WAYS OF EXPRESSION: THE IMPACT OF VFX TECHNOLOGY ON MODERN STORYTELLING IN FILM AND INTERACTIVE MEDIA PRODUCTION.

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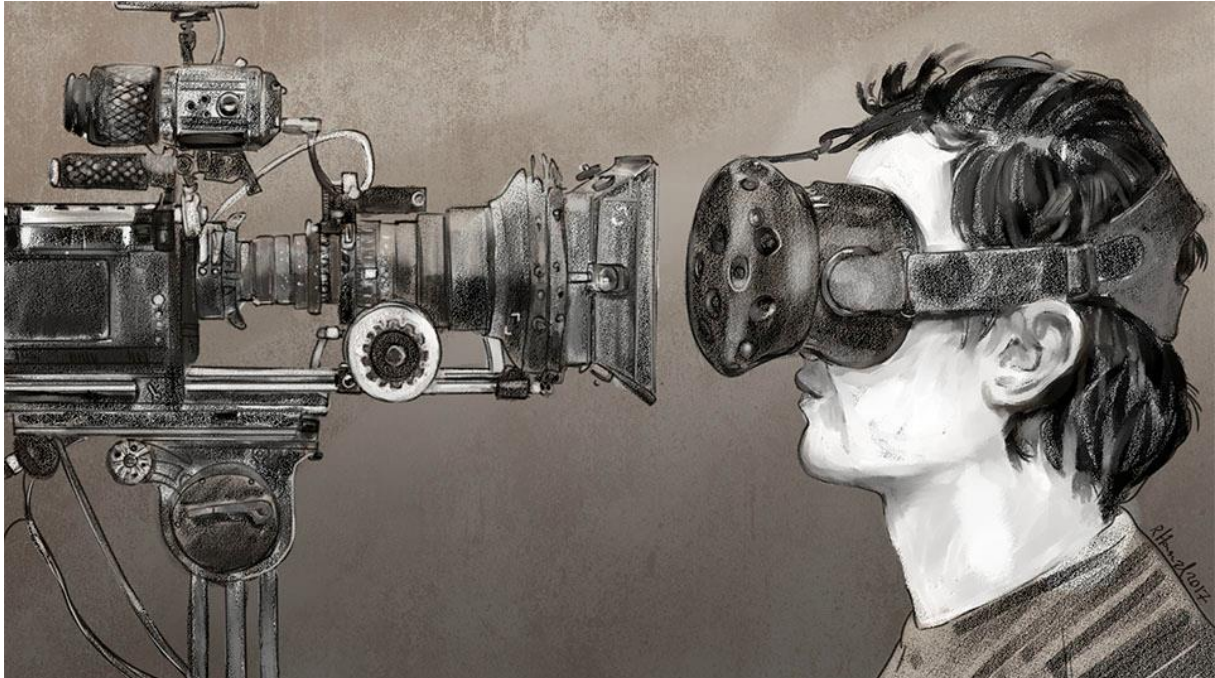
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VFX AS A VERSATILE TOOL

In the past decade digital technology has become inherently involved in almost every artistic creation. Artists use computers at various stages of creation, employing them for diverse tasks. Even if the final work is not directly connected with digital technology, various software can be used to communicate with other artists or collaborators, organize the creative process, gather resources, or publish the artistic outcomes. Many professionals have had to reinvent the way they work or to convert to a completely different specialization. Their methods of seeking inspiration and developing a concept have also had to be adjusted so that they use the benefits of technological progress. It is possible nowadays to create films and animations without computers, but it is completely impractical. Books can also be published manually, by means of letterpress printing, but it is much easier to use desktop publishing software. However, there are some art domains, such as web-art, video-performance or extended reality, where it is impossible to create without digital technology. Thanks to dynamic development of digital technologies and increased affordability of both hardware and software, digital tools which were once beyond the reach of an ordinary artist are now available for everyone.

Every time a new technology appears, people try to use it in an old fashioned way and to describe it with existing terminology. A good example is photography, which has finally developed into an independent art form, but was initially treated as another emanation of painting. Pictorialists tried to apply traditional painting or drawing techniques in the first darkrooms, while developing prints and films. This approach also started the debate on the relationship between a technical and an artistic aspect of the medium. A similar situation has

occurred recently in relation to the new media and extended reality. People try to adopt old patterns to new circumstances, while contemporary challenges require a new approach. The attempt to connect the old and the new allows the general public to grasp a new technology and to make it more accessible to use from the very beginning, but it also imposes rigid limits on the scope of its possible applications. As Murch points out, during the transitional period after introducing the new technology the means of communicating the content are more perceptible than the content itself. Only after some time, after the complete assimilation of the new technology, does the content regain its primary position. [1]

Visual effects domain is based on new technologies. They very often offer a new way of telling an old story. The rapid development of digitalization in the mid-90s brought about a new phenomenon. Computers provided a common platform which facilitated the process of spreading specialist software used in one artistic field into other fields.

activities. Various software techniques were employed in different fields of art. One example is the possibilities enabled by NURBS curves. They were primarily developed for the automotive industry and then improved in Maya, VFX software. When architects started to use 3D software originally designed for film special effects, the logic of the animated form entered architectural thinking. It led to an aesthetic and intellectual revolution and engendered a new expressive language. [2] Animation software conceptualizes form as being inherently and infinitely variable. New techniques of modeling pushed architectural thinking away from rectangular modernist geometry and toward the privileging of smooth and complex forms made from continuous curves. Another example of the impact of a new tool on the language of creation is the evolution of digital sculpting. It has emerged as a result of the development of ZBrush. In the beginning, ZBrush was only an extended painting tool, differing from other painting programs only because it could understand depth. While most 2D programs treat the working space as a grid of pixels, ZBrush uses a propertiary "pixol" technology which contains additional information on depth and material. It was described as the first painting program where you use a traditional 2D brush to paint with fully rendered 3D objects. [3] This advantage was not so revolutionary until someone discovered that one of its tools, a polymesh tool, is ideally suited for 3D sculptings in a sort of virtual clay. This new application opened utterly new possibilities for CGI artists, jewelers, traditional sculptors, etc. It enabled several new specializations in the film industry and created the original art domain of digital sculpting.

Visual effects are a specific type of tools within the digital creation group. They can be used in a similar way as other tools, and choosing a particular tool is like choosing between gouache and charcoal. In the twentieth-century, the role of the cinema was to capture and to store a visible reality. Now the reality can be constructed outside the film image. New picture editing possibilities offered by computers bring all visual techniques down to the most basic element, that of a pixel. For the viewer it does not matter how the pixel was made, and this actually equates the real world with the computer-created one. During the transition from celluloid film to digital filmmaking, the medium has lost its permanence. VFX department is seen as a distinctive symbol of this transition but this lies beyond the scope of my artistic research.

It seems crucial for modern art to embrace the new methods of visual storytelling which use digital techniques to create a bridge between different specializations, not only on the level of technology, but also on a higher level in general. Computer-generated effects are such a creative instrument of communication with the audience. Their primary aim is to tell an amazing story. As the power of digital tools has exploded exponentially, the departments that were once separated have become more consolidated with full digital environments, sets, characters, and visual effects. Visual effects artists sitting at the computer are becoming increasingly responsible for carrying out those tasks by means of using knowledge, technical ability, and skills offered by the new technology.

Storytelling and triggering emotions play a crucial role in filmmaking, but many CGI-enhanced films leave little to the imagination. This drawback is caused by the repeatability of frequently chosen approaches, by lack of ingenuity or by mismatching the means of expression. If visual effects are successful, they may add to the cinematic experience some charm of a magic show. But, just like in magic shows, the audience gets used to the tricks of magicians. [4] Contemporary technologies allow developing unique solutions. They might become a source of inspiration for the whole team. Virtual reality can be treated as a final medium of distribution or as a tool for solving production problems. It can be employed for exploring distant, less accessible locations, or it can be used to create new, imaginary ones. Being able to see simplified three-dimensional models of location can bring additional inspiration or help to plan a spatial solution for the scene. This feature is particularly useful during the development of the environment which does not exist in reality and is called virtual production or on-set post-production. Technology can be also used for the creation of a new visual language.

In my research, I focused on the possibilities that VFX tools provide for contemporary artistic realizations. While the benefits for feature shoot planning seem rather obvious, it is not so straightforward for less typical realizations. That is why I explored two extremes, the documentary and the virtual reality production. In both cases, the most important aspect was the storytelling development.

As a research method, I have chosen to work as a creative technologist during two productions, one of each type. Alongside, I verified my findings during workshops and lectures with students. My research was also meant to determine the areas of expertise of the range of activities of a creative technologist. Another focus of my exploration was the unconventional use of VFX tools. I wanted to test to what extent a particular development imposes its mark on the final content. I had to learn how to make a creative use of necessary technological glitches. The best way to explore it was to determine the faults of the analog tools and to use the traditional approach as a starting point. In digital technology, adding imperfections to artistic realizations makes them unique, which is an obvious aesthetic asset.

My research allows me to admit, looking back at my past professional career, that I have repeatedly undertaken the typical actions of a creative technologist quite unconsciously. However, this research is my first attempt to genuinely understand this new discipline and to comprehend the meaning of contemporary VFX tools in the palette of artistic possibilities.

THE NEWLY COINED NOMENCLATURE
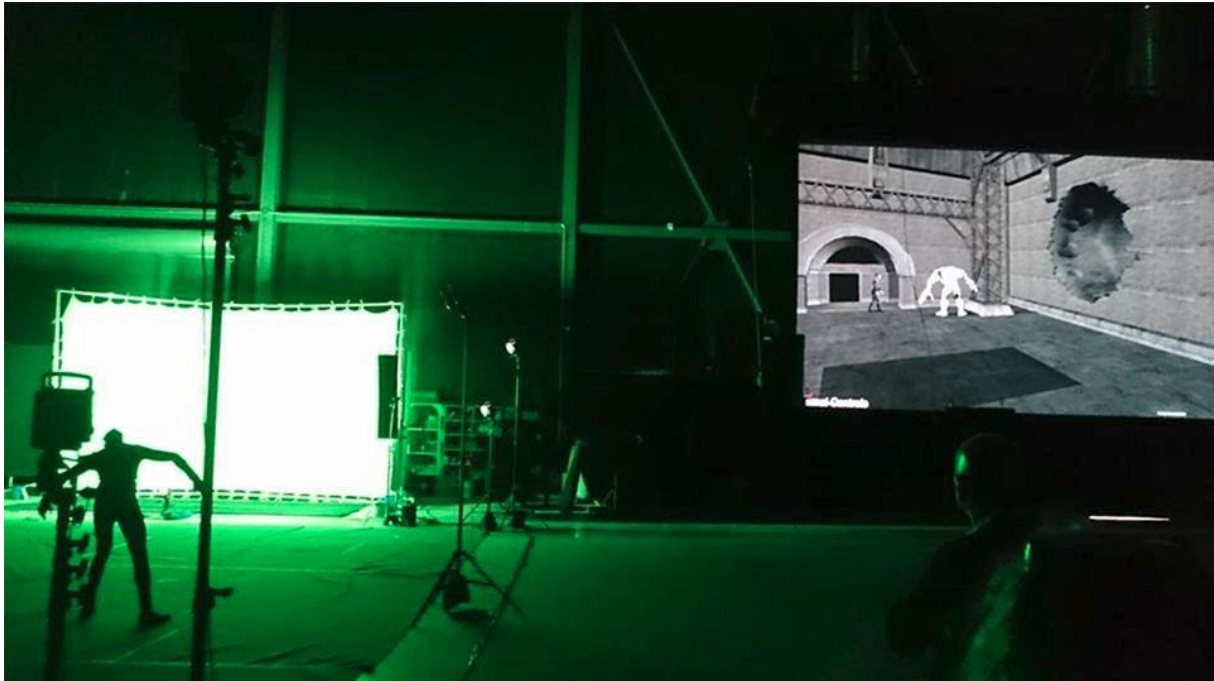
The difference between a VFX supervisor, a CG supervisor and a creative technologist is related to the area of activity. **VFX supervisors** usually supervise the effects team from the vendor side. They help to organize and finally accept the technical aspects of the effect shot. **VFX supervisors** make general calculations and prepare bids for the production, but without entering at the production pipeline level. **CG supervisors** decide what software to use and what the pipeline should look like. They work out numbers with the budget people. They also come up with creative ideas to cheat difficult shots with software and hardware resources. More complex productions have an increased amount of supervisor types - compositing supervisors, stereoscopic supervisors, groom supervisors, asset supervisors, etc. They are more specialized, and usually strongly linked with post-production.

The growing amount of special effects in film production has triggered a need for a global VFX supervisor who can coordinate the realization of special effects from the producer side. Such a professional is particularly indispensable in the case of multiple vendors for effects. The growing tendency to have a more controlled budget results in the need for more efficient resources management. The base of such management should be, amongst other, precisely defined storytelling paradigm through artistic goals and priority of spectator's emotional involvement.

Computer-generated effects are like a bottomless pit: you can throw in any amount of money, but there is still something which can be improved. Because of that, big visual effects studios usually try to offer similar solutions to different clients. In this way, they can providelow realization costs while still maintaining optimized pipeline. The problem is, however, that the artistic creation should offer a distinctive approach to the subject, a unique style or aesthetics.

This dilemma creates the need for seeking the services of someone who can find balance between the creative uniqueness and the efficiency of a solution.

VFX production side supervisors watch over almost every aspect of production and sometimes do the work of the art director, approving shots artistically. In more difficult productions they take the role of the second director, directing the effects shots. They are involved in resource management and budgeting in a general manner; they can even suggest overall preliminary solutions for technical issues, which they later improve with senior or lead department developers. On the crew list, these professionals usually appear as "visual effects supervisors" without the indication of a company name to show their bindings with the director and the producer rather than with special effects vendors.

They cooperate with the crew to realize the visual world of the movie in accordance with the director's vision. Their role is particularly to research the theoretical aspect of the visual extension created by the visual effects team to make it more realistic. For instance, they can work out the dynamics and appearance of splattering blood or colliding planets. They can suggest how a particular effects scene may be accomplished so that it looks realistically. With a few exceptions, this has previously been a function of various film crew members representing special effects. Contemporary filmmaking experience prove that there is a need for employing an independent artist, working at the same production level as the cinematographer and the scenographer, ready to take creative co-responsibility for the realization of the film's visual expression.

A creative technologist is a new position in film, television, games, and the new media. This job demands a wide range of skills and qualifications, and the most important is the ability to apply digital technology as an artistic tool in a team that creates an audiovisual story. The digital development of recent years has shown a vast need for this position, which can be part of the director's central team. The duties of a creative technologist can be described as intensified tasks of a production VFX supervisor, focused in a particular way on new technologies. A creative technologist employs a wide range of traditional and digital techniques for image manipulation and creativity. Also, the position demands knowledge and experience of working with several platforms for stories, ranging from conventional cinema to interactive 360-degree media, such as VR and AR. The transmedia trend puts experimenting with the artistic potential of different platforms in the spotlight.

It is important to distinguish between a technologist and a technician. The second position relates to the practical use of technology, i.e. operating various devices which make the production process possible. In filmmaking, the example of such a professional is a location sound recordist, a data wrangler or a lighting technician. A technologist, in contrast, is an expert in technology, who serves as an advisor.

The term **Digital Visual Design** was developed for the needs of education at The Norwegian Film School. Its role was to emphasize the exceptionality of the new approach to film production, based on storytelling development. The particular importance in the development is played by the visual factor supported by well-tailored special effects and contemporary digital technologies. The idea of teaching VFX professionals of the new era finds its roots in

the activities related to the tasks of a production VFX supervisor, but it is also derived from academic fundamentals and The Norwegian Film School tradition. Similarly to a VFX supervisor, **a digital visual designer** coordinates other visual effects supervisors and crew members to fulfill the director's vision. His or her job is to support the creative process among the production team to allow smooth exploration of artistic goals in an unknown and unpredictable territory of the new technology. The role of a digital visual designer goes far beyond being a technician. He or she delivers concepts based on artistic experience and technical knowledge as a full-fledged member of the creative team and is responsible for visual communication between different art departments. The fundamental part of a digital visual designer's work is to make an artistic choice on topics explored through the storytelling aspect, leaving the space for further development at the same time. Another important activity is resources management and internal budgeting but without bidding. If a particular special effect does not work well for a storyline, it is his or her role to suggest the way of redeploying funds to a more critical part of the film.

Digital visual designers create a bridge between a spoken idea and its visualization. They can use different tools to visualize the look, timing, and space arrangement. This helps to fit into the budget while still allowing to reach the artistic target. The task of such a production advisor is choosing between a classical on-set special effect, called **SFX,** and a computer-generated visual effect, called **VFX**. Contemporary cinema still applies the traditional effects based on makeup, prosthetics, animatronics, miniatures, etc. SFXs are far more useful, considering the instant result which can be seen by every crew member during filming. They can also support acting. While computer effects require more imagination during components recording, using special effects on the set allows actors to relate to real things.

VFX is the combination of live-action footage and additional footage created outside the context of a live action shot. It usually contains computer-generated imagery (**CGI**). Digital visual effects are meant to create photo-realistic, believable images. This primary goal, the illusion, distinguishes them from animation. VFX shots range from basic image manipulation and compositing, the integration of live action with CG, to full CG environments with computer generated actors.

The most effective technique is shooting SFX footage and improving it with the use of VFX. You can combine and unite them during post-production. It is essential to balance both elements inventively because in some cases special effects are less expensive and more spectacular than visual effects, and consequently they should prevail in the production.

Introducing the curriculum for a new department at the Norwegian Film School proved that the popularization of a newly created term "digital visual design" in the feature film community is extremely difficult, mainly for historical reasons. Professionals preferred to use the old name of a VFX supervisor. The DVD abbreviation was also unfortunate, suggesting a connection with a digital optical disc storage format. The name inherently implies a "digital" context, while the essence of the students' activity is to create a bridge between classical and computer generated effects. Currently, the name of the department has been shortened to "**VFX design**" to maintain its connotation with the film industry. It is more conservative but easier to propagate.

INDUCTIVE STORYTELLING ANALYSIS
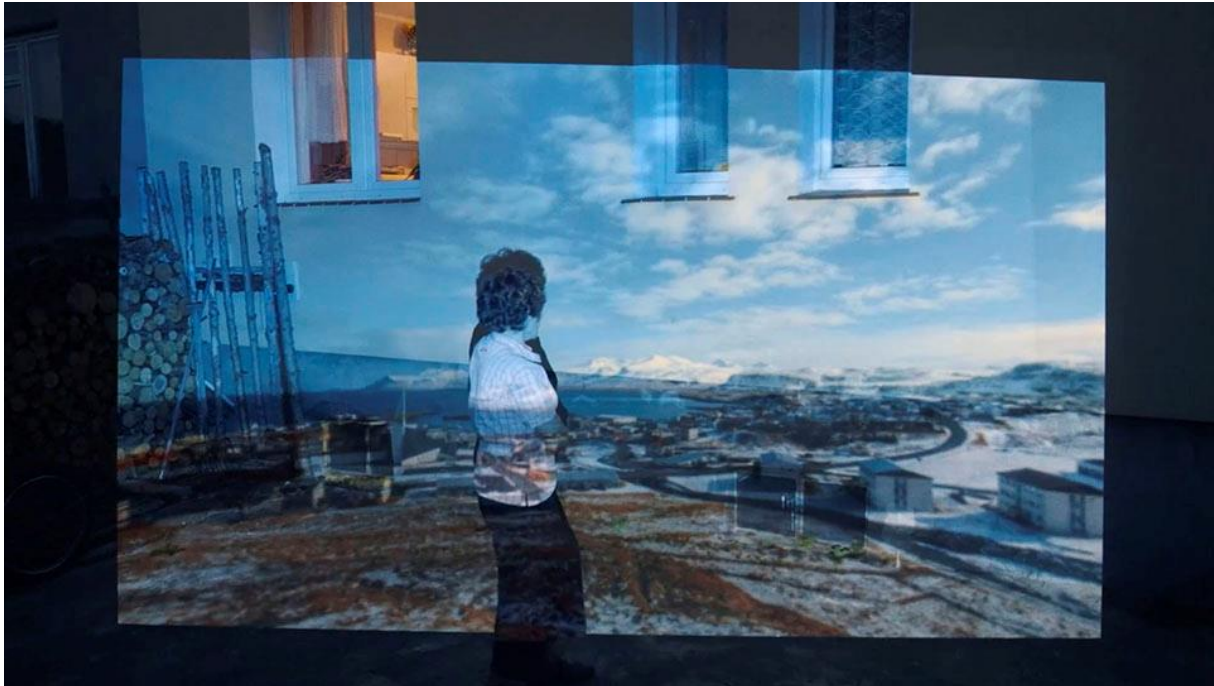
Clear methodological approach is fundamental to every research. It is also the hallmark of effective artistic experimentation. During my research connected with the documentary, I mainly used inductive, bottom-up analysis approach to search patterns which could establish the visual style and scope of CGI extension added to the picture. I started with series of detailed tests and worked out the solutions by examining related issues. There are two arguments justifying my choice of reasoning. When I began cooperating with the director Pawel Ziemilski in January 2016, he had already worked on the film for three years. During this process, several possible visual solutions or stylizations were initialized, but none of them sufficiently fitted the story. Usually, in this situation, all the answers which were not eliminated during the development seem equally good or bad. In feature films, a production VFX supervisor is responsible for such kind of selectivity, as well as for realizing the director's vision. In many other instances, unfortunately, such a professional is involved only during pre-production. A documentary is not usually associated with using special effects, especially if initially only some undefined form of a visual stylization is planned. If a pre-production process is meant to be more secure, it should include someone who can suggest adequate technical solutions. At present, it is almost certain that most film realizations will require some kind of post-production. This means that a creative technologist should take part in the production of a documentary from the very beginning.

The second reason for employing the inductive analysis was the lack of a decisive storytelling dominant. The director was not sure which of the themes of the film should be the leading one. The story had too many threads and developed in too many directions. Such multiplicity makes it difficult to establish the criteria for selection. Additionally, individual stories of particular film characters were similar and had a limited dramaturgical potential. People

presented in the film were not professional actors or naturally gifted in acting. Unless their story was not accompanied by traumatic experience, they were usually focused solely on their everyday life, and this did not constitute a solid material for creating the plot. Therefore, the method of working from the specific to the general seemed the best possible choice.

The first challenge was to develop the capturing system for **Skype**. The director had the protagonists' permission to record their conversations, which were initially the main component of the film. Ziemilski wanted to explore the experience of presence connected with the sense of community sustained only by Skype chats. Thanks to video capturing, it was possible to follow the fate of both those who decided to leave for Iceland and those who chose to stay in Poland. Recorded Skype conversations were also a valuable information resource, tracking any recent changes in the lives of the people depicted by the documentary. This Big Brother-like social experiment was fundamental for the film. My artistic research at that time focused only on the mainstream VFX methodology, so I thought that the strategy of acquiring materials is not really related to my area of interest. Nonetheless, I decided to devise the system of Skype video capturing to establish good cooperation with the rest of the team.

Along with the evolution of my academic interests, my understanding of the research topics has changed. Thanks to my artistic research, I now prefer to describe my position as that of a creative technologist. My analysis led me to the conclusion that the change in the scope or area of activity of a VFX supervisor demands that we acknowledge the transformation of its role and its name. The abovementioned development of the Skype capturing system was a perfect example of such a transformation. I designed the solutions to acquire video materials and the original, stylized manner of their presentation. The visuals captured in this way are of a low quality. Footage is highly compressed, it has a lot of noise, and the recording cameras are low-resolution with a poor low-light performance. Moreover, each participant used different devices from variable manufacturers: smartphones, tablets, PCs, and Macs. Because the important factor for each artwork is visual integrity, having to deal diverse low-quality footage presented us with two possible solutions. The first one was to improve the quality, which may be costly and time-consuming, the second was to level down the quality and introduce additional stylization to cover imperfections. The degradation method was better because some of the materials were planned to be acquired with professional cameras and then stylized to resemble Skype conversation. It was impossible to achieve that degree of quality with the original Skype recorded footage. I found several visual tricks to add relevant distortion and interference to disguise the difference in quality. The director accepted the

result, but the visual side of recordings did not fit the final artistic concept, and only the sound part of the conversations was used in the finished film.

During the realization of my first task, I noticed the unusual phenomenon of resistance of the film crew against getting beyond a particular level of technological advancement. The producer, Lukasz Dlugolecki, initially planned to install recording software on each computer separately, then capture visuals without any control, and finally copy the recorded materials from hard-drives after three months. With more than fifty participants, such a system was not very convenient. Instead, I proposed a number of solutions, including a cloud-based system where all conversations could be recorded globally on the server. Although Microsoft Poland approved our project and they were able to offer us an affordable solution, this idea was abandoned and a less advanced method, based on remote computer access, was applied. We tested this technique for several weeks before the final implementation. In my view, the abovementioned limit of acceptance for technology is only natural. A creative technologist or a technophile does not have such a restraint: every new technology is challenging and fun. For most of the population, however, it may pose a problem. The users may feel lost and insecure. In the same way, a conventional artist can accept a only restricted technological leap in the creative process. For instance, a significant number of artists employ a method of manual conceptual drawing on paper and then the digital edition of scanned pictures. Computer is a transparent tool of early creation only for some of them. People prefer traditional methods supporting the thought process. This technological barrier was particularly evident later when the production moved forward.

In addition to the Skype sessions, the film initially was supposed to involve several distinct techniques: animation, scripted static shots, and hand-held "organic" observational scenes. They were supposed to interlace with each other. Each of these elements was meant to describe a different aspect of the society portrayed in the film. I was asked to develop several possible solutions for these components and to explore the visual possibilities. The main topic was the etiological myth which started the emigration trend. To distinguish the past and the present, the director decided to use animation.

The ships sailing under the Icelandic flag reach the Polish port in 1980. An Icelandic navigator Valdi decide to travel across an alien land in search of a wife. The first person that attracted Valdi's attention in Poland is the train conductress Joasia. He falls in love with her at first sight. Despite the language barrier, he manages to determine that she is single and lives in Stare Juchy. Without hesitation, he decides to visit this distant place in the Masurian forests. This adventure will lead to the migration of one-third of the population, four hundred people, from this town to Iceland.

When I joined the team, they already worked on the idea of single-cell animation superimposed over live footage, with the voiceover of interviews with founding fathers. The director asked me to explore other stylistic possibilities. My first idea was to use a map theme and a journey motif. Valdi was a navigator, so the next logical step was to use stylization to 1980s computer graphic or ASCII animation. The narrative could be based on letters from Valdi to Joasia. I also tried to use the method of communication between ships as an inspiration. It referred to a type of work Valdi did.

The second idea was to test South Park style animation. I tried out the stylization combining Polish Masurian folk and Icelandic folk. The plan was to use the combination of drawing and cutouts. Ziemilski wanted the story to progress with a seamless transition between a cartoonish look and a photographic quality of Skype. The main problem was how to gradually change stylized animation into real photographic footage. Unfortunately, the results were not fully satisfactory. The connection of the love story with a funny cartoonish look did not seem to work for the film. This kind of absurd humor was not adequate to the mood that the director intended to get. It emphasized the weakness of using the Skype recordings, because they seemed rather trivial. Finally, the founding story of Valdi and Joasia was abandoned after this research. This allowed me to clarify the definition of digital visual design and to check out the potential of a creative technologist.

Animation is not included in the VFX activity but may be added to it as a separate technique. This possibility comes from the fact that the European film industry does not have such a strict assignment of responsibilities as the Hollywood industry. In Norway, many cinematographers perform the tasks of an on-set VFX supervisor themselves. Computer generated animated films apply many visual effects techniques, but they are a different kind of creativity. In visual effects, computer-created objects, characters, or environments serve to support live-action story and are usually are intended to look photorealistic even if they depict fictitious situations. [1] While VFX supervisors and digital visual designers create elements that are incorporated into live action shots, creative technologists are not limited in such a way. The digital visual design students of the Norwegian film were frequently asked to resort to animation, and this technique is sometimes the most efficient solution for issue various issues encounters in feature film production. Nevertheless, the animation was outside the scope of my artistic research, and In Touch gave up this direction of development.

Complicated relations between members of different families were the core of the story. The network of relationships between the characters initiated for each of them a sequence of

personal experiences. The director's idea was to create a gigantic **family tree** and present its fragments to show the connections between people. At the bottom of the tree was Joasia, the Founding Mother, at the top was the youngest generation of emigrants. I used a system of mind mapping to establish clear and editable links between the research objectives. This part of development allowed us to construct the story better. Using paper-based notes was impractical, so I employed cloud-based Google Docs as a universal collaboration tool. To represent graphically the form of the family tree, I suggested stylizing 3D rendering to microscope photography. The result was supposed to be realistic, similar to medical visualizations. Even though it was a computer-generated animation, because of its realism it could be classified as a visual effect. After some consideration we abandoned this idea, as it did not match the desired storytelling style.

The next task in the development was to introduce the context of the colonization of an undiscovered land. This context was supposed to be our exposition, the background information necessary for the viewer to understand what is going on in the story. [2] I put forward a number of suggestions, including the use of a tilt-shift effect. In traditional photography, this effect is created by mechanical rotation of the focal plane through specially constructed lenses. Visually it gives an impression of scale change; people look like ants and buildings resemble scaled maquettes. Familiar sights look like video transmission from an unexplored planet. There are many artists, like Bjorn Vermeersch, [3] who highly specialize in this type of photography. Unfortunately, the tilt-shift equipment can be inconvenient to use on the set, especially in a documentary realization. It requires meticulous setting, which takes a lot of time, while outdoor documentary filming demands rapid action and fast decisions. In Iceland, everything is weather permitting, and it is hard to catch the moment when one has to use uncomfortable equipment. This solution requires planning ahead of time. However, the effects are easy to replicate in post-production and are affordable for every budget. The computer made tilt-shift effect is based on a gradual blur. In more complicated cases the amount of blur is mapped on the greyscale bitmap. To give the impression of a real lens, visual artifacts are often added: chromatic aberration, vignetting or an additional directional blur.

Animating and setting the effect is easy. The best solution is to connect both digital and analog technique to get a rich and multi-layered result. Usually, this kind of stylization is used only for external landscapes. It challenged me, so I did some test on the potential of using such effect indoor and possibilities for digital enhancement. I looked at it as a challenge, so I tested if this effect could be used indoors and if digital enhancement of the effect was possible. My experiments confirmed the theory that it is most effective for outdoor photography. This effect was easy to replicate digitally, but building interiors never achieved such special scale as landscapes could. The stylization could be done, but the lack of space changed the context in which the effect would be perceived. Initially, the tilt-shifts used in the film were to be mixed alternately with other elements, in a final edit were grouped together as the beginning of the movie, and lastly, only some of them were collected in one place, in the middle of the film. Initially, the tilt-shifts were supposed to be mixed alternately with other elements. In the final edit they were grouped together as the beginning of the movie, but the final/theatrical cut/version used only some of them, collected in the middle of the film. The director decided that they fit emotionally the story of only one character, since it is told in an oneiric form of an unreal dream. In the background, we hear the voice of a person from Poland, with a strong echo effect added. This person is imagining Iceland.

Since we had ruled out several options, the most dominant elements were "**postcards**", consisting of two parts. The first one showed a person against the landscape, with the off-screen voice telling his or her story. Because of the limitations of the vocal performance of characters appearing in the documentary, the director planned to write down interviews and engage professional actor for reading. At a later stage, we wanted to make it with tilt-shift, but eventually, this component was replaced by classical shots.

The second part of the "postcard" presented staged scenes where the protagonists were talking to the camera. The scenes used a vertical or horizontal screen division: one part of the screen would show a person, the other would show the subject area of his/her talk. Originally the scenes narrated short stories about the protagonists' experience in Iceland. Different "postcards" had different styles, according to the profile of a particular character. Because of the form, they looked like personalized messages from the most remote part of the world sent home, to the village, to the relatives, and to the film audience. These one-shot static scenes were supposed to describe how Iceland influenced people's lives, how it enriched them and their families. The subjects were asked to describe what they have achieved and learned, how they have changed. The scenes were intended to show how exotic Iceland is for newcomers and to explain what they added to the community. One example was a man naming all Icelandic fish he caught and showing them at the bottom part of the screen.

Instead of dividing the screen I suggested using in-frame composition based on multiple layers. I made a test scene with a moving car and presented it to the director. I believe that it was the **breaking point** for our development. Afterwards, we decided to use the film means in an unusual way. The new goal was to show the connection between the people similar to a Skype chat, but by using film effects. We came to the conclusion that the characters of the documentary pretend to be together, trying to act as if they had never left their home country, but it is obviously not true. In fact, they miss contact with their close ones. Instead of showing direct conversations, we decided to use the prerecorded footage to depict a different emotional bond and deeper feelings. Instead of showing Icelandic geysers and icebergs, the film could present what actually is important for the characters. The "postcards" could show

who characters actually are; they could reveal their individuality. I found several methods to make multilayer frame compositions. The easiest one was to use on-set compositing with an LCD screen or a projector, but I wanted to try something more sophisticated. I suggested using VFX in a creative way to combine different pictures in one edit. Instead of dividing the screen into two parts it was to be divided into two planes through a composition based on green screen technology. We decided to try this idea first as the most challenging realization option.

In October 2016 we went to Iceland. It was my first encounter with the locations and the protagonists. An effective development requires getting to the source of inspiration. I wanted to test my ideas on real locations. While I was there, I made extensive documentation of the places, people, letters, and mementos from the past. It was an excellent source for further development and also, as it turned out, the material for the ending of the film.

In order to have virtual access to these locations, I made several high-dynamic-range panoramas and photogrammetries. These actions are commonly used in average VFX realizations to share with the post-production team the information about the location that was available to the shooting team. Having such information, you can measure dimensions, design the set, examine the placement for the equipment or make the next location scouting in virtual reality. During our journey, we encountered enormous, beautiful northern lights. I

recorded them using time-lapse photography. Some of these materials were used later for the production. Documentation at such a level is often treated as a final source.
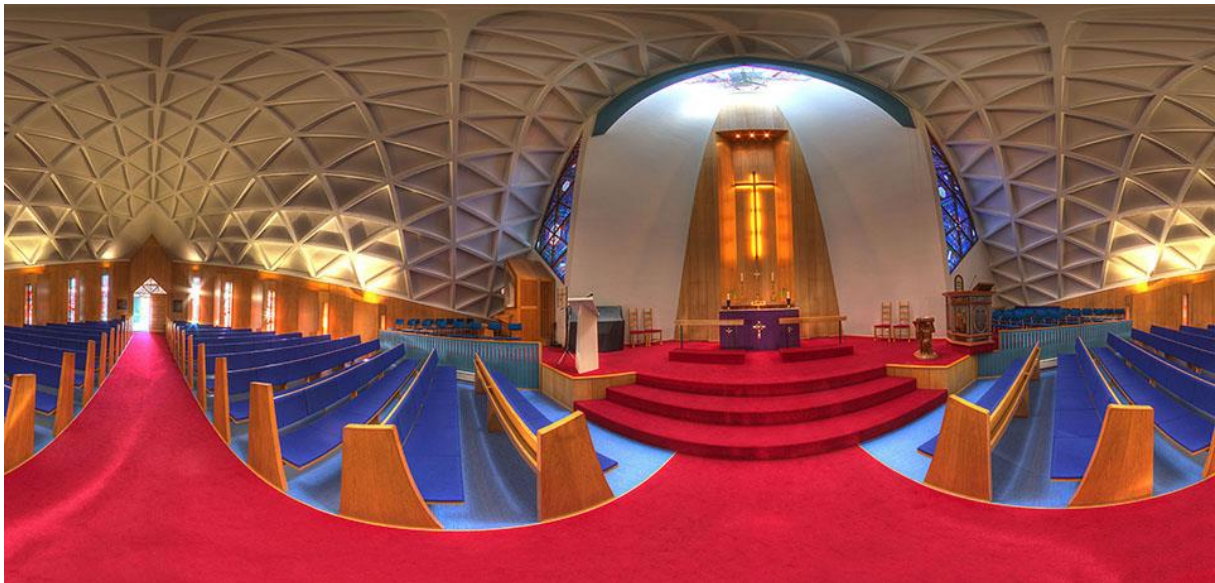

My next challenge was to find the way to involve the protagonists to a greater extent during shooting. My idea was to explain to them our intentions, to tell them how we want to create the film and how we plan to use special effects. The film was intended to bring together, in its own way, the members of a community separated by thousands of kilometers. We wanted to reunite families and friends through VFX realization, and they had to understand that. After a short explanation, they transformed from passive interview subjects into the members of our team. Another positive aspect of this strategy was that they started to bring their own creative solutions for the scenes. It was possible because these days special effects became the contemporary standard. Everyone knows how they work and what their purpose is. Advanced technical explanation was not necessary. The characters just needed to understand basic VFX rules and the main idea of the film. We tested this method a couple of times. In the beginning, I was required on-set to explain it in simple words, but later the director started doing it himself. Murch claims that the human imagination is able to recognize ideas more powerfully than we can articulate them. [4] You always understand more of the language than just verbal communication. People presented in the film required planting an idea of the movie in their heads. It allowed them to be able to reveal their stories better. Before, the material was more humorous than poetic. Now we had a proper building material to create the story.

Scenes enriched with **VFX effects** explained how Iceland influenced people's lives. This created the connection between those who are left behind and those who migrated, but pretended that they never left and they are together with their loved ones. The VFX-enriched scenes showed the evolution of the individuals, the families, and the whole society in the context of values such as freedom, openness towards the world, the opportunities given by rapid mobility. Modern technologies, like mobile phones or Skype, changed people's knowledge of themselves and of the ones around them, as well as the understanding of controlling their ways of life. Instead of shooting Icelandic geysers and icebergs, the film could present what was really important for the characters.

Every work of art is based on contrasts. You cannot have loud without silent or bright without dark. Each element is relevant to the other in the process of creating a composition. To develop the story we needed to present the influence of the Icelandic culture on emigrants by means of comparing them to the people who stayed in Poland. The first layer of the composition was filmed in Iceland and was based on the experience connected with the country. This part functioned as a background, the environment where we would add the person from Poland who was also involved in the story. We planned to film the second component in Poland with a green screen background, to allow easy post-production. In addition, it was congruent with psychologically based dramaturgy. The feelings in the people who were left behind are much more intense than in those who migrated and who live two lives. The light from the first component was supposed to be recreated on the second set. Such a strategy demanded full technical documentation from the Islandic sets with the high-dynamic-range panorama included, which delivers light calculation information, indispensable in such a restoration.
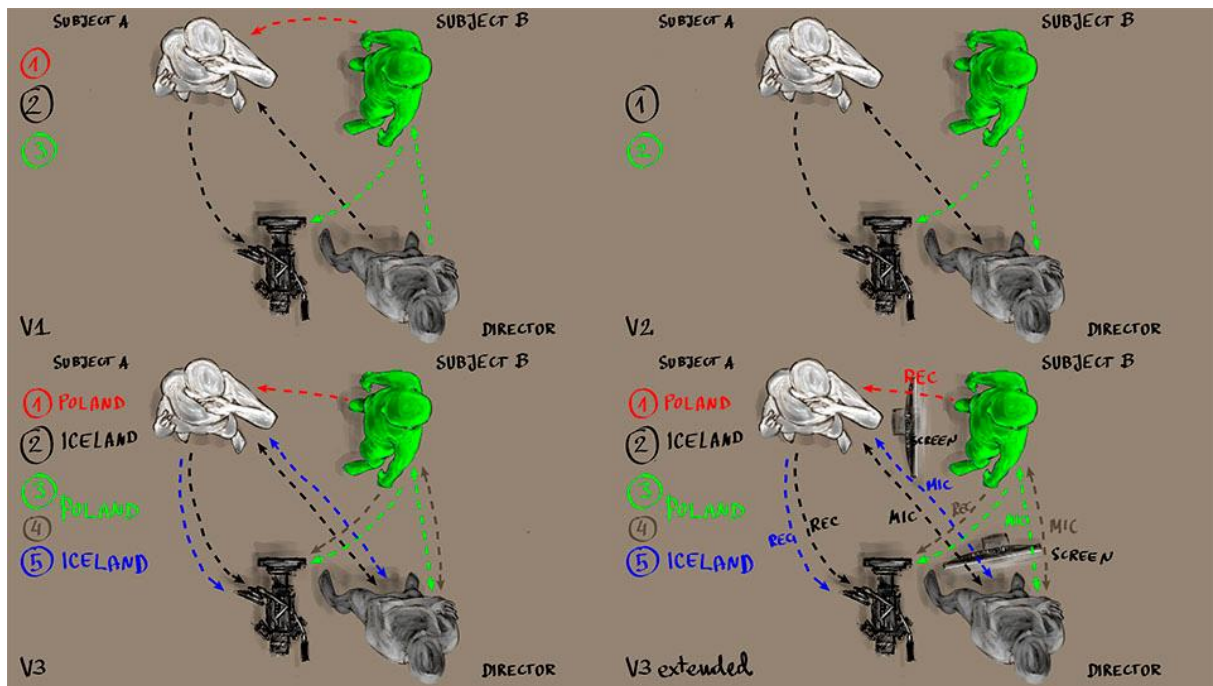
We planned to use a whole spectrum of special effects tools, including photogrammetry, tracking, green screen, and deep data. We did not want to make VFX completely invisible, to emphasize the technological impact in the picture, and to maintain the impression of documentary truth. We needed to optimize resources to avoid blowing up our limited budget. In addition to proper stylization, every VFX "postcard" scene had to be properly planned to avoid unnecessary additional work. Everything can be corrected in post-production, but it may tremendously increase expenses and time needed for completing the process.

In order to plan everything properly, I made a detailed document, kept in the cloud, with the names of the protagonists, the gist of their stories, the scope of Skype recording, the description of the green screen actions and technical challenges for each scene. We developed more than 20 possible postcards in both types of exposition: off-screen narration and the connection of the two worlds. I also explored some other formal possibilities, such as long shots with excessive camera movement, interiors containing digitally added objects, locations moved to different environments, or the deconstruction of space. I also made relevant storyboards, concept art, and animatics.

This was, in fact, the second time I encountered the tension against crossing a technological barrier, similarly to the Skype recording problem. The director did not want to enter a certain technological level. He explained that it was beyond his working method and that he was afraid to lose control of the process. Instead, we tried the less advanced solution based on a system of hidden headphones and monitor projection, with the director prompting the protagonists during filming. Those solutions were tested, but the results were not satisfying for Ziemilski. He had a problem introducing natural behavior of the protagonists, because they acted in an unnatural way. The green screen made this way did not live up to the director's expectations. The technology must serve the production team but the director found that the solution was confusing and it did not bring the expected results. This happened despite the

fact that all the modifications of the method were done according to the director's suggestions. The method required further development.

I was always fascinated with artistic activities based on image **projections**. In the late nineties, it was hard to find standardized equipment setup for VJing. Many gave up using it, but others wrote software to make it easier [5] In 2000 I created my first visual system using action script. It was prepared for the performance and the multimedia show I had in the planetarium. I kept improving this system during the next performances, making visuals for music improvisation. In the beginning, it was a live drawing system, but it evolved into the method based on live compositing and editing based method. At that time I had to rely entirely on my own creativity.

I was skeptical against using this solution for the documentary. Firstly, this method seemed cliché for our film. Projections are quite common in low budget realizations, especially in video clips. This topic has already been extensively explored. Projections in post-production are easy to replicate, especially when the camera is static. All you need is a layer with a proper merge algorithm and distortion. I believe that a good movie needs a new approach to the topic which was difficult to achieve with such a commonly used technique. Secondly, I knew that was impossible to receive high-quality shooting because the projection will be always degraded through the resolution and the brightness of the projector. In addition, the casted picture is distorted and irregularly blurred. In November 2016, I checked with the students the possibilities of evoking emotions through projection in the performance test during The Social Fantasy workshop made with cooperation with Black Box theatre in Oslo. This experience only strengthened my conviction that this solution can be just our plan B for emergency. Falling in love with one's own tools is dangerous, and I worried that this method is already overused.

I revisited Iceland in March 2017. This time I was equipped with appropriate tools for a set survey. In this kind of production we need to provide a digital facility with detailed information about the live-action set. [6] This trip to gather data was essential for later creation. Right after the arrival, I found out that the decision was already made, and that we would make projection shooting instead of green screen shooting. This situation was difficult for me. I was prepared for a different kind of production, and the specialized equipment I brought was now useless. Gradually, I became used to this shift in plans. The director wanted to use my panoramas for the projections, so I started making them. I photographed more than fifty different locations fitting the stories told by protagonists. In addition, I made some 360-degree videos with the protagonists. They were designed in such a way as to multiply the moving subject and make him/her visible from several angles. The director wanted to use it interactively on set.

Some of the script for green screen scenes that we had already established were easy to adapt to the new solution. Projections are the analog special effect of the on-set type. We started to do further tests to check to what degree the casted pictures are visible indoors, when projected colored objects. We also checked the visibility of projections on the human body, the number of details one may notice, and the degree of distortion. We planned some additional effect shots, such as a nail painting scene. We got a night shot with some footage of waterfall at night. The production continued with classical shooting. Eventually, after more testing, I got accustomed to the new method of realization. This method was sufficient to show the relations between the subjects, it reflected our intentions. Projections allowed to achieve this result in an easy way. They were not only an upgrade from Skype, but something more, something which allowed to show a different kind of contact between people. In the communication of this type more happens inside the subject's head than during the regular conversation involving two sides. It was a natural trigger for emotions. Maybe not everything went on exactly as I planned, but the result was equally good and provided an effective solution for the production problem. Finding a compromise and getting accustomed to it is one of integral parts of a creative technologist's job.

The director wanted to control the position of projections during filming. I showed him an easy way to manipulate the picture through the Android-based panorama viewer. It used the gyro system of the smartphone for rotation and it was easy to set up. I tried to find a more sophisticated method of control, based on a joystick or a 3D mouse, but I had no time to develop it sufficiently. We had access only to an ancient, low-quality projector there but I was convinced that if these tests produced acceptable results, we could expect an even better performance with professional equipment. As Spinrad points out, projectors are basically just very simple, dumb monitors. They will take whatever you feed them and make it look big, bright and great. [7] My concern was the quality. The sharpness of the filmed projection was lower than the filmed scene. From half a meter distance, the projector's matrix was clearly visible. Any picture distortion magnified this artifact. There was no way to improve it in the post production. Theoretically, there was a way to avoid distortion, but it required specialized software.

Unfortunately after this second visit to Iceland my time allotted for this project ran out, and I could not follow the rest of the production. I had to focus on my second project, a virtual reality presentation for the Philharmonic.

In August 2017 the production was continued without me. During panorama shooting in Poland, the director contacted me through Skype and asked me to prepare some footage for projections. I tried to increase the size of static panoramas, but the resolution of 27294 x 13095 pixels still delivered low quality in the camera and was too demanding for the equipment used on set. I saw it coming before, but I had no possibility to find a solution for it anymore. I also prepared a 360-degree video containing multiplication, but they had a problem with a large size of the file and with the codec in the context of the video player capabilities. Another problem was downloading 40 GB files through slow internet connection available on the set. Their rig consisted of the most advanced iPhone model attached to a big 50 kg projector and a camera on a heavy tripod. It was uncomfortable to operate it, and the gyro mechanism in the smartphone was inaccurate. I had never a chance to talk to the VFX supervisor who continued my work. It was a mistake, but I could do nothing about it.

The "postcard" development was the beginning of my experience with a **spatial montage**. Manovich claims that this type of montage within a shot includes the superimposition of separate realities which form contingent parts of a single image. [8] Green screen sequences and subsequent projections constituted this kind of superimposition of images. Such a technique resembled rear-screen projection shots or nineteenth-century avant-garde filmmaking experiments. The image created through keying represented a hybrid reality composed of two different spaces. [9] It was possible to achieve by means of contemporary VFX technology. In a similar way Zbigniew Rybczynski, a famous Polish filmmaker, uses in his films the combination of pictures complementing one another. Philosophically, the difference between the method containing projections and the one based on green screen resembled the difference in the kind of contact experienced by the protagonists on set. Instant SFX, which was projection, allowed to receive the result with two steps, while VFX required additional post-production, and the final result was visible only after completing this stage. The projections evoked more accumulated emotions, more directly and more immediately. In fact,

none of the characters presented saw the finished movie during the four months after its premiere.

Looking for the form is closely related to the storytelling process. The story, however, should take precedence. A creative technologist supports the process of searching for the real topic of the film or new media realization. Everything that happens in the story relates to the central question which is asked in this story. [10] This search can be called looking for "**the need**" or "the protagonists' needs". The documentary should try to change something or to solve some problem. It is not only a good story. All my activities as the creative technologist focused on this problem, on finding the answer to this most crucial question: "why are we doing it?" When we clarified the "the need", the form was more apparent. In our realization, the form had to support "the need".

The main problem in that project was that I was not involved in the film from the very beginning to the end. It was impossible, considering that the realization took more than five years. Most of it was pre-production and development, both in Poland and Iceland. During my research, we developed the ideas that would be sufficient for several films. We tried many different techniques and methods, and eventually, we found the solution. The final shape was the director's decision, but the film could not be the same without several artistic choices I made. The inductive method allowed us to join varied and broad plots into a harmonized story. To conclude, the film shows the true essence of the characters' lives because we worked on both the visual side and the story. In my opinion, these two factors belong inseparably together. All of these elements must provide artistic unity.

TELLING STORIES IN ANOTHER DIMENSION

The "Road to Excellence" realization was in many respects different to the documentary production. This project was based entirely on my idea. I supervised the production from the beginning to the end. Unlike in the case of the documentary, I chose deductive reasoning for storytelling development, and I followed my initial intentions through the whole process. The progress from simplicity to complexity is usually more rewarding, especially in artistic research.

In December 2015 I met the general manager Tomasz Beben at Arthur Rubinstein Lodz Philharmonic. The video-performance accompanying the concert by Arthur Rubinstein Lodz Philharmonic Orchestra we did previously was very successful. Getting up a new artistic project together seemed really rewarding. We discussed several technological possibilities, a new performance based on projections, and some film options. I asked about the most important topic for Philharmonic. They had recently opened the first concert hall in Europe equipped with both a Baroque and a Romantic organ. These instruments are tuned differently and built in different ways. This solution reflects nearly the entire spectrum of organ music, allowing the audience to experience diversity in one space. [1] It is a big challenge to compose for both types of organ playing together. Only a few pieces were written for both instruments because of the uniqueness of such a system. The instruments are an artistic challenge both for artists and listeners, and they are the real pride of the Lodz Philharmonic.

Beben wanted to show me the interior of the instrument. Normally, only the maintenance person and the organ tuner have access to that place. Just a few other people had visited it before. The construction of the organ was possible because of the exceptional width of the concert hall. The Baroque instrument is flanked by a bipartite Romantic organ. The former, modeled on the one Johann Sebastian Bach used to play, occupies the middle part of the wall behind the stage. Its design follows the principles of the organ builder of Bach's time, Gottfried Silbermann. The interior is made precisely in the same way as it was done in the original

instrument, with the same materials. The organs are the culminating point of the hall from the artistic and the esthetic side.

The tour inside the organs is accompanied by an intense emotions. The route is a dark labyrinth, without clues where to go. Tight corridors extend along the whole length of the floor. The claustrophobic feeling is deepened by the openwork construction which allows one to see the vast concert hall through the holes. It is also dangerous. You need to walk on a narrow bridge and climb the steep stairs, up to the height of over three storeys. There is no railing, no safety net, no rope to catch. You are surrounded by sensitive mechanisms, delicate parts whose repairing would cost fortune. You cannot touch them. The pipe organs inside look like a modern sculpture. Wood is mixed with metal, rectangles with cylinders, shiny elements with matte. Above and around one can see thousands of precise components, pipes, wind-chests, manuals, and it all resembles a big organism. A quiet whisper of pumped air gives the impression that this entity is alive.

After the tour, we continued talking. We wondered how to most accurately and most vividly show to the people the inside of this masterpiece instrument. The most promising method to reflect the visitor's emotions was the virtual reality. At that time, VR technology was still not widespread enough, and its methodology was mostly unexplored. We both were enthusiastic to test the new technology and started looking for a way to make it possible. After several months, I organized the presentation on the possibilities of virtual reality in the Philharmonic. We confirmed that it possesses a high potential for our plan. The project coordinator, Marzena Wisniak, was assigned to work with me. This face-to-face confrontation with the new technology allowed us to test various options, and to create a common platform of understanding for further discussion. As a next step, we needed to prepare a treatment and estimate the costs in order to get the funds.

During the **conception phase**, I considered my bad experience from the previous 3D animation project. I wanted to make the renderings visually perfect, so I added a high amount of elements difficult for realization: clothes, hair, particles, dynamics, and many more. The resources I had were not sufficient to make it smoothly. As a result, all the work was focused on technical aspects instead of the content. I did not want to overload the Philharmonic realization with too many flashy but insecure elements. They could obscure the kernel of the main idea, and distract the creative process, deviating to less important visual fireworks. This was my first realization in this medium, and I knew that I would have a limited amount of resources. It was necessary to eliminate all uncertain and potentially cumbersome factors. Overcomplicated realization pipeline can prolong the realization cycle and blow up the costs in an uncontrolled manner. I wanted to make it mainstream, a traditional virtual reality application to focus not solely on the VR technology, but primarily on the content.

Virtual reality is such a new medium that everyone has to get accustomed to what can be done, but it is also a tool, like any other. The artist needs to get used to it, in the same way as to the new brush in the collection. The most significant innovation is that, while the classic movies are lean-back experiences, virtual reality gives the audience the opportunity to be part of the show and lean forward. The most important aspect is the immersion. It is more important than the gameplay, even more than the storytelling. You do not need fancy graphics to feel it. The spectator buys almost every illusion as a believable world, but there are rules. The most potent aspect of the experience is "presence", the immersion in the place. It requires a special position tracking hardware which supports the so-called "6 degrees of freedom" feature. It allows looking around and moving in each direction, while less advanced systems grant only the rotation around the anchor point. When the presentation provides enough cues, the feeling of the "presence" is so strong that you need a while after taking off the goggles to get back to the reality. At that time the only equipment delivering such freedom was HTC Vive. This impression of "presence" was exceptionally well suited for our project, so we had only one choice.

Simply put, our project was based mostly on the reconstruction of the Philharmonic location in virtual reality. This was the main task; all other things were an addition to it. I had to determine the range of space explored inside the virtual space . The essential components were both instruments with three storeys and the balcony. After consultations, I found out that the Baroque organs are more important. Consequently, the presentation of the instruments should be carried out in the proportions of 70 to 30 percent. We wanted to show the differences between them, but the Romantic organs were meant to be shown only as reference. This decision saved much work, cutting down the amount of 3D components created in VR.

My primary intention was to increase the listeners' apperception and awareness during a real concert by offering them immersive experience in virtual reality before the concert. The best way to do that was to demonstrate the way in which pipe organs create sound. The presentation was supposed not only to show the organs from the inside but also to visualize the musical process. I did not wish to duplicate the audience's experience from the real concert hall. I wanted my virtual reality presentation to induce in people the desire to see a genuine concert at the Philharmonic.

I started testing the possibilities of the medium, having in mind my intentions. I also did some VR presentations for students, checking their reactions. They were enthusiastic and inspired. This experience of a different reality was the foundation for the story in one of the next students' films. From my point of view, the intensive exploration of the VR technology delivered invaluable inspiration. It triggered my creativity and opened me to new artistic potential. It was important to start using it from the beginning, not only for exploration but also as a tool. I am convinced that the development of the artistic act should be at least partly pursued in the same medium as the finished realization; this allows opening up for new options.

In each artistic project, it is important to know who you aim your work at, to establish the main target for your presentation. In the new media, such as virtual reality, there are two kinds of audience: the experienced users, and the first-timers. We assumed that the Philharmonic audiences are mostly not experts in new technology and they have almost no experience with VR. The spectrum of potential spectators was narrowed to adults, with the option of showing it to the young. This made it necessary to start the presentation with a short tutorial, and therefore we had to add a training location to virtual reality space.

At that time we did not know how fast virtual reality would spread in Poland, so we decided to make an on-location VR experience instead of preparing it for distribution. During the realization, it turned out to be the right prediction. VR on-location is becoming more and more common these days. Virtual reality became quite standard but it is still not an everyday, conventional equipment for everyone. The aspect of public exposition created a need for maintaining a level of intimacy during events. The feeling of being watched can reduce the level of openness to the experience. I decided that we will need a big monitor showing the transmission from the viewer's point of view to distract the other people around and direct their attention to the screen, away from the strangely behaving spectator with goggles. We also needed a dedicated place to limit the number of people participating in the event at the

same time. The chamber room had this potential of separating the space and allowing to set the equipment properly.

I also had to take into account the needs of the vendor, the presentation contractor company that would work for us. In the VFX industry the vendor is a VFX house chosen for post-production realization because of its best efficiency at a certain type of work. [2] I knew that the basis of my solution would be one of the most popular game engines: either Unity or Unreal. A ready-made development environment is beneficial for the budget. There was a higher probability of finding a capable and experienced vendor. Differences between both systems were negligible because of the low level of our project complexity. The methods of creation in the game based production are similar to those in the VFX realization. In this particular case, the most important issue was the creation of realistic 3D space which would also be optimized for VR equipment needs.

The visuality and interactive character of "game type realization" may create specific connotations among the inexperienced, especially old generation audience. It resembles the lack of appreciation of computer generated art in the last decade. It was the reason why I wanted to include 360-degree videos. This was the easiest way to introduce a live actor and make the overall reception more "organic". One of my ideas was to increase the comfort of exploration by adding Leap Motion hardware. This extension is an additional hand tracker attached to the front of the headset, allowing to create the impression of seeing bare hands and operating them in virtual reality. After tests, I gave up this idea because it required additional training for a newcomer and would make the tutorial longer. The pipe organ project had many unknowns and demanded additional time for experimentation and adaptation after the initial development. It was impossible to predict all the problems we may encounter. The concept was designed in such a way as to leave us some freedom of choice at the beginning of the final production.

Technology is becoming obsolete very quickly. The life expectancy of each generation of VR hardware is estimated for two to three years. Game based realizations are getting old as fast as the equipment. Especially their visual side is vulnerable to become outdated. This phenomenon is similar to the aging of CGI-based special effects in blockbusters. Usually, artistic values of a new media realization degrade in half a year to four years. Due to the software development, it is possible to produce more detailed and complicated realizations in short intervals. The knowledge about the new medium increases, allowing more advanced and more accomplished artworks. The expected life span of the pipe organs presentation was assumed to be maximum five years from the implementation.

It was important to create **cost estimation**, not only for making the software application but also for the exhibition hardware since the Philharmonic did not own virtual reality equipment. All the available VR equipment was permanently on the prototype level, and its installation was cumbersome. I took under consideration using additional headphones for reproducing binaural sound, but instead, I chose the more convenient Deluxe Audio Strap. We needed extra tripods, a protective case, a wireless connection to the monitor and the wireless keyboard to assist the spectator remotely. The growing tendency was to use a backpack PC as a computational unit, and I decided to include it. This solution allowed to eliminate the cables

and was more presentation friendly. Another concern was hygienic safety of the equipment, since it was planned for multiple-use exhibition purpose. All in all, a proper strategy was crucial, and I was the only virtual reality expert at the Philharmonic, so I had to make all the compelling decisions myself.

The planned budget was not enough for a complicated, game type realization but seemed sufficient to reach our goals. We applied to the European Structural and Investment Funds and received a grant in November 2016. The next step was to write and announce the tender. All these tasks were part of my regular responsibilities as a creative technologist. Cost estimation is a VFX supervisor duty as well. It is directly connected with resource management. Nevertheless, all the equipment responsibility was directly relevant to the creative technologist domain. In June 2017 we finally chose the vendor, and we could start the production.

I needed the **comprehensive documentation** of the place to maintain remote supervision over the realization. It was also necessary to provide this documentation to the contractor company. The access to the interior of the organ was highly restricted. This documentation, along with the construction plans received from the Philharmonic, allowed the contractor to start working on the organ model immediately, without waiting for the finished script. Making documentation was quite a challenge. I wanted to create high dynamic range panoramas from every possible location inside. When I moved around inside the instrument, it felt like wall climbing without protection. I had to keep balance like walking on a tightrope and squeeze through the tight and delicate construction, holding the tripod with the camera. The next steps were to find a proper place for the exposure, to press the delayed shutter button, and to immediately hide out of the view of the lens. It was extremely difficult, and I could not delegate it to someone else. I also tried to make photogrammetry inside, but it was useless since we had all the construction plans. The textures had to be entirely procedural to optimize them for a demanding virtual reality application. Like in the Icelandic film project, the documentation was treated as the final source, and the vendor used images as a background projected on the sphere in the concert hall and in the tutorial location. My panoramas had an enhanced range of luminosity, so they were a good source of lighting. Every full panoramic HDR image is in fact a light probe, capturing and preserving lighting information. [3]

The documentation allowed me to work remotely on **the script**. The Philharmonic assigned the organ expert Krzysztof Urbaniak, their artist in residence, to support me with specialist knowledge on the pipe organ. In the beginning, we made a list of location descriptions, and we connected them with panoramas. We used files on the cloud to allow easy access for everyone from the team.

Creating the story for virtual reality resembles screenwriting on steroids. Your goal is to adapt storytelling and your audience to another realm of experience. Even if it tries to be realistic, it still constitutes a simplified version of reality. It reminds oneirism, a state of abnormal consciousness. You are living the story with the characters, not separated by a screen. I started my work with an attempt to imagine myself inside the story I am creating. I was the main character, the organist's helper. I was in a particular place and had a particular a task. Virtual reality is still an isolating experience. You put the goggles on and then you are surrounded with the computer-generated word without other humans. To break that feeling I decided to add the narrator, hidden somewhere inside the instrument. We can hear his voice, and we have a feeling of being observed. The narrative creates emotions and naturally draws the viewer's attention. The narrator tells us what to do, supports us in difficult moments. To make this illusion more believable, I decided to include a starting film sequence to show the narrator. This was the easiest method to bring the realistic character to the presentation. Digitally created humans are the most expensive elements of games and special effects. The theory of the uncanny valley proves that this task is extremely difficult. The comfort of the observer increases as a character becomes more human stylized until a certain point at which observers start to feel uncomfortable with an almost, but not quite, human like character. [4] My solution resembled old games where film sequences were mixed with gameplay.

Eye-stops within the frame, typical of the film, do not exist in virtual reality, because the viewer's camera moves around. Instead, you have to consider the areas of focus. The 360 space composition of the introductory movie consists of two such areas: the organist zone and the environmental background. Spectators new to virtual reality are hesitant to turn their heads and look around. They are used to facing stationary screens in front of them. This compositional duality aims to provoke the viewer to break this first barrier. The user is incited to turn around to the character. The voice audible from behind gives a hint that somewhere there is a person, talking. At the end of the film sequence, the narrator opens the doors and goes into the instrument. After that, we will hear his voice from inside.

The process of searching for a universal language of art in virtual reality, similar to synthesizing arts within *son et lumière* open-air shows, reflected my desire to further simplify the form of pipe organ imaging. It was also the reason why in the Philharmonic presentation I gave up using "spatial montage" which I used in documentary. Contrary to the film, this method is quite popular in virtual reality. Various holograms are often imposed on the background image, especially in the futuristic stories. It is also used as a visualization of the portals for transportation. Temporal montage is much more limited here. It is one of the VR principles. The fast cutting between scenes may cause motion sickness.

The claustrophobic interiors could make you feel sick as well. Some people are afraid of confined spaces, others could find the monotony of the expression tedious. To eliminate this distress, I added an Easter egg in the middle of the presentation. This additional film sequence woven into the story was filmed in the Gottfried Silbermann Museum in Germany, in a room stylized on old organ workshop. It provided a short break in the plot to soothe the discomfort and increase the feeling of the monumentality of the organs compared to the small room outside. I also used the film sequence at the end of the presentation. As a reward after completing the tasks, the spectator can see the organist playing the organs.

Every time-based artwork should have a visually intriguing start to hook up the audience attention. For most new users, the tutorial is actually the first contact with the presentation. I wanted to start the show with an attractive first impression. As a location, I chose the largest foyer in the Philharmonic. To create a linking context I put in the center the conductor's desk with some props: sheet music, a small pipe, a tuner tool. It gave the spectator the reason to look around and to play with the objects. I wanted to engage their attention from the beginning. Interaction by means of handheld Vive controllers increases the immersion. Moving between different places is done by "teleporting jumps", so the final step was to learn how to move around. Finally, I added the option for more advanced users to skip the tutorial by going directly to the transportation cube in the center.

Virtual reality introduced the sense of "spatial immersion" and "emotional immersion". The first one is associated with the environment and the spatial composition of the scene. We can feel our presence in a particular location more strongly. The second one is significantly more immersive in terms of the sense of "being there", realism, the sense of engagement and sensory cues. It is related to deep engagement in a challenging task. The user feels emotionally absorbed by the narrative content. [5] Constructing the detailed plot, I made some additional assumptions. The main spectator's task is to prepare the Baroque organs for the concert. The assignment consists of several typical maintenance works. The exploration is in the style of

Alice in Wonderland: we follow the rabbit deep into the unknown. Some parts of the interior are available only after completing key tasks. Interactivity combines with exploration.

Focusing on objects that are close actually does not exist in virtual reality. Convergence is set to infinity, although the use of new eye scanners may change this. Environmental cues are essential for directing the viewer's gaze into the right place - lights, sounds, and movements in the environment help to focus attention. I tried to distinguish the signal light by making it green, but the color did not fit the overall design. Instead, I increased the brightness of it. Finally, I designed some additional visual effects which were meant to show the essential features of the instrument. All the concept work I made is standard in the process of feature VFX production related to storytelling.

The number of assembly cuts was reduced to a minimum to increase the realism of exploration. Instead, subconscious cuts appeared in natural positions like doors or stairs. In reality, passing a door is perceived by the mind as an assembly cut. The main job of a virtual reality designer is to avoid things that break the immersion. Touching and manipulating objects increases involvement. I wanted to improve the level of emotions inside. For this reason, I introduced a sound warning when the spectator touched specific organ elements. He or she could fall down from height, taking a step too far. Usually, fast camera action without a corresponding body movement increases the motion sickness, but this quick falling animation strengthened the impression of danger. I added some more surprise effects, such as unexpected loud music or unexpected visual effects inside.

During the first encounter with virtual reality, a new viewer generally has a low level of resistance to extended heavy presentations. I decided to plan three different gameplay strategies. The first one is for users who are eager to follow the instructions and want to complete all the tasks. It ends on the third floor, when the viewer grabs the sheet music, as the last task in a row. The second strategy is for the users who do not want to follow commands and want to explore the interior in their own way. Both strategies have a time limit. After ten minutes, the gameplay jumps to the last film sequence. There is also the third strategy for more advanced players without the time limit. It allows exploring all aspects of the presentation, looking closely at the interior, and discovering additionally hidden attractions.
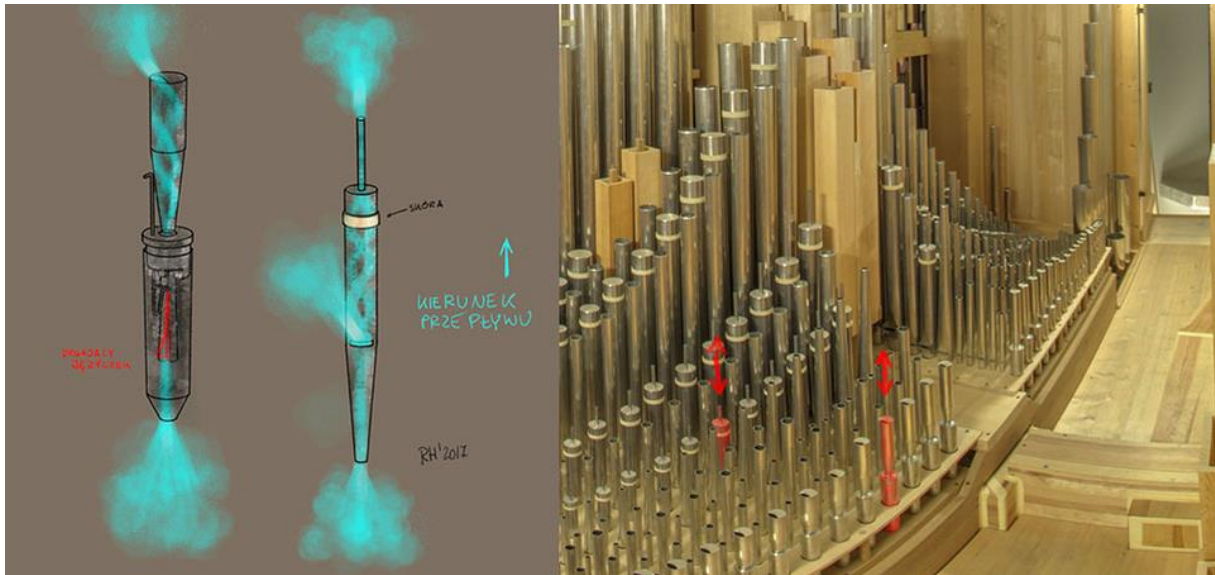
While refining the script, I coordinated the teamwork with the production director on the vendor side. The first step was to create a 3D model of the organs based on construction plans. Then all objects were assigned textures. The progress of the vendor's work was provided in form of screenshots. After importing the model into the game engine and initial programming, I could assess the interior and find all the errors. In this type of production, the first version of the software application can serve as previsualization. I needed to consult the 3D model with the expert, Urbaniak, because the screenshots were not precise enough. He could assess the correctness of the construction, and we could discuss the story flow in a different location. The problem was that Urbaniak did not have virtual reality equipment and we were in two different countries. I had to develop a **hybrid virtual teleconference** solution based on my virtual reality headset. When I was exploring the virtual instrument, Urbaniak could see the image from my virtual camera on his laptop. He was giving me instructions on where to go and what to look at, and I was making notes. In this way, I could create a bridge of creative communication between the music department of the Philharmonic and the digital realization team. The similar method is used in contemporary special effects production, but instead of having just one headset and a flat screen, the whole team is equipped with goggles through which they can see the same space. This also signals the birth of a new specialization, a "VR Scout", a person tasked with investigating locations for VR based experiences.

Apart from making construction mistakes of the virtual organs, the vendor team unnecessarily used their own invention and added to the presentation elements reminiscent of science-fiction style. Cyber hands were used instead of controllers, and the sparkling navigation lights looked like Star Trek teleportation. They restricted movement to some selected points of interest, and they added icons with small animated feet. These improvements were stylistically wrong. I knew this was not the stylization that the Philharmonic recipients would expect. It was suitable for a different audience and did not fit the subtle sophistication and the monumental appearance of the pipe organs. Maintaining clear stylistic and narrative unity is also one of the creative technologist's duties. Another important thing is to make sure that the spectators' free choice does not kill the story. The viewers should have the freedom of movement, but their decisions should be discreetly guided.

Following my corrections and modifications, the **more advanced version** was prepared. This time it was more interactive and had a more developed plot, which made it more suitable for testing. The game type production is quite different from the feature realization. In many cases, the only way to prove what works and what does not is to build it and try. The iterations in the game engine are more easy to do and are not a burden on the budget. It is much more difficult to change the general idea of a presentation or elements which require multiple separate works. The knowledge which corrections are safe and which are potentially troublesome is crucial in a creative technologist's job.

360-degree movies realization required a different kind of approach, one similar to the feature production. I wrote additional scripts and created the concept art for each. The arrangement of the set was easy to plan. On the organ's balcony, the camera was located close to the sitting organist but turned at such an angle that the organist's mouth was not fully visible. It allowed swapping the sound track between the Polish and the English version. We chose four different organ works to play: the fragment of Sigfrid Karg-Elert's symphonic chorale *"Ach bleib mit deiner Gnade"*, Felix Mendelssohn-Bartholdy's *"Sonata in A major"* and the fragments of Johann Sebastian Bach's *"Fantasia in G minor"* and the chorale *"Ach, was soll ich Sünder machen"*. They corresponded to the style in which the Baroque organs were built. The music was performed by Urbaniak, and he also played the organist in the movie. The recording of the organ music was made at several measuring points to fully reproduce the sound based on the acoustic conditions of the concert hall. It was recorded outside the instrument although the music in virtual reality appears in several locations inside. The loud distorted sound could spoil the immersion, and we wanted to avoid it. The essence of our virtual show was to present the impression of the real experience and its artistic interpretation.
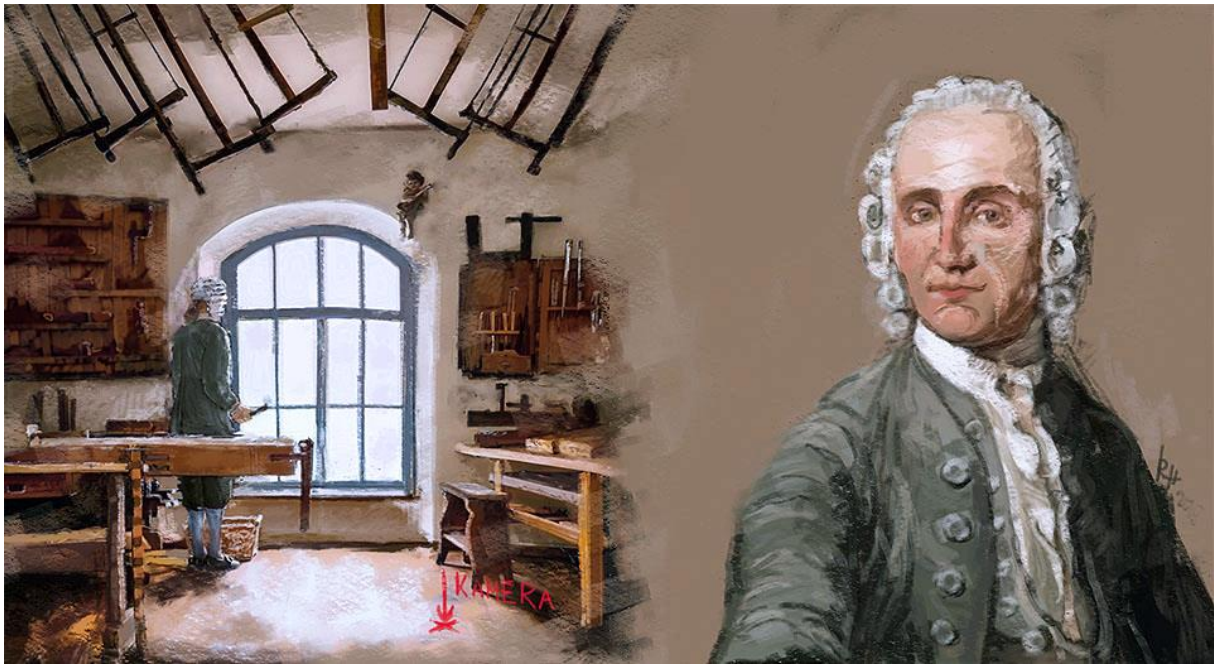
In the museum scene, the camera was located in the middle of the workshop. According to my script, in the room there was a figure dressed in the eighteenth century **costume**. We needed a white wig with curls, a frock coat, white knee socks, and black shoes with buckles. I made concept art and created sketches for the costume. I could not be present on the set in Germany, so I made a list of detailed directions. All modern items had to be removed, if possible, from the camera's view range. Outside the window, cars should not be parked. Virtual reality should give the spectator the impression of traveling in time.

The vendor used my high dynamic range panoramas in the final presentation. It facilitated the production but also created a problem after shooting. Instruments on the stage were differently arranged. When I was making the panorama, I did not know yet that it would be used as a background. In addition, the film footage had a much lower resolution and quality than the still panorama. It was impossible to improve its condition up to the level that was efficient for **matte painting**. Consequently, I needed to take another panorama. This time I arranged the instruments properly and positioned the tripod precisely at the same place as the shooting camera stood. Matte painting allowed me to improve several elements, make the Philharmonic logotype on the opposite wall more visible and correct all the errors of the movie. The film from the museum also needed some **retouching**. I had to get rid of power sockets, speakers, people walking outside the window, and a heater. I added burning flames in lanterns hanging from the ceiling. The panoramic filming requires careful planning because the post-production is always laborious. The more you can improve on set, the less work is to be done on the computer. The automatic stitching process is never perfect. It requires additional work and roto painting. I used Nuke with Cara VR plugin to correct stitching errors

and make compositing. This is the most popular tool for VFX post-production in the industry but it is also very demanding and resource heavy.

Audio is another important element of immersion. In addition to the music, we recorded plenty of other sounds inside the organs. Each interaction, like an opening door, touching the pipe, or putting away the item, should have its own, **unique sound**. It turned out soon that the base of sounds we have is too small. I recorded additional sounds myself but some of them I had to create directly on the computer. On the balcony, two big pipes move out of the instrument and hide after a while. There is no natural sound that could accompany such an animation. I had to design its tone myself. The teleportation sound is another example of such a creation. It had to be adequate to the mood of the presentation, and I had to design it from scratch. In the end, after the last film sequence, the credits are shown. This is traditionally the moment when the spectators get to know that it is time to take off the headset. I did not want to leave this part silent and I decided to add a background noise of a crowd waiting for a concert. This was additional work, which was not included in the normal production schedule and I had to do it myself. I also found out that the voices are too flat, you can hear them in the middle of your head. To improve it, I added reverb and edited all errors. The sound design and editing are not the typical tasks of a creative technologist, but they show the need for versatility in this profession, especially during the new media creation.
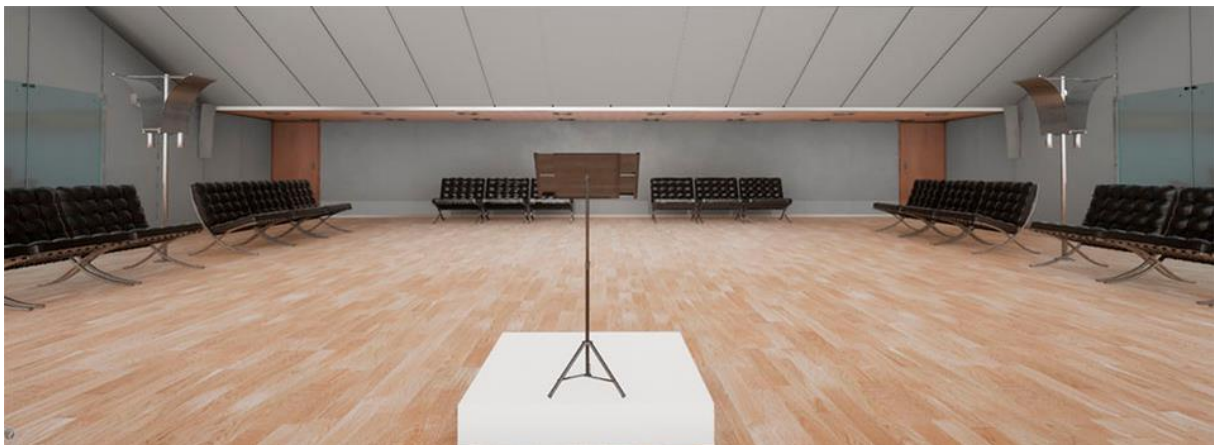
A person who experiences the appearance of motion while their body remains still reacts with an increasing sense of discomfort. Motion sickness causes symptoms such as headache, irritability, vertigo, nausea or vomiting. Only a small amount of population is immune to that distress. The reason why virtual reality can make a viewer sick is the intense illusion of being in another place. It is closely related to people's spatial cognitive capability, due to a mismatch between the information that the person receives through his inner ear and eyes. The working version of the presentation had many errors causing the motion sickness. The user movements occur in narrow corridors and confined spaces. In similar cases, VR applications allow the possibility of penetrating through the objects. In our presentation, this option would have disastrous consequences for the consistency of the story. If the viewers could freely walk through the walls, they could see unsuitable parts of the space, and the whole storyline would be spoiled. The first solution of the vendor was to limit the minimum distance between the head and the surround. After crossing a certain range, the surround began to move away from the viewer. It immediately triggered motion sickness. I found out that a better solution is to

gradually darken the view when the head is close to the obstacle, up to complete blackout, and to turn the visibility on when the user moves their head back. It was a clear signal for the viewer how to behave in virtual space. Dealing with this problem was an important part of testing the prototype. The lack of continuity in immersion was another issue I had to cope with. If the immersion is interrupted, the viewers are very aware that they are wearing goggles, and may become annoyed with the whole experience, no matter how good it is. For instance, at one time the realization team, contrary to any suggestions, put a small white platform beneath the conductor's desk. They wanted to distinguish the central place in the tutorial, but instead they prompted the users to try to step up on this platform, which was purely virtual. This not only created a threat of injury, but also resulted in the fact that the shock spoiled the feeling of immersion.

During this phase, I made a tremendous amount of **various tests**. I showed the presentation to various people and gathered their opinions. I was testing it in the Norwegian Film School to have the second opinion not only from amateurs but also from film professionals. Organizing this kind of beta testing is typical of the supervisor work. The improvements were made, and we added some special effects in order to intensify the mood and differentiate the instrument parts. Finally, we showed it to the musicians in the Philharmonic. This demonstration was supposed to be the last one, but the virtual reality application was still far from perfection. Some viewers did not want to follow the ordinary path. They made atypical and unexpected actions. The presentation had to be insusceptible to such activities. There were also some compliance issues with the script. Storytelling was broken in several points. I started a new round of tests. In the end, I made a long list of errors, over twenty pages. Only after these improvements could the work be considered as finished.

A creative technologist's duties in a feature film and in virtual reality are similar, in spite of different means of expression. Virtual reality, like a game production, contains an extra feature, interactivity, which allows the spectator to participate in shaping the individual variation of the show. Traditional cinema has the director's vision embedded, while during the interactive show the director is more like a master of a ceremony. Immersion, presence, and reality trade-off are the means of artistic creation. In a realm of new possibilities, the level of acceptable simplification is higher. It makes the world seen through the goggles the ideal creative environment for artistic experimentation. Virtual reality uses perception tricks in shaping the verisimilitude in the mind, but in truth, we do not really understand the brain that well. You have to be aware that you are provided with a powerful, yet not enough elucidated, tool of interaction with the audience. All your wrong decisions may harm the spectator in a physical and psychological way. This is particularly important in today's initial stage of adaptation of the new technology.

Without proper development, you may end up producing the work addressed only to a very narrow audience with an expertise in virtual reality. The technical side of the medium is becoming transparent by the purposeful use of immersion. It is essential to avoid factors that draw the viewer's attention to technological aspects. It takes a variety of skills to communicate between teams, to connect internal and external developers with one another across different domains. Virtual reality changes standards and the way to achieve a satisfactory result. A creative technologist is a professional who bridges the worlds of artistic design and technological development in order to create delightful, engaging, and cohesive experiences.

THE GOLDEN RATIO OF PROGRESS

Each process of artistic production can be subdivided into distinctive development phases. The most substantial amount of work and the biggest costs are often incurred by the last stage, but the beginning is **the phase most open to artistic choices**. Only during pre-production do we have enough freedom to fully decide about the visual aspects and the style of storytelling. The more progress in production is made, the more difficult and expensive later changes in style become. Making right creative and methodological decisions at the initial stage is exceptionally important with a limited budget. One of the chief tasks of the creative technologist is to keep the balance between the artistic goals and the available resources, and to inform the director if the production approaches the financial limit that can disturb the realization.

During my research, I mostly focused on the stage of pre-production as the most important part of my work in artistic realization. While in the virtual reality project I could follow the realization from the beginning of the work to the very end, in the documentary project I had to adjust to the ongoing production, and I left the team before the production was finalized. Although it was not good for artistic continuity and the proper implementation of all my development, the decisions I made laid the foundations for further production. It also helped me to isolate my experience in the artistic research as a creative technologist focused on the pre-production stage.
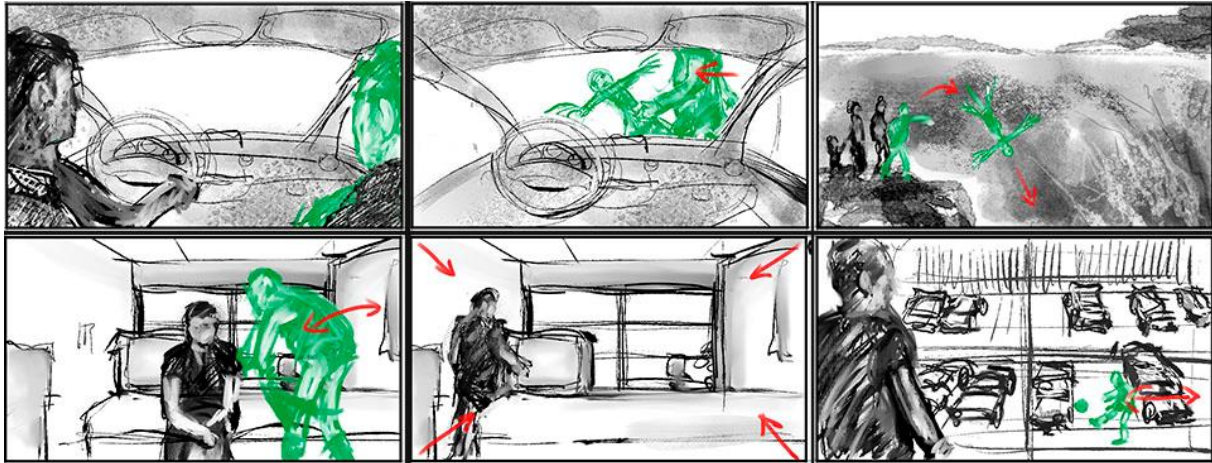
The green screen solution, finally abandoned, was carefully planned. I made storyboards, conceptual sketches indicating the placement of the camera and the crew, as well as full descriptions of the scenes. The director wanted to work in a more spontaneous way and to have more freedom on the set. The projection scenes were prepared on more general principles. I made some sketches of a possible technical solution, and a simplified version of this conception was used during the final production. My sketches were a spontaneous illustration of debates with the director and of and issues related to the realization. Shooting and performance relied on my concepts of automatic tracking, a space mouse or a tablet attached to the projector. The description tables from the greenscreen were adapted to the projection scenes. They were a conceptual basis for the realization.

Nr	The protagonist	Skype recording	Tilt-shift description	Tilt-shift attribute / context	The story	Projection description	Projection technical challenge
3	Adrian Jaszczurowski	With his father	repairing the road in the city	Reykjavík outdoors	He was a fireman, a party boy, known all over the village, but looking at older friends he saw that maybe in life he had nothing to live for in the village, as he would not change anything. He left. He brought over 40 people to Iceland.	He is driving a car (as a projection) with his father and talking about the roads which he repaired	Find the right camera angle to show them both / or profile shot with wide angle, the camera is close to the front window
4	Stefania Mazurek	With Cecylia, her friend	watching the weather, tilt shift through the window, or outdoors in a characteristic place	She looks at the sky - she thinks about the old world + fish processing plant	She left in the first group of women in 1991. She has worked at a fish processing plant until today (at the end of the world). In the beginning she lived alone without her children and husband. Cecylia, her friend from the village, took care of the children and became their second mother for several years. In the end, Stefania was able to bring her children to Iceland, but after a year her younger son died in Iceland in a car accident. The husband, who stayed in the village, says it was her fault - and he divorced her. To this day, Stefania has the closest relations with Cecylia.	She is lighting a candle on her son's grave with Cecylia. She shows Iceland to Cecylia.	Find an interactive method to change the angle and position of projection during Cecylia's movement on set
5	Sandra Pawlik	No recording, maybe it will be possible with her grandmother	a policewoman drives a car through a small town and wilderness outside of Reykjavík	suburban - roads in the wilderness, almost no cars	She left Poland as a child. She always wanted to be a policewoman. She dreams of being a police officer. There are only two policewomen from Poland in Iceland.	works as a policewoman – can we film her at work, after a an accident?	Projection of the wilderness, the landscape she sees

It was impossible to make a storyboard for it because it was hard to predict how the protagonists will behave on set — rough concepts and a number of tests allowed us to work in an improvised way. Usually the result of a creative technologist's work is more precise, but testing various solutions and experiments with form can also be applicable in different cases. A creative technologist in the first place has to adapt to any specific type of collaboration.

Some people need to see the final product, some just need to see sketches, while comprehensive tests are enough for others. In each case, the concepts should leave some space for imagination and creative freedom of other team members. It is natural because the creative technologist's main task is to deliver the visualization of ideas.

My choice of **using an inductive or a deductive method** was motivated by a different kind of challenge in either production. Deductive reasoning starts with a premise which leads to other premises and then to the inevitable conclusion. Inductive reasoning goes in the opposite direction. It is based on repeated observations that lead to generalizing repeatedly observed phenomena.

In documentary realization, my inductive reasoning relied on a comparison between the content of people's stories and the ways of telling their stories. I started with a number of specific instances: animation, Skype stylization, 3D simulation, photorealistic picture extension, green screen. Then my research led to the generalization and the stylistic integrity of the projection scenes. I drew conclusions from observations; the more information about the realization possibilities and protagonists' stories I had, the closer to the final solution I was. In this aspect, my first visit to Iceland was absolutely necessary to get the required amount of data. At the same time, I made a series of rehearsals. I tried different realization techniques. The process was similar to a puzzle type game, where I had to connect scattered dots to receive a well-defined shape. In this phase of generalization, the elimination of unnecessary elements was crucial. The inductive method is not efficient in most artistic productions because it consumes a lot of resources. However, it was the best solution in this particular case.

In the virtual reality realization, my deductive reasoning was more consistent. Each next step was a modification and improvement of an initially chosen artistic direction. I started with a general premise that we want to show the pipe organs interior. The technology that offered most complete immersion was virtual reality. We wanted to increase the feeling of a presence inside the instrument and thus we opted for the virtual reality technology. Immersion is connected with interactivity. The most interactive realizations in virtual reality are game based. This led to the conclusion that we want to use a game engine for the realization. Most games have levels related to progress. The organs have three storeys and the balcony, so the game was divided into four distinct stages. The target group consisted largely of inexperienced viewers, so I added a tutorial at the beginning. The greatest flaw of the virtual reality organ tour was the feeling of loneliness inside. The most difficult and expensive element in this type of realization was a realistic human animation. We had a limited budget, so I decided to add 360-degree movie sequences with a live character. We needed to limit the area of exploration. The Baroque organ is more important and more spectacular. Therefore, the Romantic organ is treated as a reference in the background. The game progress is connected with completing the tasks. We needed to expose how the organ works, so the viewer will assist the organist to prepare the instrument to the concert. In this way, I started to test theories to reach the final solutions. Deductive reasoning led to a specific instance of a game realization. Conclusion was drawn from the premises.

During the virtual reality endeavor, I encountered several production problems. The project coordinator on the Philharmonic side left the position, and no one was delegated into her place. The contract between Philharmonic and the vendor effectively locked me out of my own work, and the number of correction iterations that we could implement was increasingly limited. The contract did not guarantee access to game sources, so were forced to ask the vendor to introduce every alteration. At the end of production the vendor cut me off of making final adjustments. I wanted to make the changes myself but I was denied to have an access to the blueprint and final asset. No beta tests were provided by the vendor; I had to organize them myself. Unfinished work was accepted against my suggestions, so there was no fourth phase of corrections. Problems of this kind are common in commercial work, but they make the innovative project overcomplicated and result in a **discrepancy between the artistic goal and the final result**. My artistic concept was not fulfilled because of that, and further project implementation proved it. In such an experimental realization, it is crucial to have a possibility of conducting several tests, spread over time, at the final phase of realization. However, even though I failed to control the work entirely, I still had an impact on the final shape of the presentation, and it was archived as close as possible to my initial idea.

The list of improvements that should be made in the next phase contains bringing the voice sound during the tutorial and during the game to the same level, changing the indicating light into flashing, adding planned special effects to the virtual doors in the tutorial, lowering the light level inside the organs, so that light clues become more visible. To improve assistance, the tutorial should be started after pressing a button, which would allow to set up the equipment for a viewer. The ladder to the third floor should work independently to the progress of the game. Catching the ladder for navigation was not practiced in the tutorial; instead, the ladder should be touched to get to the upper storey. The time counter is visible in the corner of an eye and should be hidden.

Being the director and the creative technologist in the same project is always problematic. During the virtual reality realization, it created a dilemma of priority. When these two roles are divided, the director can focus on a vision, a daydream, and artistic integrity, while the creative technologist supports him/her with original ideas or solutions for the visions, and watches up the resources. When the resources (time or money) are running out, the creative technologist is supposed to signal it and get the project back on track. In my project, the resources ended quite rapidly because of the production problems described above. While it is better for the work and final result when these jobs are split between two people, it is possible to make this type of project with additional support of another team member or to delegate this part of responsibility to the project coordinator or producer. Unfortunately, the Philharmonic did not have such a person, or a budget to hire someone in that place.

If I could **improve the process of this realization**, I would focus more on the contract and the extension of the final phase of testing and correction. I am also convinced that it is possible to move even more conceptual and prototyping activities to the pre-production stage. The game type realization creates a temptation to work directly on the final meshes, while form simplification facilitates the storytelling exploration. The first testing version was based on the

tutorial part, and the most important elements were left until the end. I was focused on immersion breaking points, and the storytelling was secondary to it. However, I should instead treat these two components equally, maintaining balance between them.

I am aware that the new medium requires a new kind of approach. The simulation of 3D space in games was initially regarded as a means of achieving movie aesthetics. Later, however, 3D space came to function as a means by which a greater level of immersion and involvement than cinema could deliver played a part in a development. [1] I tried to find a new language of expression adapted to new rules and, of course, as any artistic language, it requires constant improvement.

No matter how appropriate a platform or an experience may seem to you as an author, your project will be more successful if you design the content respective to the audience's point of view. Like in solving a two-thousand piece jigsaw puzzle, audiences need the overall image to make sense of each individual piece. [2] After the premiere, I conducted an **additional survey** among twenty users to verify the result, to check the possibility of the occurrence of immersion breaking moments, or to evaluate the story experience. It was based on five questions related to the "Road to Excellence" realization.

Tutorial. Does it work as a standalone experience?

 Most people consider a tutorial as easy to follow, but it does not work as a standalone experience. The respondents often do not listen to the voice of the narrator; they are waiting for the instructions of the assistant. After observing dozens of people of different ages, I have the impression that at the first contact with VR there are so many different stimuli and sensations that the sense of hearing is "switched off." After a few minutes, with the support of someone from the outside, these people become more confident, and then they open up to voice messages from the presentation. The only way to improve seems adding additional visual clues and animations.

The presentation in the first place was planned as an assisted experience, on location. The virtual reality equipment – backpack computer, goggles, and manipulators – are difficult to operate for a beginner. They need guidance. The tutorial requires more visual clues. In addition, my design of virtual doors was implemented only partially. The glass cube with the door in the middle of the room is devoid of visual effects I planned. People are disoriented which door to choose.

Navigation. Is it intuitive and does it preserve immersion?

It does preserve immersion, but for some people without prior VR experience, the teleporting or "jump" is unnaturally fast, which creates a certain feeling of distance from the experience. It is not intuitive what to do and where to go. Experienced gamers are more used to interaction with unexpected conditions. After a few repetitions of the "jump", the user's movement gets a bit smoother. The common problem is getting up the ladder to the last level. The illumination of the expected direction is also not always understandable. Not everyone wants to go towards the light.

A possible solution for it could be to turn the guidance light into a flashing cycle. This could be implemented easily but it was never done because of the contract. Human mind perceives changing elements of the environment more distinctly. The dissolved light inside the organ is still too strong, in spite of my correction. There is also a need to explain how to hold the manipulators. Most people point the manipulators upwards, while they should bend the wrist

and point them downwards to set the "jump" indicator to the right position. As an improvement, I made an additional manual to supplement the guidance of an assistant.

Story. Is it clear and retellable?

In most opinions, the plot is clear and quite simple, although people have a problem to follow the story. They admit that it is nice to see a human character as a guide. Choosing directions or navigating might be confusing, for example it might be difficult to have to go back, to open a door, or to to climb a ladder. Viewers in the VR world focus on what is happening around, on their experience, and listen mostly to the person who supports them in the real world. Sometimes, only after completing the tour and removing the goggles, they ask questions about what they actually saw and where they were. Some people ask for a possibility to play a few sounds on the organ. An element of interaction could appear in the organist's workshop sequence, instead of merely standing and watching (raising the pipe or something like that). Respondents do not always concentrate on the story, because their attention is focused on the way they move. Some people claim that they would follow the instructions if they could repeat the experience.

The narrative in virtual reality does not have the same impact as in flat cinema. Unexperienced users are often stunned with the new kind of experience. The immersion dominates over storytelling significantly. To maintain the balance between the story and the immersion it would be necessary to strengthen the visual clues. Narrator's guidance is not enough. The option to play the organ would increase the cost of the realization and distract users' attention. However, signaling such a need indicates that the story is not emphasized enough. People are trying to explore the environment on their own. On the other hand, we cannot force people to follow the storyline. I took into consideration that some of them will want to explore the new environment and will not follow the narrator. That is why I added the time limit to the main version of the presentation (it has three different scenarios). It naturally ends the presentation for people who prefer the individual way of exploration.

Sound. Does it live up to expectations?

There are problems with sound volume during the experience. The narrator's voice is too low; you cannot hear the content. Users have problems to follow the guidance. A person using a hearing aid had could not follow it at all. The sound quality is good, but all that is happening around the viewer and the level of noise in the real environment make a significant impact on the intelligibility of the voice.

The sound was not correctly implemented by the VR sound programmers. They promised to deliver an advanced method of tracking the sound direction based on the headphones angle but it was never fulfilled. I had to improve the quality myself, adding a reverb effect to all audio files to make it more realistic. I asked for an impression of the voice coming from the inside of the instrument, but instead, it was leveled down. In view of the fact that the presentation is often used in a crowdy and loud environment, this poses a serious problem disturbing the storytelling.

Immersion/Realism. Is it believable, does it induce the desired impact?

Users feel totally immersed. The sense of height and depth were convincing enough for one user's brain to induce a fit of vertigo and we had to break the experience. She understood where she was and felt the sensation of being inside the instrument. Another user, suffering from claustrophobia, was so scared that she had a problem to go inside. She was afraid to fall off the edges. There are opinions from people who have seen the real organs inside that what they see in the presentation is a little bit worse, but they are also aware that it is a digital equivalent of a real instrument. There are also questions from people who have never seen the instrument inside if it really looks like that. They are truly surprised.

The computer rendered parts in 3D work well, but the 2D live-action sequences lose the sense of scale, which is a common problem connected with 360 degree filmmaking. The impact of the presentation on the people shows how strong a virtual reality experience is, but also proves that the immersion meets the expectations and this part of the presentation is well made.

The survey I carried out after the premiere proves that it is absolutely necessary to provide four levels of beta testing for such an advanced, experimental realization. During the first level of testing, I made conformity assessment with the initial idea, script, and compliance with the real instrument; during the second level I focused on general rules of movement and interactivity; the third level was a thorough elimination of game errors. The fourth level could possibly improve the quality of the experience and eradicate the remaining errors.

A creative technologist needs to be constantly vigilant to what is happening around and ready to leap into action quickly. He/she should be up to date with the changes that are constantly introduced during the production as the schedule is modified. The worst scenario is when the budget or the time limit is reached and introducing a next round of corrections is not possible anymore. On the other hand, each artistic project has to have its end, therefore it is better to achieve progress, not perfection. Tight budgets and time limits trigger creativity and provoke us to find new ways to accomplish and to present artworks. The dilemma every artist confronts is when to stick with familiar tools and materials, and when to reach out and embrace those that offer new possibilities. All artists test new means of expression, but in time exploration gives way to expression. [3] It is also related to risk that the finished work is not perfect because each next work could be even better. Against all odds, my job as a creative technologist dynamically contributed to the creation of the film and virtual reality realization.

LOOKING TO THE FUTURE

At the beginning of my artistic research, I had a traditional understanding of visual effects and the scope of their application. However, VFX technology contains many specialized tools for picture manipulation, 3D world creation, visual planning, or storytelling development. It appears that you can use them not only for visual effect realization but also for different types of artistic development. My research proves that visual effects tools can also be used successfully for solving artistic problems in fields different than making feature films. They are well suited for all kind of conceptual work. Moreover, the VFX theoretical framework should draw from various fields of classical art theory, such as storytelling rules, aesthetics, harmony, proportion, rhythm, color composition or form.

A spontaneous artistic act can be planned using contemporary technology and even realizations which have a large margin of uncertainty on the production stage and which can be supported by creative VFX methods. Particular media techniques can also be applied effectively to different media. For instance, VJ projection for performance shows can be successfully adopted on-set for documentary filming. Such spillover among various media and techniques is characteristic of the contemporary moving-image culture. Furthermore, this approach is necessary for transmedia and hybrid media realizations. Visual effects are just a creative instrument of communication with the audience. The ability to do proper context research and visual development plays a key role not only in modern cinema but also in all artistic teamwork realizations. The process of creation is common to different branches of art. The new logic of form is deeply encoded in the interfaces of software packages and the tools they provide. The idea of the new type of an artist who can collaborate with the creative team to bring the story to life is deeply ingrained with a sense of storytelling.

The name "creative technologist" is not widely accepted yet. I proposed an exact description of this profession only at the end of my research. My participation in the feature documentary was described in the closing credits as a "VFX on-set supervisor and production development". During the virtual reality Philharmonic realization my main assignment was named "supervising art director". In both of these productions, I performed typical tasks of creative technologist. The film industry is like a big ship: it is hard for it to make sudden changes in the course. More hopes for such changes lie in the new media, since it is an entirely new, yet unexplored field. The propagation of the name of a creative technologist will certainly be a long process during which its description will probably evolve further.

The documentary had a premiere screening at The International Documentary Film Festival Amsterdam (IDFA) in November 2018 and received a Special Jury Award for Mid-Length Documentary. According to an Icelandic online newspaper Vísir, this Polish-Icelandic coproduction was the first Icelandic documentary to win prizes in the main competition at the festival. The virtual reality presentation had the official opening in December 2018 and received positive reviews in the Polish press and the media. During the premiere, the production director told me that it still remains one of the bigest virtual reality projects made in Poland.

I believe that storytelling is a factor which makes the use of interactive media not only a technical performance but an artistic spectacle. After finishing my artistic research, I am convinced that a creative technologist can productively participate to designing the visual universe of film and the new media in order to produce artistically compelling results.

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