, entertainment becomes a key part of the equation, which is exactly the added value that technologies such as AR as well as storytelling expertise can provide (Bacca, Baldiris, Fabregat, & Graf, 2014; Dede, 2009).

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