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Other Contributors	University of Bremen
Authors	Kathrin Obernhumer, Frank Suttheimer
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Executive Summary

Aim of the Deliverable. *This deliverable was set up to define the functional requirements in the application area "theatre production" for the first.stage software.*

Brief Description of the Sections of the Document. *Section 2 introduces the reader to the world of theatre, explaining how productions are planned and realized nowadays to give a better understanding of the origin of the resulting requirements. Section 3 contains the results of the interviews with experts and their expectations for a Previs solution. Section 4 describes scenarios in which the future use of Previs with the first.stage software for the specific application area. These scenarios are mainly inferred from the outcome of the interviews and special application knowledge by the authors. Section 5 then describes individual use cases of the first.stage software specific to the application area. Finally, section 6 derives the functional requirements for the first.stage software from the previously described scenarios and use cases.*

Mayor Achievements. *Definition of the functional requirements for the application area "theatre production"*

Summary of the Conclusions Obtained. *The functional requirements for application area "theatre production" have been documented. These requirements will be needed to define the core functionalities in the deliverable D1.5.*

Content

1 Introduction

This document aims to investigate the functional requirements for previsualisation in the theatres domain. The basis for these requirements were interviews conducted within the Theater und Orchester GmbH (TOG) and external stage designers.

It seemed to be useful to roughly describe the current processes to provide a better understanding for the as-is-situation. These descriptions were based on interviews with Uwe Schmitz-Gielsdorf, the managing director of TOG with vast experience in both economic and artistic matters from heading various theatres and festivals and with Hermann Schneider intendant/artistic director of TOG, who is a member of the Chambre Professionale des Directions de l'Opéra (CPDO) in Paris, held lectures at the music college in Cologne / Aachen and Düsseldorf and is professor and conductor of the opera school to the Franz Liszt Academy of Music in Weimar.

The current workflow, its challenges and the potential optimisation were discussed with both in-house personnel and external stage designers. There are TOG employees who have been working for the Landestheater for more than 20 years, coming from different professional backgrounds and providing a diverse, yet holistic picture of the work being done at a theatre.

The questions asked by scientists and engineers, who are no theatre experts sometimes, just detected things very obvious to the professionals. The unaffected approach however sometimes helped to scrutinize things and processes, which are apparent only at the surface and might need reconsideration after seeing them in a different light.

It must be mentioned here, that after an initial and lengthy phase of scepticism and unavailabilities, the interest in the project and its potential benefits rose surprisingly fast. The growing openness and the readiness to contribute has made the project work much more easy and fruitful in the last few weeks. To some extent, the blossoming enthusiasm already needed some expectation-management – explaining that the first.stage project will not deliver an integrated solution for all interested departments. People now are more and more aware of the fact, that – at the end of the project – there will be a functional prototype covering the most relevant aspects of an envisaged solution which will need a lot of additional time and money to become a commercial product.

2 Current situation

2.1 Selection

The theatre managers (artistic director or intendant and the commercial manager) of an enterprise like the Landestheater with several houses have to stage up to 40 productions per year. Therefore, they need to plan the productions well in advance. The minimum lead time for a drama is one year, for an opera 3 years or more is the usual planning horizon.

The selection of the productions first of all has to match a certain guiding theme which the intendant has chosen for the specific season. This theme is of a certain societal and esthetical relevance and the basis for the further programming. Together with the heads of the divisions (opera, musical, drama, dance) the intendant selects an appropriate mix of genres (comedy - tragedy) and epochs (classic - contemporary), also aiming at different target groups (e.g. segmented by age).

When the plays have been picked, the next step is to choose a director, which can be done completely without restrictions in the field of drama. When planning operas, the selection is frequently done together with the conductor. They have to consider the cast of singers (esp. the protagonists) in the light of the vocal requirements. In case no in-house artist with the needed vocal range is available, an external singer must be engaged, which not only has effects on the budget but also requires more coordination of the different availabilities.

Two of many approaches of selecting a director should be mentioned here to illustrate the different objectives a production might have:

The director must – first and foremost – represent a certain level of quality. But when producing a rather modern or unconventional play, the theatre might be looking for a director who is known for a staging based on traditional craftsmanship and who is able to narrate the play in a clear and straightforward way. On the other side, a rather well-known opera might sometimes need to be staged going 'against the grain' telling the story in a different light.

The theatre scene being a 'buyer-market', the search for a director is quite easy. There are days, when up to 20 directors offer their productions - simply looking for a job. In cases, where the wanted director is not available at the requested time, the production might be postponed. When there are alternatives, somebody else gets invited.

Selecting a director most of the times means choosing a well-proven team. In many cases at least the director's 'usual' stage designer is involved, sometimes also a costume designer is part of the team. So, the theatre usually works with an external group of 3-6 people including the assistants – only in a few cases it is just a one-man- or one-woman-team.

The contractual agreement includes a passage confirming that the technical possibilities of the house are known and considered as adequate for the production. Only theatres with unlimited budgets can spontaneously make big investments should they turn out to be necessary for realizing sophisticated requirements, which became apparent during the production.

2.2 Stage Design

Very shortly after the execution of the contract the preparations start – often more than a year in advance. Now, the technical manager of the house becomes the main contact for the realization. Of course, the artistic intention must be coordinated with the intendant, sometimes also with a dramaturge/playwright (depending on the background of the intendant).

They first exchange drafts and technical specs of the set. This is done in many different ways. It often includes construction drawings (frequently already generated by CAD programs), photos or films clips – sometimes the stage designer sends true-to-scale models.

Costume designers also communicate in very diverse ways. They send photo collages, clippings from journals, drawings and sometimes little figurines with cloth samples attached to them.

In the production meeting, the resources needed for this production are discussed, agreed upon and calculated. This includes the days needed at the workshops, the material and the costumes.

2.3 Stage Construction

In the following months the local technical crew builds several variants of the stage in consecutive or overlapping steps.

First there is a 'construction rehearsal' on a 1:1 mock-up stage consisting of crude wood structures often covered with construction foil. This helps to sort out dimensions, define the lines of sight and the overall appearance and happens up to 10 months before the premiere.

Then a provisional rehearsal stage is being built und used until a few days before the premiere. It is not as fragile and make-shift as the mock-up for the construction rehearsal but is stable and can be walked on. Its only purpose is to give the actors a feeling of the dimensions of the stage they will interact on.

In the meantime, the construction of the actual stage has been started. The stage designer or her/his assistant might visit the workshops occasionally to check on colours and textures, but in general the work is being done by the in-house craftsmen very independently.

Coordinated by the CTO the stage is constructed in a way that it fits the machinery on, above and under the stage and is compatible with the storing capacities and dimensions of the theatre. All parts of the constructions either must have a weight limit or must be made detachable in a way, so that the carpenters can handle them.

The danger of collisions with other parts (of the same or other productions) when moving them is avoided by detailed drawings. Quite complex movements of revolving stage, the hydraulics underneath the stage and the load possibilities of the rigging grid must be taken into account.

Many divisions in the theatre are involved in this construction phase and alterations required by one, often has impacts on another. Thus, seamless coordination and permanent open communication is needed to avoid complications.

2.4 Rehearsals

Finally, the whole team comes together at the completed stage. All potential problems with the structure have been sorted out in the construction phase and during various tests.

Although the artists are eager to rehearse on the final stage, this only happens in a very late phase of the preparations – approximately 1-2 weeks before the premiere. The restrictions are firstly the lead times on the workshops and the availability of the stage, which – with other productions being staged on an almost daily basis – cannot be used without complex and costly conversions when switching between the actual stage for the evening performance and the one for the rehearsal.

The light rehearsals are also done in the final days. There are limited ways to test different lighting situations with a computer, the real world tests are still crucial. To be able to do this without the actors (who are under stress in the final days anyway), these tests are done with 'lighting extras'.

3 Envisaged Previs Solution

3.1 Methodology

The process of defining the requirements for the theatre application area consists of four consecutive steps, including interviews, scenarios, use cases and deriving the functional requirements. This is an informed process based on relevant literature [1, 2, 3].

First, semi-structured interviews with professionals from the application context were con-ducted. The objective of the interviews was to obtain information on procedures adopted by users and on their expectations of the system and gather information based on the user's experience. The interview targeted current and envisioned previs practises, experience with previs and workflow, areas of improvement, current disadvantages of previs and limitations in everyday work, as well as preferences in the application area, ideas for the integration of previs in the future using 3D tools, and possible impact on the production. Individual questions based on the person being interviewed as well as follow up questions were allowed in order to spark idea generation and the exploration of alternatives.

The interviews were conducted with:

- 3 internal members of TOG technical staff
- 5 external artists from different genres.

The persons interviewed (including their expertise/backgrounds) are listed in 3.2.

Based on the interviews the team derived use case scenarios which generalize the answers from the interviews. For this, key statements were extracted from the interviews concerning tasks, workflow, benefits and drawbacks of used software, input /output hardware, natural interaction techniques as well as preferences for new software. From these statements, scenarios were derived that summarize all statements from the different interviews and generalize from the concrete answers given in the interviews. Further, the theatre developed individual use cases describing each of the tasks from the scenarios in more detail. Pre- and postconditions as well as a detailed description of the tasks are made.

From the scenarios and detailed use cases the final functional requirements for the theatre application area were extracted. The requirements for each use case were derived first based on the content as well as the pre- and postconditions of the specific use case.

As different use cases can derive the same substantial requirements, the requirements were grouped and combined if possible. Driving actors and roles for the requirement were also considered in the process of grouping the requirements.

3.2 Interviews

Interviews were conducted with the following persons:

Internal

- **Philip Olbeter**
  CTO at TOG since 20 years, teaching Theatre Engineering in Vienna, board member of the

Austrian Theatre Engineering Association and of the UNESCO International Theatre Institute Centre Vienna.

- **Gerd Braun**
  Head of stage engineering at the Landestheater Linz. Responsible for the technical and personnel capacity available for all venues and representative of Philip Olbeter.

- **Ivo Iossifov**
  Lighting board operator, former dancer.

External

The external interviewees have received a brief questionnaire asking for their experience with previsualisation and their expectations for this technology. These artists have been selected because of their broad and diverse expertise (opera, drama, dance etc.) and their regular work for TOG.

- **Mathias Fischer-Dieskau (Musical)**
  Mathias Fischer-Dieskau focused during his studies on architecture, German language and history. He founded one of the first independent opera groups in the early 1970s. To this day, he has designed stage sets for more than 100 productions all over Europe (opera, drama, musicals and shows).

- **Falko Herold (Opera)**
  He studied stage design at the Academy of Fine Arts in Vienna with Erich Wonder. From 2001 to 2003 he was lecturer for stage design at the masterclass for scenography at the Kunstakademie Wien. In Linz he just designed the set for “Solaris”.

- **Dirk Hofacker (Ballet)**
  The stage and costume designer / painter Dirk Hofacker studied painting at the Anthroposophical Alanus College of Arts and Stage Design by Prof. Schneider-Siemsen, followed by a 7-year artistic and technical collaboration with designer Michael Scott. He worked with directors such as Oskar Prize winner William Friedkin and Maximilian Schell, John Dew, and many more. For the choreographer Marc Ribaud, he designed internationally acclaimed Ballet productions such as Coppelia, Cinderella, Romeo et Juliette, and so on. He is closely associated with Mei Hong Lin (Ballett director TOG). Since 2010, he did the stage design for all her productions and for Brautschminkerin and Carmen also the Costumes.

- **Momme Röhrbein (Drama)**
  Momme Röhrbein has worked as an outfitter, stage and costume designer for more than 150 productions. He has worked with the directors Philippe Besson, Matthias Hartmann, Leander Haußmann, Wolfgang Hofmann, Anthony Pilavachi, Katharina Thalbach, Antoine Uitdehaag, Markus Völlenklee, Guntbert Warns and Stephan Suschke (Drama director TOG) for many years.

3.3 Previs Experience

While some interviewees only are used to drawings photos or even functional stage models (with moving parts), others already have experience with digital representations of at least parts of the stage.

Many of them work with construction programs, also using their 3D-capablities. Sometimes the virtual models are rendered and exported to Photoshop to produce realistic images of constructions.

In our small sample, *Vectorworks* is more popular than *AutoCAD* as it is less complicated makes easy, intuitive 3D drawing possible. It also can track shots and change perspectives for viewing angles. There are sometimes problems with the matching surfaces, so a *Photoshop* editing is necessary, but very time consuming. Other applications mentioned (without going into much detail) were *Motion*, *After Effects*, *Premiere*, *Renderworks* and *Spotlight* for experimenting with lighting. The tools for sharing or communicating the results are *Dropbox* or *Wetransfer*.

For costumes one designers uses *Poser*, but finds it actually too time consuming, as hand drawings for mask, costumes and props are very adequate.

3.4 Envisaged Benefits

For most of the people asked it was hard to imagine a production workflow completely supported by previs technology. Nobody outright denied any potential benefit, but sometimes the restriction to a screen and the potential 'coldness' were criticized. There were also doubts, if a digital previsualisation could the same realistic appeal as a model. Imagining reality would be maybe still be easier with models.

The most common favourable answer was that previs could help in certain phases, with lighting being mentioned most frequently ("3D is fantastic, if it would be possible to pre-light"). That could be a big help, especially for the director – and due to that a considerable expenditure of time on stage.

For construction it might be partially helpful, although the workshops prefer a real model. Being able to use a CAD drawing to calculate the materials needed was mentioned as a potentially valuable benefit. The aspect of sustainability becomes more and more important in the theatre as well – so the efficient (re-)use of material must also be taken into account.

Another field of application mentioned at the interviews are presentations for potential sponsors.

3.5 Assessment of output quality

In order to assess the quality of the requirements gathered in this document and to ensure that these are valid requirements, two steps were performed based on common user experience guidelines and practises [1]. First, after gathering all requirements for all four application areas of the first.stage project, the requirements were reviewed and prioritized by each application partner. Prioritisation included all requirements, sorting them in either of the three categories low, medium, and high priority.

Thus, less important requirements could be identified in order to focus on core and the most important functions of the future system while at the same time incorporating a control loop that allows for dismissal of certain requirements, which however was not the case. All requirements were kept. However, the order of implementation is highly dependent on the priority of the requirements. The prioritized requirements can be found in Deliverable 1.5. This step ensures that only valid and important requirements result from the requirement analysis.

As a second step, the requirements are subject to constant validation, change and rework in the process of testing the prototypes developed based on these requirements. These efforts are rooted in Work Package 6. Based on the iterative approach of software development practices, on the basis of the initial requirements and their priorities, first prototypes are developed. These prototypes are tested iteratively in the application context with professionals. Based on the results of these tests, the requirements are adapted and new ones are added if necessary. In addition, non-functional requirements regarding the interaction with the system are gathered based on first user tests of prototypes, as interaction requirements are often hard to obtain from users without much technical knowledge. The results of the new and reworked requirements can also be found in Deliverable 1.5.

4 Scenarios

The main target of a theatre is to produce as much ‘art’ as possible for a given budget. Previs can help to get ‘more theatre’ for every Euro.

However, it is always a difficult question, if streamlining processes in arts might eliminate playful creative processes and – by removing obstacles – obstruct the path to uncommon, creative solutions.

The first.stage project will have to concentrate on facilitating creative processes and not eliminating or obscuring them by the use of technology. Playing with different possibilities must trigger the artist’s imagination and not restrict it to the technical possibilities.

Previsualisation will therefore also help to give additional artistic options, to create something new, something that has been never seen before on a stage. One of the targets is to create new visual worlds on a stage, and by this to be more appealing to an audience spoiled by the VFX provided by the blockbuster movie industry on a daily basis.

4.1 Stage Design

The target would be to have a virtual, functional 3D-model of the relevant parts of the theatre, the machinery above and below the stage, the technical structure and infrastructure of the building into which a stage designer can 'project' his or her ideas. It is important to not only show the potential and the opportunities but to clearly outline the restrictions and caveats.

Optimised lines of sight from every seat in the auditorium and other structural parameters could be taken into account at an early stage.

In the first phase, basic technical data of both the stage and the envisioned stage design would be exchanged. Later on, there the teams would arrange distributed meetings with participants from different locations working on the same virtual model and experimenting with ideas and possibilities. They could include other parties to evaluate their ideas. For instance, the intendant might want to get involved in this process to advise on the specifics of the regional audience or to bring in experience from similar stage designs.

The planning activities for the workshops responsible could be made much easier by calculating the amount of material needed and the weights of the final construction.

An early dialogue with the engineers on the workshops would raise efficiency by avoiding travel cost and construction changes caused by misunderstandings. It would not only help with the optimization

if construction efforts and budget: workflow and handling issues (how many people does it take to operate this production) could be taken into account at an early phase.

It is also important to take into account what stages are being used in parallel at the time of the production. Storing and suspending capabilities are limited and optimisation of stage elements in from that point of view can save a considerable amount of handling cost. The general planning for the locations is been done by *Theasoft*, a software for theatre schedules.

Lighting seems to be a core functionality of previs and could be tested at a much earlier stage than in the current process. This includes 'beaming' parts of the design as virtual enhancements to real components, opening new fields of creativity. Thus, an early lighting simulation might positively enhance and alter the process of stage design.

Generally though, first.stage should be useful for all employees of a theatre by giving them the chance to experiment in real-time with a stage they normally would see only months later.

There are also theatres who – unlike TOG – do not have in-house workshops. These houses procure all construction work based on detailed plans and tender documents. For this work-flow first.stage might bring new approaches and facilitate co-operation with suppliers.

4.2 Cooperations and International Co-Productions

When cooperating with other theatres it is tantalizing to share ideas and possibilities at an early stage. Transferring an existing production saves cost on the receiving side and is return on investment on the giving one. However, simply 'buying' a production and adapting it afterwards is not the most efficient way of cooperating.

When the director and stage designer can take into account the different architectures of two theatres, the stage design can be done meeting both requirements. They can consider the different 'lines of sight' depending on the respective proportions of the auditorium

Using first.Stage software in this process can generate compatibilities in an early stage and make a distributed production process possible. Planning two productions for two theatres in parallel might almost reduce cost by 50%, thus doubling the budgets for a production.

4.3 Transfer Previs to the Stage

Previs technologies might not be restricted to the planning of a production. The photorealistic previsualisation technologies could be also used to enhance the actual production or the easily transfer it into other locations.

A virtual stage design might make a physical one obsolete, creating new possibilities for smaller theatres or groups of artists without own infrastructure. 'Theatre' could be transferred to other spaces in an instant and at quite reasonable costs.

Applying green screen and motion detection technologies could make stages completely independent from locations. Distributed acting with performances on several 'linked' locations combined into one virtual setting would blur the geographic boundaries of the theatre.

On a smaller scale, motion detection could combine composition with dance. Capturing movement data and transforming it into music or light would open new fields of artistic expression and further enhance the application of previs technologies.

5 Use Cases

In this section Use cases are developed that describe typical tasks performed with the first.stage previs software.

UC #	UC Name	UC description	Actors	Flow	Scenario
UC1	Stage Import	It´s possible to import a detailed model of the theatre stage with correct measures and all relevant parts	Set designer, director, light technician	First action in the process	5.1
UC2	Physical Restrictions	The imported model of the stage incorporates all physical restrictions, like moving parts and machinery limits, so planning with these restrictions can be done within first.stage	Set designer, director, light technician	While planning a set design and effects	5.1
UC3	Lines of Sight	The lines of sight for all seats of the loaded theatre model can be checked to identify unintended views onto, behind or under the set	Set designer, director,	First set design is finished and will be evaluated in this step	5.1
UC4	Collaboration	Different employees of a theatre working on the same virtual model and experimenting with ideas and possibilities	All	At all stages	5.1
UC5	Calculation	The project is exported to a list of items needed for the previsualised set in order to calculate costs and materials	Administration and workshop employees	Initial Set design is done and needs evaluation for affordability and feasibility	5.1
UC5	Production Planning	To visualize multiple projects on the stage to ensure they can be	Set designer, administration	Multiple set designs have been made	5.1

		set up in parallel at the same time			
UC7	Light	To plan the lighting of a set by drafting mood, brightness, colour	Light technician	First design of the production is finished. Iterative process with the director	5.1
UC8	Distributed Co-Productions	To develop one set design for two or more different stages at the same time	Set designer, administration	A set design is finished that should be tested on different stages	5.1
UC9	Photorealism	To use photorealistic renderings and animations as high-quality textures and backgrounds for the actual production	Set designer	A high quality set design has been built in first.stage	5.2
UC10	Motion Capture	Motion is captured using a motion capture suite and used to direct music, lights and effects	Director, actor, technicians	Music, lights or effects are set up in first.stage to be controlled	5.3

5.1 UC1: Stage Import

Short Description:

It is possible to import a detailed model of the theatre stage with correct measures and all relevant parts.

Precondition:

A correctly measured 3D model of the stage was build using standard 3D software.

Postcondition:

The 3D model is accessible in the first.stage software for planning the set design, light, etc. The model itself cannot be changed within the first.stage software.

5.2 UC2: Physical Restrictions

Short Description:

The imported model of the stage incorporates all physical restrictions, like moving parts and machinery limits, so planning with these restrictions can be done within first.stage.

Precondition:

All physical restrictions are incorporated into the 3D model of the stage before importing it into first.stage.

Postcondition:

Planning positions, orientations, and paths for object on the stage within first.stage is only possible within the defined limits.

5.3 UC3: Lines of Sight

Short Description:

The lines of sight for all seats of the loaded theatre model can be checked to identify unintended views onto, behind or under the set.

Precondition:

The position of all seats in the theatre are built into the model of the theatre and marked as possible viewing spots.

Postcondition:

The set designer has identified unintended views and can develop fixes or workarounds for these viewing angles onto the set.

5.4 UC4: Collaboration

Short Description:

Different employees of a theatre are working on the same virtual model and experimenting with ideas and possibilities.

Precondition:

Availability of virtual model of stage and production-specific constructions and technical equipment (lighting, rigging) within first.stage. Multi-user enabled toolset with synchronous and asynchronous accessibility.

Postcondition:

Collaboration between director, artists and workshop independent of location and time.

5.5 UC5: Calculation

Short Description:

The project is exported to a list of items needed for the previsualised set in order to calculate costs and materials for the physical construction of the stage design.

Precondition:

The complete stage construction is made via CAD and all dimensions and materials are in the database.

Postcondition:

The exact amount (and cost) of material needed at the workshop is a by-product of the previsualisation.

5.6 UC6: Production Planning

Short Description:

To visualize multiple projects on the stage to ensure they can be set up and stored in parallel at the same time.

Precondition:

All projects are planned in first-stage and co-ordinated with each other. All rigging and storing options are captured on the digital model of the theatre.

Postcondition:

The technical manager of the theatre can be sure, that the stage constructions for parallel productions will not impede each other during conversions.

5.7 UC7: Light

Short Description:

To plan the lighting of a set by first drafting mood, brightness, colour. Later by applying the results to the physical lights available in the theatre.

Precondition:

Both stage / actual construction for the production and the light equipment are available in the previs tool.

Postcondition:

The light technician can simulate different lighting proposals and immediately react to new requirements.

5.8 UC8: Distributed Co-Productions

Short Description:

To develop one set design for two or more different stages at the same time.

Precondition:

Both theatres/stages are digitally captured and can be linked within the previs tool

Postcondition:

The director/producer/set designer can tailor a production for two stages at the same time without having to be on site.

5.9 UC9: Photorealism

Short Description:

To use photorealistic renderings and animations as high-quality textures and backgrounds for the actual production.

Precondition:

The objects on the virtual stage can be textured with photorealistic renderings and animations, their visual effect and impression can be simulated from every position in the auditorium.

Postcondition:

Director and set designer have the possibility to project photorealistic renderings and animated backgrounds onto the stage, thus further enhancing the visual experience of the audience.

5.10 UC10: Motion Capture

Short Description:

Motion is captured using a motion capture suite and used to direct music, lights and effects.

Precondition:

The motions can be captured on a lab-like stage with similar dimensions as the final stage and must be morphed into the virtual previs stage.

Postcondition:

The set designer and the lighting experts have evaluated different areas of the stage and visibility of the actors.

6 Functional Requirements

6.1 Interface Requirements

Usability was the only pre-requisite for first.stage that was mentioned in every single interview. People who are basically reluctant to change the tools they use for creative processes, must be 'lured' into adopting new methods of work, by an attractive and intuitive GUI/NUI.

Today's operating systems and user interfaces mostly provide great examples of how easy even complex software can be used. These concepts and metaphors are widely accepted and must find their way into the first.stage interface.

6.2 Software Requirements

The first.stage project must provide a solution, which can easily be adapted to the different needs of the respective theatre, concerning both extensiveness and complexity.

Smaller houses will want to use only basic functionalities or just a few modules of the entire solution. Theatres with more advanced technical equipment will need the complete workflow to be mapped within first.stage. The system needs to support such different approaches and should not make too many modules or features dependent from each other and must allow a nonlinear way of working with the toolset.

There will be a wide variety of users with computer skills being virtually zero or at an excellent level in other cases. Different types of users will expect and need other functionalities.

The first.stage solution will be able to attract much more interest, if it can not only offer a horizontally modular structure, but can also provide a vertically adaptable level of complexity and functionality.

6.3 Hardware Requirements

The first.stage solution will have to run on standard hardware – stationary and mobile. For special tasks on certain steps of the workflow (rendering etc.) more sophisticated hardware might be needed. 'Playing' with the results however, should be possible with mainstream equipment, on regular PC's, laptops and tablets.

The ‘off-the-shelf’ requirements also apply to peripherals – including the exceptions mentioned above. For regular input and output tasks, easily available standard devices must be used (mice, touchpads etc.). Again, there might be situations where special tools are necessary, for instance laser scanners for capturing basic data for the first time or 3D printers for special modelling needs. The interfaces must be open and flexible to be able to implement new peripherals as soon as they become available.

6.4 Data Requirements

The first.stage environment will constantly exchange data with other systems. It therefore must be designed to easily work with file formats generated by other tools (e.g. CAD) and hand its data over to other machines (e.g. mixing consoles) in an open and well-established format.

The project will not only have to comply with all current standards (DXF, DMX etc.) but will have to closely examine upcoming formats and codecs used by the industry.

7 References

[1] Rex Hartson and Pardha S. Pyla. The UX Book: Process and Guidelines for Ensuring a Quality User Experience. Elsevier, 2012.

[2] John M. Carroll. Making Use: Scenario-based Design of Human-Computer Interactions. MIT Press, 2000.

[3] Klaus Pohl. Requirements Engineering: Fundamentals, Principles, and Techniques. Springer Publishing, 2010.

8 Document History

Ver.	Date	Changes	Author
V0.9	16.11.2016	First content added	Obernhumer
V1.0	20.11.2016	Structure adapted to elaborated content	Obernhumer
V1.1	27.11.2016	Uses Case structure updated	Muender et.al.
V1.2	28.11.2016	Functional requirements added	Obernhumer
V1.3	29.11.2016	Refinements	Obernhumer
V1.4	01.05.2018	Methodology added	Suttheimer / Wenig

Appendix

Interview

General:

1. Have you ever used previs in any of your projects?
    - Yes. In what context?
    - No. Why not?
2. How do you prepare for a stage production?
3. How do you visualize your ideas and how do you communicate your ideas to your production partners?
4. In which stages of production can you imagine to use previs?
    - Set design / stage design
    - Special effects
    - Light planning
    - Mask / Costumes / Props
5. What do you expect or wish to be solved by previs?
6. Would you like to use previs tools yourself?
    - Yes / No
    - Which requirements have to be fulfilled so that you would use it?
    - Do you fear to be limited in your creativity when using technical tools?

If working with digital previs already:

1. Which programs do you use for previs?
    - Photoshop
    - In design
    - After effects
    - Premiere
    - Autocad
    - VECTORWORKS
2. What are your requirements for a previs software?
3. Can you imagine that your draft / design is used in further stages of production (final film / animation / stage production)?
4. Do you think that previs will be more important in the future?

