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SmartSet Virtual Studio Solution: Validation Phase Test Results

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SmartSet

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SmartSet

Foreword

Validation is a part of the project Work Package 4 ”System verification and validation”. In this phase, the system developed in SmartSet project will be tested, both on a small scale (restricted trial to verify its performance), and on a large scale (validate its use by end users as a complete system for virtual TV sets).

The principle objectives of this work package are to:

- Adopt a consistent assessment and validation methodology to demonstrate the project technologies in terms of technical and socio-economic aspects.
- Define a concise and comprehensive guidance for validation activities in the context of this project.
- Ensure that stakeholders' needs and desires are met.
- Confirm achievements at the end of the project are robust and clear.

This publication presents shortly the methodology that was used to measure the user acceptance and the functional completeness and correctness of SmartSet in the project framework. More importantly, this deliverable summarizes the main results of the validation process in each of the SmartSet templates. End user consultation is the second part of the validation process. The validation process was planned, monitored and analyzed by the partner Lapland University of Applied Sciences.

The main object of the overall validation and consultation process was to gain information about specifications of the SmartSet solution at the beginning of the project in order to compare the end users first impressions to actual user experiences during the project. After the project, the end users now have more experience in using the actual SmartSet hardware and software. It's important to evaluate if the early expectations and final experiences have met, or possibly changed, during the project. Validation activities have helped to monitor that the requirements are met after the solution is ready.

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1 INTRODUCTION

1.1 Project description

Creative industry SMEs in the broadcast media sector, such as small-scale TV stations and production companies, have a need for Virtual Reality and Augmented Technologies to remain competitive, bearing in mind their limitations in facilities and resources. The possibility of expanding the use of advanced graphics technologies which are only within reach for large-scale TV networks, will be an important step forward to creative industry SMEs in the competitiveness of this industry. (User Consultation Process Protocol and Tools 2015.)

The vision in the **SmartSet project** is to develop a low cost virtual studio solution that, despite being ten times less than the cost of comparable solutions on the market, will have the same quality of high cost solutions currently used by larger broadcast media companies but with a simple and limited functionality so that the project will increase the competitiveness of the European creative industries, particularly in the broadcast media sector (User Consultation Process Protocol and Tools 2015). In this sense, the SmartSet concept is a "game changer" and will provide creative industries' SMEs with the capability to compete with the big broadcast media players in the market. Moreover, the SmartSet solution will provide any organisation with an interest in broadcast media with the means to set up broadcast television capability. (Project Implementation Manual and Quality Control Plan 2015.)

The SmartSet project aims to meet the following challenges:

- Creative industry SMEs in the media sector, in particular, have highlighted the need for a high performance, low cost, virtual studio solution. In order to meet this challenge, the SmartSet technology must be both cost effective and meet a wide range of diverse user needs.
- To increase the probability of commercial success, relevant stakeholders must be involved from the outset, not only to ensure that the validation criteria to be used are appropriate and in line with user needs but also as an early step towards market preparation.
- Existing virtual studio solutions are complex, expensive and beyond the reach of many creative industry SMEs. Therefore, building on existing industry standards, the SmartSet consortium is intended for producing a more cost effective, market-ready solution, comparable to existing high cost solutions available in the international market in terms of quality, graphic resolution and realism etc. There are low-cost solutions available but the quality of performance is poor. (Project Implementation Manual and Quality Control Plan 2015.)

1.2 Document description and purpose

The challenge to be addressed is that creative industry SMEs in the media sector, in particular, have highlighted the need for a high performance, low cost, virtual studio solution. In order to meet this challenge, the SmartSet technology must be both cost effective and meet a wide range of diverse user needs. (Project Implementation Manual and Quality Control Plan 2015.)

The SmartSet project objectives include prioritising user requirements and mapping these to project capabilities to ensure project outcomes are driven by user needs, and devising mechanisms to verify that user requirements are being met and specifying variables to be monitored during the validation process so that the market demand for the solution and the innovation potential can be clearly demonstrated (Project Implementation Manual and Quality Control Plan 2015).

Validation is a part of the project Work Package 4 "System verification and validation". In this phase, the system developed in SmartSet project will be tested, both on a small scale (restricted trial to verify its performance), and on a large scale (validate its use by end users as a complete system for virtual TV sets).
The principle objectives of this work package are to:

- Adopt a consistent assessment and validation methodology to demonstrate the project technologies in terms of technical and socio-economic aspects.
- Define a concise and comprehensive guidance for validation activities in the context of this project.
- Ensure that stakeholders' needs and desires are met.
- Confirm achievements at the end of the project are robust and clear.

Validation data collecting took place in each of the user sites in order to critically evaluate the SmartSet solution. This task was carried out with the collaboration of the appropriate staff from each user partner participating in the project who, as well as providing support and guidance for the end users, will collect objective information. The collected data was continuously analysed in order to determine how well the SmartSet technology has been accepted by end users and to evaluate the impact of the SmartSet experience. During the process, the SmartSet solution was continuosly refined by the developers based on the feedback from the end users.

As set out in the project deliverable D2.1 User Consultation Protocol and Tools, the user consultation process is divided in three phases:

1. first impressions
2. work in progress
3. aftermath.

During phase 1 (first impressions), the preliminary user requirements were collected by carrying out a questionnaire and interviews with both, project end users and stakeholders (chosen CIAG members). The results were presented in the project deliverable D2.2 User Requirements Definition, and based on these results the developers have made the first prototype of the SmartSet solution of which charasteristics are presented in the project deliverable D2.3 Virtual Studio Specificaton. Validation process aims to ensure that the chosen charasteristics are best suited for the end users' purposes.

Phase 2 (work in progress) included implementing the virtual studios (hardware and software) in the end users' facilities by Brainstorm and organizing a workshop on learning how to use the hardware and especially the SmartSet software. During phase 2 all demo productions were actualized and produced by using SmartSet. The validation process took place in this phase.

Phase 3 (aftermath) includes the evaluation of the finalized SmartSet solution, and during this phase the end users give their concluding feedback and validation about the SmartSet, its pros and cons and development suggestions based on their experience how the expectations from phase 1 actualised during the phase 2. Phase 3 is mainly based on the gathered validation information in the phase 2, but equally important part of the phase 3 is the end user questionnaire.

This deliverable presents shortly the methodology that was used to measure the user acceptance and the functional completeness and correctness of SmartSet in the project framework. More importantly, this deliverable summarizes the main results of the validation process in each of the SmartSet templates. End user consultation is the second part of the validation process. The validation process was planned, monitored and analyzed by the partner Lapland University of Applied Sciences.

The main object of the overall validation and consultation process was to gain information about specifications of the SmartSet solution at the beginning of the project in order to compare the end users first impressions to actual user experiences during the project. After the project, the end users now have more experience in using the actual SmartSet hardware and software. It's important to evaluate if the early expectations and final experiences have met, or possibly changed, during the project. Validation activities have helped to monitor that the requirements are met after the solution is ready.

2 METHODS FOR GATHERING DATA

2.1 Validation process

Validation is a documented process, testing a system to demonstrate and ensure its accuracy, reliability, and consistent intended performance. It gives Actual Results for the developers, i.e. what a system does when a particular action is performed. It also reveales Deviations when a system doesn't act as expected. (Ofni Systems 2016.)

The objective of the validation was to ensure that SmartSet solution includes all the needed elements and it's operation is flawless. The validation process has been a continuous dialogue between the developers and end users (as presented in the Figure 1) and the data gathered during the validation process was an important tool to further develop the SmartSet to get the final product.

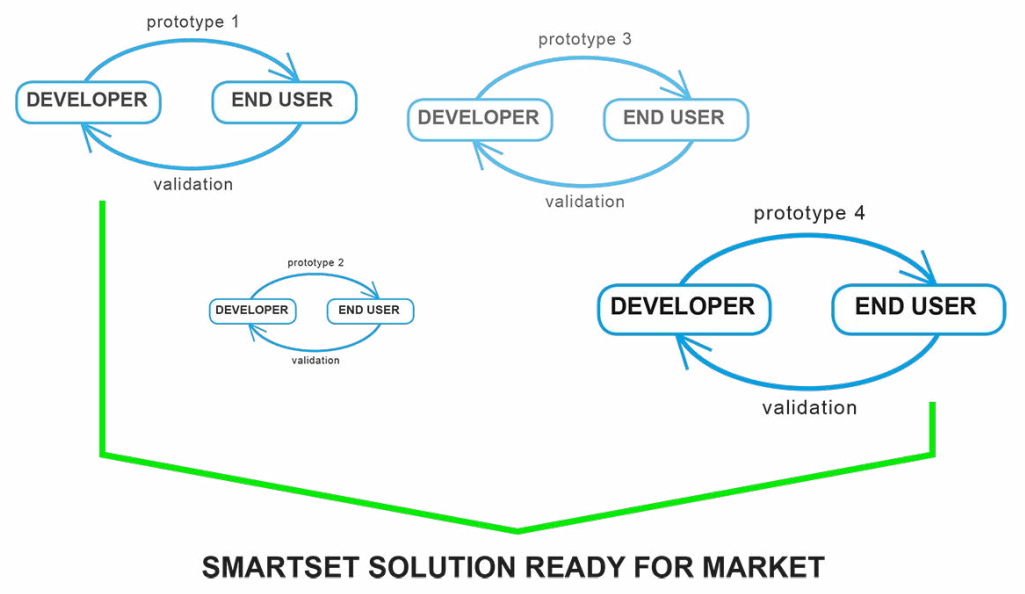


Figure 1. The final SmartSet product is based on a continuous development process between the developers and end users

In SmartSet project, the validation process consistsed of two separate phases:

1. The actual validation process during the project while the SmartSet product was continuously developed in order to refine the final product.
2. The final user consultation, which took place in the end of the project when the SmartSet product was ready.

2.1.1 TARGET GROUPS

Participants in the SmartSet project comprise:

- **developers** of the SmartSet software,
- **end users** who are also the SmartSet project partners with developers,
- **stakeholders** who are professionals of the broadcasting or production field or other relevant industry, and
- **Commercial Impact Advisory Group (CIAG)** which is formed from the group of stakeholders to share a more general opinion among professionals in the creative industry concerning the commercial potential of the SmartSet product.

The project partners represent the end users in the project. These partners are:

- Lapland University of Applied Sciences (Finland)
- The Association Remar España – Solidaria TV (Spain)
- BonumTV (Hungary)
- Hallingdølen AS (Norway)
- Joulupukki TV Oy (Finland).

All of the project end users were involved in the validation process by supplying data of each of their demo made with SmartSet prototype. The data was gathered with a common template that was provided to the partners by Lapland UAS. Provided feedback and information affected the development process of the ready solution. The stakeholders and CIAG members were consulted when needed.

2.1.2 VALIDATION OBJECTS

The starting point of SmartSet is the full Virtual Studio application developed by Brainstorm devoted to large broadcasting companies. Having this application as a baseline, some new features have been spotted as necessary for the system to become even simpler to manage while others require to be simplified or removed in order to make the tool accessible to non-specialised operators.

One of the most important results based on users' feedback was the decision to simplify the interface by removing the need to create and configure new scenarios from scratch. SmartSet will be released along with an expandable set of program templates that will allow scenario and behaviour configuration and will include their own Mixer Interfaces, designed and created ad-hoc for each case. This philosophy should make possible to operate the system almost out of the box.

As described in the project deliverable D2.3 Virtual Studio Specificaton, the main simplifications proposed in the SmartSet system are:

- SmartSet will not include a camera tracking system.
- SmartSet will use only one fixed camera (HD or 4K).
- SmartSet will use only internal chromakey.
- SmartSet will be easy to calibrate and position.
- SmartSet will allow easy configuration and operation based on preconfigured programs template, which will include the configuration assets and the ad-hoc operating interfaces.

With the objective to get the best possible quality vs. price ratio, SmartSet hardware setup is designed based on semi-professional equipment. The functionalities of hardware characteristics were tested during the validation process to define best combination of low-cost pricing and professional quality for the hardware. Other important issue was also to validate the reliability of the hardware in demo productions to serve best SmartSet software and to make the virtual studio solution complete.

The functionalities of software characteristics were tested during the validation process to define perfect mix of user-friendliness, professional quality and reliability of the software through different kinds of demo productions. It's also important to keep in mind the commercial impact of the final virtual studio solution.

2.1.3 VALIDATION TEMPLATE

Each end user had a similar validation template, which was fulfilled during each of the demo productions. This template consists of open questions in which the end users can reflect the user experience on their own words. In addition to this, a Requirements Traceability Matrix was used as a tool to provide information on which of the features are most commonly used, how well they worked and how important they are for the end result.

The developers must have a clear definition of what makes a demo case pass and what makes it fail the validation. Beforehands was determined that SmartSet validation process has succeeded when following qualities have been reached through demo productions:

- Professional quality both in recorded and live broadcast material
- Simple and user-friendly template-based solution
- Reliability of the SmartSet solution including both hardware and software
- SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution

The validation template consisted of the following cathegories:

1. Background information
2. Actions towards executing the demo
3. Maintenance issues
4. Outcome
5. Learning process
6. Validation criteria assessment
7. Requirements Traceability Matrix

With various questions and separate Requirements Traceability Matrix, the validation template provided necessary information in order to analyze if the SmartSet solution is heading to right direction, in other words, how well it fulfills the validation criteria in each stage of the validation process.

2.2 User consultation process

As mentioned in the Introduction chapter, the user consultation process is divided in three phases: 1) first impressions, 2) work in progress and 3) aftermath. All of these three phases contribute to this deliverable.

User requirements were collected by carrying out a questionnaire and interviews with both, end users and stakeholders. Results from the phase 1 are presented in the project deliverable D2.2 User Requirements Definition. These results are a baseline for this final validation phase test results analysis.

In phase 3, the end users and stakeholders are once again consulted via the same kind of questionnaire as in the beginning of the project. During this phase the end users will give their concluding feedback about the SmartSet, its pros and cons and development suggestions based on their experience how the expectations from phase 1 actualised during the phase 2 (demo productions). In short: is there a market for SmartSet.

During each phase end users and stakeholders will answer to user consultation questionnaires and/or join Skype meetings/interviews organized by Lapland UAS and Brainstorm. The main object of the overall consultation process is to gain information to obtain the specifications of the SmartSet solution at the beginning of the project and also during the project after the end users have more experience in using the actual hardware and software. All these consultations help to monitor that the requirements are met after the solution is ready.

2.2.1 TARGET GROUPS

In the final user consultation, all of the project participants are taken along and their opinions and views are valued. End users have the most important role as they now have actual user experience of the SmartSet virtual studio after several demo productions. Each partner has utilized the solution in a role of an end user, and therefore they have gained a lot of valuable information on for example how user-friendly the solution is and how it can be used – and also marketed for potential new target groups.

The group of stakeholders include professionals working in the field of the media, broadcast and creative industry sector. Stakeholders are also consulted with questionnaire, as was done in the first phase of the user consultation. Stakeholders, however, can only rely on their first impressions also at this stage because they haven't actually used the SmartSet solution. Takeholders are provided

with various video material produced during the project, but their knowledge of the final product is naturally much more limited than the end users' knowledge.

From stakeholders' group, the Commercial Impact Advisory Group (CIAG) was chosen. The criteria was to have an international group of experts from creative industry from the different regions of the world in order to have a very global vision and direct interaction/advice. The CIAG advises on development and refinement of the business model for the SmartSet technology based on market research gathered by the consortium. In particular, the CIAG members will be asked for feedback on the requirements and needs of potential users of the SmartSet system to ensure specifications include a good balance between low cost and high quality capabilities in an operational system which is adapted to the needs of small creative media and educational organisations. (Commercial Impact Advisory Group Composition and Management Plan 2015.)

During the validation process, CIAG members were asked feedback on the requirements and needs of end users to ensure, that specifications include a good balance between low cost and professional quality which could be then adapted to the needs of creative and media SMEs, and educational organisations. Focus was especially on the commercial potential and attractiveness of the final SmartSet product as a simple, template-based, user-friendly and complete solution.

The role of the developers (Brainstorm Multimedia) was to monitor the process and further develop the product based on the user experiences.

2.2.2 QUESTIONNAIRES' CONTENT

The central method for user requirements consultation is a validation questionnaire to form a general opinion of the end users and stakeholders. There were two different questionnaires: a wider one for the end users and a more compressed and targeted one for the stakeholders. Both questionnaires were carried out with Webropol (online questionnaire tool) by Lapland UAS.

End users' questionnaire was based on 11 categories/themes:

1. **Background information:** Respondent's and his/her company's (size, business branch, clientele) information.
2. **Personnel's competence:** Evaluation of the current and needed competence of the personnel in using virtual 3D studios.
3. **Financial issues:** Respondent's company's investment capability concerning the SmartSet hardware and software as well as the operating personnel's salary.
4. **Buying decision:** Reasons why the company would or would not purchase the SmartSet solution and an evaluation on the different aspects that affect the buying decision.
5. **Target groups:** Potential of reaching existing and new target groups with SmartSet and choosing the right marketing channels.

6. **Content:** Evaluation on what kind of content the company could produce with the SmartSet.
7. **Hardware:** Company specific requirements concerning the SmartSet hardware.
8. **Software:** Company specific requirements concerning the SmartSet software.
9. **Other solutions and add-ons with SmartSet:** Possible need for compatibility with 3rd party software/hardware solutions.
10. **Geographical point of view:** Country specific characteristics/requirements and mobility of the 3D virtual studio.
11. **Maintenance:** Issues concerning maintenance, e.g. maintenance service location, time for reaction and software updates.

The questionnaire for the stakeholders was further developed from the end users' questionnaire. This compressed questionnaire consisted mainly of the themes: background information, personnel's competence, financial issues, buying decision and maintenance. In addition to these, hardware and software requirements were asked. The emphasis of the stakeholders' questionnaire was on what kind of things affect the most to the buying decision and what should be taken into consideration in planning of the maintenance services for low-cost 3D virtual studio.

Link to the online Webropol-questionnaire was sent to all of the end users (5) and stakeholders (13). After getting the link, respondents had approximately 2 weeks time to answer the survey. As a result, we got 5 responses from the end users (100 %) and 4 responses from the stakeholders (31 %). Through these responses we were able to gather data on how well the final product answers to needs of the potential clients. The sampling was not extensive but adequate for the purpose as our primary aim was to collect qualitative data.

The user requirements data was collected in two phases, in the beginning of the project on 2015 and in the end of the project on 2016. The questionnaires were for the most part uniform in both phases. Original plan was that if necessary, some more specific questions will be added for the second phase questionnaire, as there already are user experiences and wider knowledge of the SmartSet in the end of the project. However, we decided not to add questions but rather reduce them as some of the earlier questions wouldn't have brought anything extra information at this stage. Concerning end users, we now concentrated more on the actual SmartSet product, as in the first user consultation their estimations were more about virtual studios in general.

2.2.3 OTHER WAYS TO GATHER INFORMATION

In the first phase of user consultation, to complement the data from the questionnaires there were also a series of online interviews and face-to-face meetings organized by Lapland UAS with the help of Brainstorm. The interviews were based on the data

gained from the questionnaires. The interviewees were end users, stakeholders and CIAG members.

Especially CIAG members were consulted also during the validation process, in phase 3. At the first stage, online interview sessions in Skype were organized with the CIAG emebers separately. At this final stage, the feedback was asked when necessary. Mostly the CIAG members gave their contribution concerning the marketing of the final product.

3 METHODS FOR ANALYSIS

3.1 Validation process

The validation process was executed in three different stages concluding three different reports delivered for the developers. Based on these validation results in each of three stages, developers further developed the product to meet the expectations. End users made demo productions and simultaneously or immediately after the production they filled out the common template that was provided by Lapland UAS. Collected data was continuously analysed in order to determine how well the SmartSet technology has been accepted by the end users and to evaluate the impact of the SmartSet experience. Representatives of Lapland UAS composed reports that included all validation results.

Validation process aimed to ensure that the above mentioned validation criteria set out for SmartSet actualize:

- Professional quality both in recorded and live broadcast material.
- Simple and user-friendly template-based solution.
- Reliability of the SmartSet solution including both hardware and software.
- SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution.

In addition to these overall criteria, the validation process focused on the more technical issues concerning SmartSet software and hardware. Specific validation topics were presented in the chapter 2.1.3.

3.1.1 TEMPLATE-BASED SYSTEM

During the project, 6 different SmartSet templates was developed: SmartNews, SmartMagazine, SmartMagic, SmartDebate, SmartWeather, SmartTeleport and SmartEducation. All of these templates have their own characteristics and functionalities, and therefore the validation process was carried out separately for each template. End users generally utilized only few of the SmartSet templates, and therefore they couldn't have evaluated SmartSet as a product in general – i.e. template-based method for analysis ensured that the results are reliable

Each stage of the validation was set out to define if there's some things that end users experienced during demo productions that could/should be further developed in this particular template. In each tIn all three stages of validation, end users' evaluations were summarized template by template. All of the SmartSet templates were not included in all three stages, because the reports were made

based on the templates that each five end users had utilized in that specific stage, i.e. all templates were not necessarily in use in each stage. Also, few of the templates were developed based on end user needs later on during the project.

The validation reports summarized the end user feedback in following cathegories:

1. Template-based system: This stage of the validation was set out to define if there's some things that end users experienced during the first demo productions that could/should be further developed in this particular template.
2. Actions towards executing the demo: The Validation process demanded the end users to think about the production process from planning stage to execution, and what kind of technical and artistic operations and expertise were needed from their staff.
3. Hardware and software: Concerning the SmartSet hardware and software, the end users identified good qualities of the product as well as the qualities that still needs more development based on the execution of this particular demo. As there was already a clear vision on the strengths and opportunities of the SmartSet solution, which are user friendliness, reliability and simplicity, the end users also reflected on how well these qualities were met in using the SmartSet prototype.
4. Maintenance issues: Concerning installing of the hardware and software, the end users were asked to consider if it was easy to set up camera and lights for chroma on their own or was there need for third party support. End users also answered a question of what kind of issues came up that (would have) needed a contact to maintenance services.
5. Outcome: At this stage we asked for the end users to describe the final product they produced with the SmartSet and also add a link to the video if possible.
6. Learning process: In the next stage the end users were asked to reflect on what did they learn during this demo process and how did their own expertise advance. Furthermore, they explained which of this new know-how they can exploit in the demos to come.
7. Feedback for overall product development objectives: End users' evaluation about the SmartSet validation criteria.

3.1.2 REQUIREMENTS TRACEABILITY MATRIX

In addition to validation template that consisted of open questions in which the end users could reflect the user experience on their own words, we used Requirements Traceability Matrix (RTM) as a tool to provide information on which of the features are most commonly used and how important they are for the end result.

As a part of the validation template, end users were provided by a common RTM that consisted of a variety of different functionalities concerning SmartSet hardware and software. Concerning each functionality, there was explained what the requirement for that functionality in question, i.e. what is the expected function. The end users were then asked to describe the Actual Result that means what the SmartSet system does when that function is performed. If the requirement didn't function as expected, then end users explained by words the observed Deviation.

After verbal analysis, the end users also rated the usability and importance of each requirement mentioned in RTM. In Usability they gave their remark on how easy it was to use the mentioned requirement (on a scale from 1 [poor] to 5 [excellent]). With the same scale they then evaluated the Importance, meaning how important the mentioned requirement was for that specific demo production.

Numeral evaluations from each end user were summarized concerning each SmartSet template and an average value was counted. After that, Conclusions for the developers were made based on the end user evaluation, both verbal and numeral.

3.2 User consultation process

The user consultation data and requirements are crucial information for the developers of the SmartSet. The research data consists mainly of feedback from the use of the technology (validation). The first questionnaires and interviews (phase 1) aimed to reveal user expectations and requirement. The later data collection (phase 2 and phase 3) is based on actual user experiences when the end users have had time to utilize SmartSet in making demos. In this deliverable, we summarize the user consultation results from the phase 2 and especially phase 3.

This report consists of both quantitative (technical user requirements) and qualitative (user expectations) analysis. The focus group questionnaires help in identifying how well the SmartSet solution has been developed to be a ready product for the market.

The research is based on SWOT analysis and the results of the consultation will be guided by a user-centered design. These methods served as a starting point and basis for the research and setting up the questionnaires.

3.2.1 SWOT ANALYSIS

SWOT analysis is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture. A SWOT analysis can be used to:

- explore new solutions to problems
- identify barriers that will limit goals/objectives
- decide on direction that will be most effective
- reveal possibilities and limitations for change
- to revise plans to best navigate systems, communities, and organisations
- as a brainstorming and recording device as a means of communication
- to enhance "credibility of interpretation" to be utilised in presentation to leaders or key supporters. (Chermack &Kasshanna 2007; Community Toolbox 2017; SRI Alumni Association Newsletter 2005; Westhues, Lafrance & Schmidt 2001.)

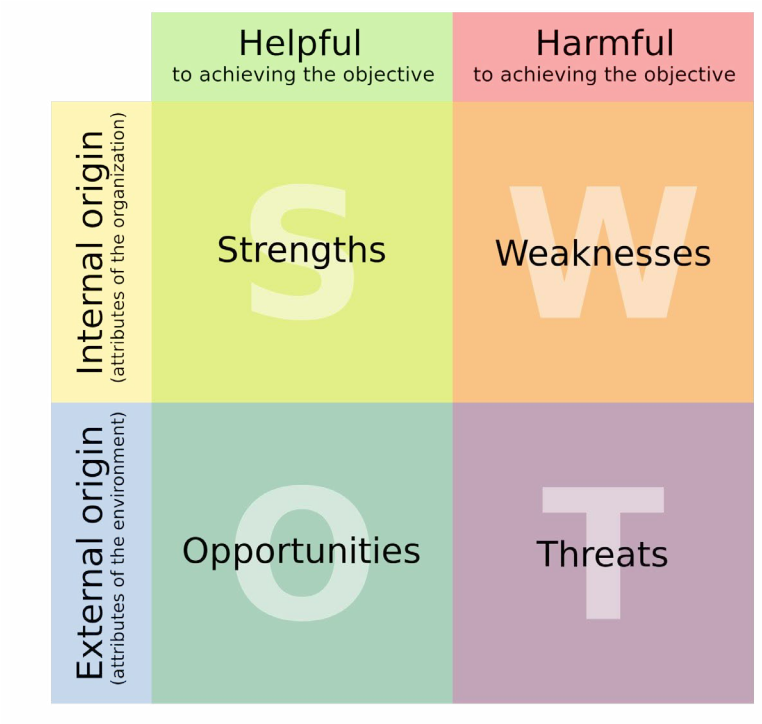


Figure 2. The basic division of the SWOT analysis (SWOT analysis 2015)

During the user consultation process, we reveal what kind of strengths, weaknesses, opportunities and threats different target groups (end users) and different organizations see in usability of the SmartSet product (primarily content, hardware and software). By SWOT analysis we can also reflect how these views have been changed during the project.

3.2.2 USER-CENTERED DESIGN

User-centered design (UCD) is a process in which the needs, wants, and limitations of end users of a product, service or process are given extensive attention at each stage of the design process. User-centered design can be characterized as a multi-stage problem solving process that not only requires designers to analyses and foresee how users are likely to use a product, but also to test the validity of their assumptions with regard to user behavior in real world tests with actual users. Such testing is necessary as it is often very difficult for the designers of a product to understand intuitively what a first-time user of their design experiences. UCD tries to optimize the product around how users can, want, or need to use the product, rather than forcing the users to change their behavior to accommodate the product. (Lawton 2007; Lawton & Thorp 2004: Rubin & Chisnell 2008.)

In today's world, where interacting with technology is an integral part of everyday tasks, the most important factor that will make a service successful, is the end user satisfaction. This is mainly true for products that people would want to use and not for ones they have to use. UCD's main goal is not to just make decisions based on user requirements, but also involve the user in the development cycle from the starting point. A vital part of UCD process is that the developer does not rely on feedback acquired through questionnaires or collected by a different team. The developers need to demo the product in person and then collect information while the user is trying it out. This is especially true in the early stages of development. (Psychogios 2014.)

While defining the SmartSet virtual studios outcome during the project, user-centered design ensures that the developers can offer the right kind of solution to the market and find the characteristics that make their product a game changer. The users' opinions are not only collected through questionnaires and interviews but the whole research process was mainly focused on the demo phase when the end users tested the product and figured out the user requirements for SmartSet.

3.2.3 TECHNICAL ANALYSIS AND NEEDS ANALYSIS

Technical analysis focuses on the requirements related to needs of the end users and professional opinions based on expertise of stakeholders and CIAG members. The data for technical analysis has been gathered from three different sources:

1. demo production templates from the end users
2. stakeholder and end user questionnaires
3. CIAG member interviews.

Needs analysis focuses on the requirements related to the goals, aspirations and needs of the users and/or the user community and feeds them into the system requirement analysis process. The main purpose of needs analysis is the user's satisfaction. (Needs analysis 2015.) Ongoing tracking of user needs and interests has been conducted, continually feeding into the SmartSet development process.

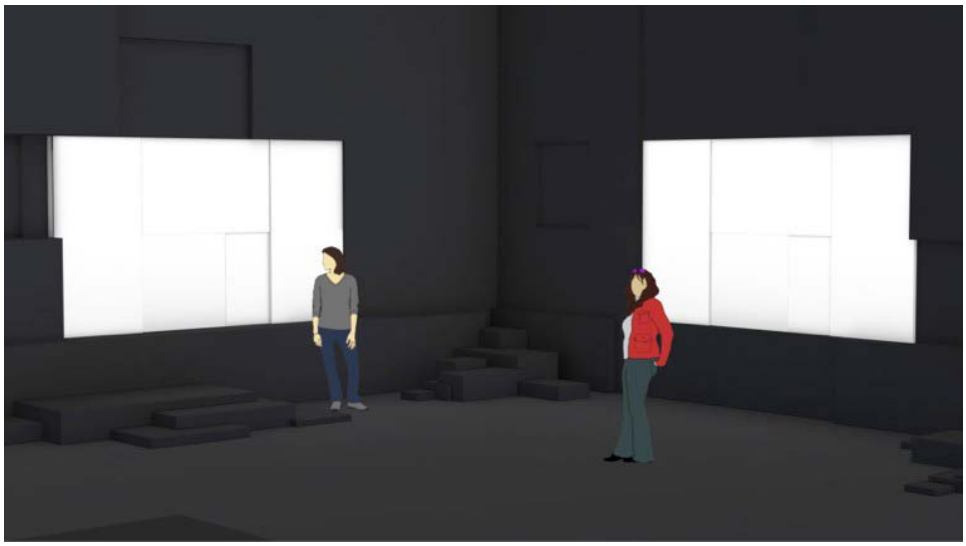
During the first phase of the user consultation, most of the data was based on the first impressions. Now when the end users have gained more experience on SmartSet hardware and software, and project demos have been introduced to stakeholders, CIAG and public audience, we can utilize needs analysis in a more specific way.

4 VALIDATION PHASE TEST RESULTS

As explained in chapter 3, the idea was to develop seven different SmartSet templates: SmartNews, SmartMagazine, SmartMagic, SmartDebate, SmartWeather, SmartEducation and SmartTeleport. As all of these templates have their own characteristics and functionalities, the validation process was carried out separately for each template. This chapter will conclude data from validation phases 1-3. Even though each template has their own characteristics and functionalities(also problems and issues), there were also a few common issues, f.e. problems to save projects correctly, to calibrate camera and set the actor correctly and pixelated image when using zoom with Full HD cameras (resolution wasn't enough).

4.1 SmartMagazine

SmartMagazine-template was originally designed Hallingdolen in mind. Hallingdolen is an established newspaper publisher planning to expand their services to online news broadcasting; therefore Hallingdolen took an active role in developing this template with a "wall of cubes".



4.1.1 DEMO DESCRIPTIONS

Six demos were produced during validation of SmartMagazine template.

Solidaria TV produced a program including videos and documentaries and 3 people worked in this production.

Watch the demo: https://www.youtube.com/watch?v=WBXLoaXHq-U

As their demo production, Hallingdolen produced a culture program titled ”Kulturmagasinet June 2016”. The background of the demo was that the newspaper

wanted to establish a monthly culture-program for the region of Hallingdal, that includes the SmartMagazine-template. 3 people worked in this production.

Watch the demo: http://www.hallingdolen.tv/kulturmagasinet-27-mai

Bonum TV's demo production was titled "Europe Magazine" and 6 people worked in the production.

Watch the demo: https://www.youtube.com/watch?v=Mfc8gyQ26lI

Joulupukki TV produced two demos with SmartMagazine: travel magazine programs called "Europevideoprod Youtube Channel: Budapest travel video" and "Europevideoprod Youtube Channel: Charleroi in Belgium travel video". 4 people worked in each of those productions.

Watch the demo: https://youtu.be/xZQo_VI_a80
Watch the demo: https://www.youtube.com/watch?v=2c8goO4fsXs

Demo from Lapland UAS was called "Tornion opiskelijaterveydenhuolto" and it was an instructional material about student healthcare for Lapland UAS' organisation internal communications. 3 people worked in the production.

Watch the demo: https://vimeo.com/181752050

4.1.2 RESULTS OF THE VALIDATION

As being one of the very first templates, SmartMagazine had already been tested by Hallingdolen in TV broadcast when the actual validation process started. Then it had privilege of being validated by all end users and it was from the very beginning pretty problem free (except having the common SmartSet problems explained earlier in this chapter). The biggest criticism it actually got from its main innovation of using cubes as for the walls; sometimes images got distorted because of the cubes and therefore image looked ”unfinished”. But this was of course a matter of taste.

As based on data from feedback for overall product development objectives, SmartMagazine got following results (1 poor, 5 excellent):

	PHASE 1	**PHASE 2**	**PHASE 3**
Professional quality both in recorded and live broadcast material	**4,0**	**3,3**	**4,0**
Simple and user-friendly template-based solution	**2,5**	**2,7**	**4,0**
Reliability of the SmartSet solution including both hardware and software	**3,5**	**2,7**	**3,0**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	**4,0**	**3,7**	**5,0**

Based on the data from the final project phase (3), the average score for SmartMagazine at the end of the project is 4.0 which means grade very good.

4.2 SmartDebate

SmartDebate was designed TV debate programs in mind. This means, that this template would be also ideal for programs with more than just one talent on screen, e.g. debates, interviews etc.

4.2.1 DEMO DESCRIPTIONS

Because first version of the SmartDebate wasn't released before the phase 1 report, there are just very few demos produced with it.

As their demo, Solidaria TV produced a program called "Debate at Solidaria TV" about politics and news. 3 persons worked in this production.

Hallingdolen made a production test video with SmartDebate.

4.2.2 RESULTS OF THE VALIDATION

Even though SmartDebate was one of the least used templates during SmartSet project the feedback from end users was good. The biggest criticism was about the interface of the Stormlogic/eOndemand which was not in the line with the rest of the SmartSet interface especially when considering the userfriendliness. This functionality got also criticism in the data for other templates as well. For the phase 2 report the lack of customize and personalize the set was seen as an weakness of the template but this issues have been improved in the later versions of the template.

As based on data from feedback for overall product development objectives, SmartDebate got following results (1 poor, 5 excellent):

	PHASE 1	PHASE 2	PHASE 3
Professional quality both in recorded and live broadcast material	–	**4,0**	–
Simple and user-friendly template-based solution	–	**2,0**	–
Reliability of the SmartSet solution including both hardware and software	–	**4,0**	–
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	–	**4,0**	–

Based on the data from the second project phase (2), the average score for SmartDebate at the end of the project is 3.5 which means grade good/very good.

What is to be noted is the low score on being ”simple and user-friendly” template-based solution which was caused mostly by the Stormlogic/eOndeman function and minor problems with creating camera presets; most of these issues has been fixed and improved during the last phase of the project.

4.3 SmartNews

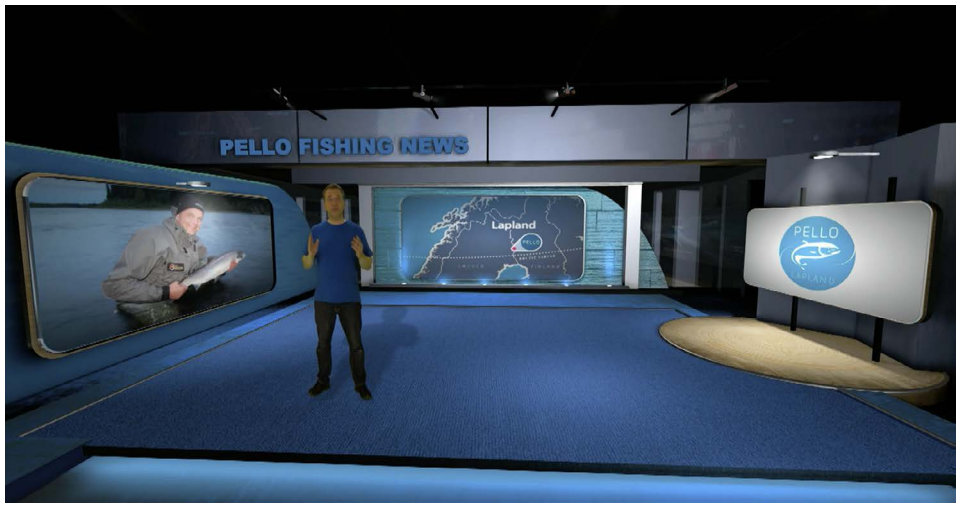
SmartNews has been same time one of the oldest and same time the most used template in SmartSet project. Originally it has been designed for news broadcasting but it has also been in other kinds of projects, f.e. to produce educational course material and instructional material for a corporation's internal communications.

4.3.1 DEMO DESCRIPTIONS

As their first demo, Bonum TV produced a news program as a test for both hardware and software. The purpose was to test TV-channel's Weekly news, and first production included the most important events and happenings from Hungary and Vatican. 5 persons worked in this production.

As their demo, Solidaria TV produced material for a live TV show. Altogether 3 persons worked in this production.

Joulupukki TV's first two demo productions were two episodes "Pello Fishing News".



Joulupukki TV has b-to-b video production customers, and one of them is Pello, the fishing capital of Finland located in Western Finland (www.travelpello.fi). The purpose of these news videos were to inform people about fishing conditions and news and give general information of the environment and nature of Pello and Tornio River

Valley in Lapland. The goal was to make a videos of 2min30-3min (like "corporate news production) in two language for the social media channels (Youtube and Facebook) of Travel Pello. Four persons worked in these productions.

Watch the demo: https://www.youtube.com/watch?v=ZEEyInWlmxc
Watch the demo: https://www.youtube.com/watch?v=QdRwQvprWoI

As of their last demo production with SmartNews Joulupukki TV produced "Europevideoprod Youtube Channel: Steampunk in Luxembourg travel video". With this SmartNews template Joulupukki TV wanted to bring a new style to their channel, and to make it look more "professional" and given an impression of true "travel magazine.

Watch the demo: https://youtu.be/_FxBZTZO60U

First demo from Lapland UAS was titled "Responsive Web Design", and it's purpose was to be used as course material for Lapland UAS's Business Information Technology (BIT) studies.

Watch the demo: https://vimeo.com/166341494

As their second demo with SmartNews-template Lapland UAS produced a demo titled "Webtallennus", and it's purpose was to be used as instructional material for Lapland UAS's staff how to use certain online services of the organisation.

Watch the demo: https://vimeo.com/183794732

4.3.2 RESULTS OF THE VALIDATION

As being tested by all end users and during all validation phases, there is much validation data for SmartNews-template. The main issues were in the beginning the missing full screen function for video playback, inability to change sets screen sizes and the scaling of images on monitors (often distorted images with varying colours caused by software's auto-streching); this issue caused a need to 3rd party software(f.e. Adobe Photoshop) to re-scale needed images to fit correctly in SmartSet. Overall inferface got also a bit mixed feedback in the beginning: in generally the direction we were heading was userfriendly and even attractive but still needed lots of "tuning". Feedback for template-based system was also a bit mixed, meaning that it enabled

possibility to produce material easier and faster but some of the objects and features should not have been locked, f.e. screen sizes. Camera calibration was also seen too complicated.

The biggest issues with SmartNews were bugs in software: most of end users were unable to save their projects correctly and therefore lost lots of time and effort. There were also often reports about missing and disappering camera presets, playlist thumbnails etc and the software tended to crash quite easily.

But thanks to the several demos by active end users and creative cooperation with the developer most of these issues and bugs got fixed.

As based on data from feedback for overall product development objectives, SmartNews got following results (1 poor, 5 excellent):

	PHASE 1	PHASE 2	PHASE 3
Professional quality both in recorded and live broadcast material	**3,0**	**3,3**	**4,0**
Simple and user-friendly template-based solution	**3,0**	**2,7**	**4,0**
Reliability of the SmartSet solution including both hardware and software	**2,3**	**2,7**	**3,0**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	**3,3**	**3,7**	**5,0**

Based on the data from the final project phase (3), the average score for SmartNews at the end of the project is 4 which means very good. What is to be noted, that this template was seen as a very usable for different kinds of productions.

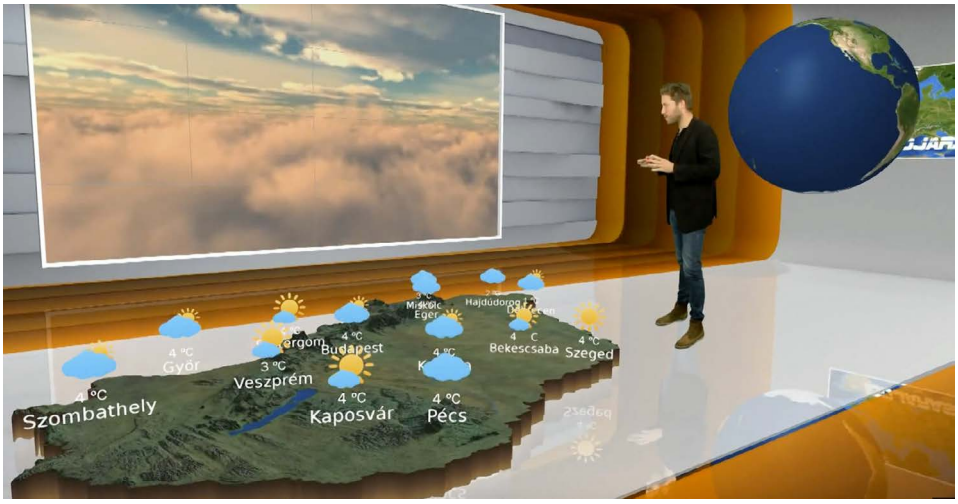
4.4 SmartWeather

SmartWeather was released as the last template near the end of the project and therefore there are only phase 3 validation data from a single demo production. This template's purpose was to provide a professional quality template for weather forecasts.

4.4.1 DEMO DESCRIPTIONS

This template was validated by Bonum TV. As their demo, Bonum TV produced a demo called "Weather forecast". The BonumTV is broadcasting weather-forecasts many times a day and with SmartWeather they were able to update and upgrade their weather forecast broadcasting. 7 persons worked in this production.

Watch the demo: https://www.youtube.com/watch?v=J5MfXDZkIxs&feature=youtu.be&list=PLNpMEmiLWm-N5-dbdyKaqhwtKhNkPYFMp



4.4.2 RESULTS OF THE VALIDATION

As mentioned before, SmartWeather got released in the near the end of the project and there is data from only one production but based on that SmartWeather seems to be very functional template already. The only mentioned issue concerned the ability to resize monitors, missing video playback functions and inability to hide the globe. Also camera calibration got some criticism of being too complicated to get desired results.

As based on data from feedback for overall product development objectives, SmartWeather got following results (1 poor, 5 excellent):

	PHASE 1	PHASE 2	PHASE 3
Professional quality both in recorded and live broadcast material	–	–	**5,0**
Simple and user-friendly template-based solution	–	–	**5,0**
Reliability of the SmartSet solution including both hardware and software	–	–	**4,0**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	–	–	**5,0**

Based on the data from the final project phase (3), the average score for SmartWeather at the end of the project is 4,8 which means grade excellent.

"We think, the design is very userfriendly, and it's easy to change everything, so it is very handy. The user surface is also userfriendly! We think, everything is good in this template!."
(Bonum TV's validation template)

4.5 SmartMagic

SmartMagazine-template was originally designed Joulupukki TV in mind. Joulupukki TV produces and manages all the videos of Santatelevision (Santa Claus Television You Tube Channel) and it's based in the official home town of Santa Claus in Rovaniemi, Finland, which is also a touristic attraction because Santa Claus Village is in Rovaniemi where you can meet the official Santa Claus. As Rovaniemi is visited by too much tourists it is not easy for Joulupukki TV to have a TV set in Santa Claus Village, so they needed a virtual set to produce their videos easier and not needing too much time for planning them. Therefore Joulupukki TV had especially active role on developing SmartMagic-template with the developer.

4.5.1 DEMO DESCRIPTIONS

SmartMagic-template was released a bit later than some other templates and therefore there ain't phase 1 validation data.

This template was validated by Joulupukki TV and they produced 5 demos called "Santa Claus' Reindeer News", "Santa Claus Video Message", "Reindeer News of Santa Claus in Lapland", "Reindeer of Santa Claus: Secrets of Super-lichens 1" and "Reindeer of Santa Claus: Secrets of Super-lichens 2".

Watch the demo: https://youtu.be/mcooMHlyfEQ
Watch the demo: https://www.youtube.com/watch?v=x1pP7fA3BV8
Watch the demo: https://www.youtube.com/watch?v=pESyeQY-My8&t=2s
Watch the demo: https://www.youtube.com/watch?v=ZM7zi4jQgAU&t=4s
Watch the demo: https://www.youtube.com/watch?v=WTVPjxAGkCo

For the first demo 4 persons worked in the production and for last four demos 5 persons worked in productions.

4.5.2 RESULTS OF THE VALIDATION

The main issues concerning the SmartMagic-template were with color correction, freezing problems of the software, over-exposed virtual set lights, aliasing problems and saving the project, playlists and presets problems. Full screen playback mode got creative ideas of a banner or counter telling the remaining time of the video clip and for a slider to control the full screen's playback audio. Camera calibration was also often mentioned in the validation data causing problems to end user disabling the use of projection mode instead of sticker mode.

The biggest challenge with SmartMagic was to create the warm, christmas-like atmosphere of Santa Claus' magic laboratory and to loose the artificial mood of 3D graphics; also challenging was to mix real set elements with virtual ones, f.e. tables, books etc and even Santa Claus as a talent created own challenges, f.e. with the beard, size of Santa etc.

But by the end of the project the quality of productions had improved a lot and the set got a good mix of virtuality and reality.

As based on data from feedback for overall product development objectives, SmartMagic got following results (1 poor, 5 excellent):

	PHASE 1	**PHASE 2**	**PHASE 3**
Professional quality both in recorded and live broadcast material	–	**2,0**	**3,3**
Simple and user-friendly template-based solution	–	**3,0**	**3,3**
Reliability of the SmartSet solution including both hardware and software	–	**3,0**	**3,5**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	–	**3,0**	**3,3**

Based on the data from the final project phase (3), the average score for SmartMagic at the end of the project is 3.5 which means grade good/very good.

4.6 SmartTeleport

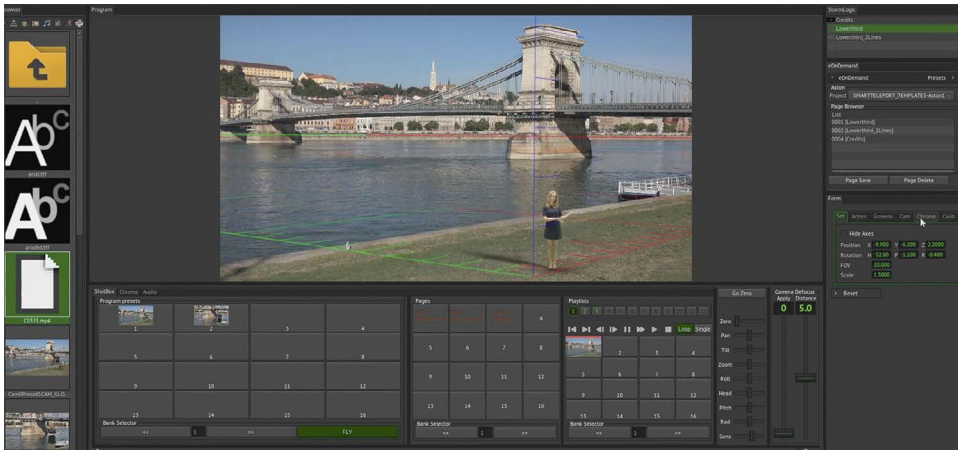
The idea of SmartTeleport is to enable end users to place their talent in to the prerecorded video material. This placing of a talent is called teleportation.

4.6.1 DEMO DESCRIPTIONS

SmartTeleport-template was released a bit later than some other templates and therefore there ain't phase 1 validation data. This template was validated by Joulupukki TV.

As their demo Joulupukki TV produced testing material for their productions and a production titled "Message of Santa Claus to children and Christmas eve departure with reindeer Lapland Finland". Joulupukki TV also provides videos for Europe Video Productions, a YouTube channel about cities in Europe, so SmartSet teleportation is a good tool to include the talent in a virtual way to those cities backgrounds without having the talent in that location making the video look different that what normal videos of travelling are about. Five persons worked for the production.

Watch the demo: https://www.youtube.com/watch?v=bwzMNMH-uEw



4.6.2 RESULTS OF THE VALIDATION

SmartTeleport has been used quite rarely in demo productions most likely because of it has been created for a very specific use and need, and therefore it differs from other templates.There were also quite a few reported issues concerning SmartTeleport but here are some of them: colour correction tool wasn't working and caused a need to a skin's colour correction in Adobe Premiere, dragging of files from internal browser didn't work and using shadows was complicated. De-focusing function caused unwanted results. Also some useful ideas were mentioned in validation reports including a collection of lower thirds for end users to choose from, and an idea to include a live input option in SmartTeleport.

As based on data from feedback for overall product development objectives, SmartTeleport got following results (1 poor, 5 excellent):

	PHASE 1	PHASE 2	PHASE 3
Professional quality both in recorded and live broadcast material	–	**3,0**	**3,0**
Simple and user-friendly template-based solution	–	**2,0**	**3,0**
Reliability of the SmartSet solution including both hardware and software	–	**2,0**	**3,0**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	–	**3,0**	**3,0**

Based on the data from the final project phase (3), the average score for SmartTeleport at the end of the project is 3 which means grade good. SmartTeleport got the lowest score of validated templates most likely because it has been used so rarely by end users. Therefore further development is recommended before releasing this template officially for sales.

4.7 SmartEducation

SmartEducation-template was developed together with Lapland UAS, and the main idea was to create an virtual classroom for both online, streamed lectures and recording course materials. During the project, the template was used also for Lapland UAS' internal communications, student course works and presentations etc.
SmartEducation was released near the end of the project and therefore there ain't phase 1 and 2 validation data available.

4.7.1 DEMO DESCRIPTIONS

SmartEducation-template was validated by Solidaria TV and Lapland UAS.

As their demos, Lapland UAS produced two names titles "Online lecture: Understanding Customer Experience Management" and "Virtual Blender Crash Course" which was supplemental course material for fine arts studies. 2 persons worked in these productions.

Watch the demo: https://www.youtube.com/watch?v=Y1T39cFdDHM
Watch the demo: https://vimeo.com/194699157

Solidaria TV demo tested SmartEducation template in a TV production under the title “Using SmartSet Education template as an interview set”. 3 persons worked in the production.

4.7.2 RESULTS OF THE VALIDATION

As being validated for a relatively short time, SmartEducation-template has got quite a lot validation data and ideas to improve the template. The main issues concerned the design of the set: more setting options were needed for roof, walls, screen sizes, floor,

band on the floor etc and most of those issues for the next versions of the template. Camera calibration got again critics and caused also some lower-quality ”moments” in the production, StormLogic/eOndemand –function also needs to be still finetuned towards userfriendlier ”SmartSet-direction”. There were also issues with the autoscaling of images and videos when using playlists and therefore 3rd party software was needed for scaling picture correctly in SmartSet. Because Lapland UAS use fullHD camera (Sony EX3) in SmartSet, the resolution of camera isn't enough for creating close up – shots in SmartSet; the image gets easily very pixelated when zooming in. Especially in teaching the close up's are important and therefore 4K would be suggested as a standard camera resolution for SmartSet.

As based on data from feedback for overall product development objectives, SmartEducation got following results (1 poor, 5 excellent):

	PHASE 1	**PHASE 2**	**PHASE 3**
Professional quality both in recorded and live broadcast material	–	–	**4,0**
Simple and user-friendly template-based solution	–	–	**4,3**
Reliability of the SmartSet solution including both hardware and software	–	–	**4,3**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	–	–	**5,0**

Based on the data from the final project phase (3), the average score for SmartEducation at the end of the project is 4,5 which means grade very good / excellent.

”The template looks great, we like the colours and the design in general.”
(Solidaria TV / validation template)

5 RESULTS OF THE USER CONSULTATION (PHASE 2)

5.1 Respondents' description

Webropol-questionnaire was send to all of the end users (5) and stakeholders (13) of the SmartSet project. As a result, we got 5 responses from the end users (100 %) and only 4 responses from the stakeholders (31 %). As the amount of responses from the stakeholders was very small compared to the previous user consultation in phase 1 (when we had 18 responses), the results are not very reliable and comparable. However, in this phase 3, the emphasis is on the responses from the end users who now have better understanding of the SmartSet solution.

The end users' companies represent four different countries (Finland, Spain, Norway, Hungary) as well as various sizes and business branches. According to European Commission's definition (What is an SME? 2014), one of the end users represent micro enterprise and three are small enterprises. The fifth end user has stated having more than 200 employees. Among the end users, there are for example an educational institution, religious community television, online video production company and (online) newspaper.

Among the four stakeholders who responded the questionnaire, there are two companies from Bulgaria, one from USA and one from Spain. All of these companies represent micro and small enterprises. The stakeholders come mainly from the entertainment business branch working with commercials, movies, tv shows etc. All of the stakeholders that contributed to our consultation process now in the phase 3 responded also in the first phase of user consultation.

The respondents' companies have a wide range of clientele. The target groups or customer base of the companies include for example education service, youth and community, different audiences depending on the project, tv stations, filmf funds, direct clients in the commercial business as well as educational institutions and students in general.

From all of the 9 respondents only 1 was women. Similar percentage was seen also in the phase 1 of the user consultation (2 women from 23 respondents). This reflects the current gender balance in the broadcast media sector. We also asked the respondents to estimate the percentage of men and women working in their organizations, and only one of the respondents informed that his/her company has more women employees than men.

5.2 Personnel's competence

The respondents were asked to estimate the knowledge and competence in their companies in using virtual 3D studios in a scale from "not at all" to "active and professional user". All of the 9 respondents stated having at least some knowledge.

As shown in the Figure 3, among stakeholders there were two companies that have some knowledge and two companies that have average knowledge in using virtual 3D studios. In the first phase of user consultation, the knowledge was more variable and among respondents there were much more knowledge and active users of virtual studios. This however doesn't diminish our results, as the SmartSet solution is also designed for smaller companies that may not yet have so much experience with this kind of tool.

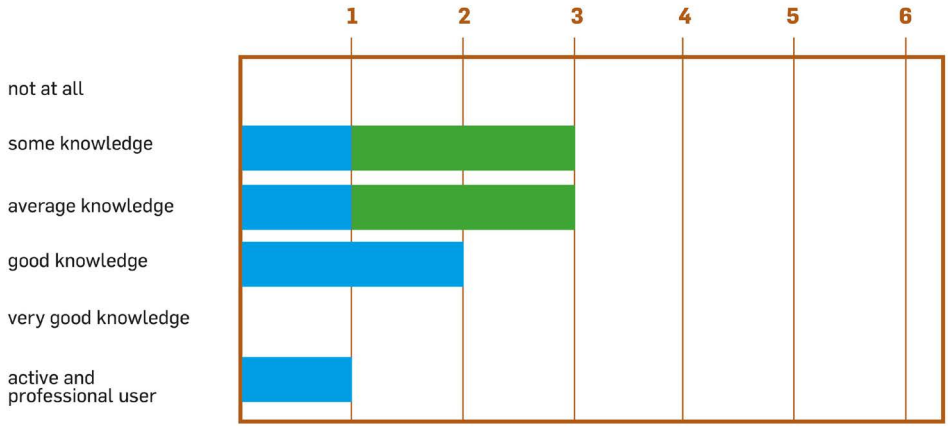


Figure 3. End users' (blue) and stakeholders' (green) estimation of the knowledge and competence in their companies in using virtual 3D studios (number of answers in each option)

At the phase 1, only one of the end user said that the company has good knowledge, other four stated having only some knowledge. As the SmartSet project seeked to find new markets and target groups for a new and user-friendly software, the end users' lack of knowledge therefore offered a realistic approach for development. At the end of the project in the phase 3 of the user consultation, we can now see that the knowledge and know-how on using virtual 3D studios has improved. Now just one end user answered having only some knowledge, one answered average knowledge, two stated having good knowledge and one even

said that the company is now active and professional user of virtual 3D studio. This results surely correlates with the amount of demo productions done in each partner company.

With open questions, the respondents were asked to evaluate the need for technical and creative knowledge acquired from the personnel in order to use SmartSet in their organization and also what kind of education and training would be obligatory before taking SmartSet into active use in the company.

From the stakeholders answers it was seen that the current knowledge isn't in very high level, as was also presented in the Figure 3. General training course was considered being necessary and some stated having help from SmartSet project partners if the knowledge isn't yet adequate.

End users aswers to this question had a lot of variety, diving mainly in two sides. 60 percent (3) of the end users saw that there isn't really that much technical and creative knowledge needed in order to utilize SmartSet. One end user pointed out that they didn't need specific knowledge, only average technical skills. Other end user mentioned that the Smartset platform was easy to use and operate, although the user needs to have a background from television production to integrate the SmartSet system into the production prosess. Third end user also said that there were not too much knowledge needed and if the user can use other graphics programs like Adobe or Autodesk, even if they don't know anything about 3d graphics, they can start using SmartSet after a few hours.

However, 40 percent (2) of the end users had noticed that there indeed is some skills that SmartSet's users have to obain. For example, one said that there were need of knowlegde of different kinds of media related skills (camera, lights, editing etc) and screenwriting, and without those skills it's still hard to imagine anybody being able to use SmartSet. The other end user pointed out that they needed to learn a lot:

- Using and designing or giving creative out-put of 3D backgrounds
- How to use studio softwares (previously we mainly made on demand videos)
- How to use set-up and use green screen and chroma key.

For the question of training needed in order to take SmartSet into use, stakeholders asked for example: basic training, basic level video editing and video production proficiency as well as technical education. One of the respondents noted that it's enough to have one or two persons from the company (depeding on the size of the studio) to learn the needed technical and creative knowledge of the SmartSet in order to organize and run a crew and share their knowledge as well.

As end users now have experience in utilizing Smartset, they could better evaluate what kind of education and training was needed in their organizations before taking SmartSet into active use. If the end user had previous experience for example in using 3d softwares or television productions, they saw that only few

hours basic training was enough as the software is quite straightforward. It was also mentioned that SmartSet project gave end users good training in using green screen, chroma key and so on. General knowledge of studio work was also gained through reading tutorials and watching instructions (YouTube) and webinars. Active usage of the SmartSet software also served a ”training” session, as many thing were learned by doing and doing again.

5.3 Financial issues

When talking about financial issues the first thing people usually think about is the retail price. In the SmartSet, pricing of the product, both software and hardware, has an essential role when thinking about potential market for the product. We asked from the stakeholders what is the price they would be willing to invest in the SmartSet software. End users, however, were asked about the price concerning both software and hardware separately.

As shown in Figure 4, most of the end users estimated that they would pay 5000 euros of the software. One end user was even willing to invest 10 000 euros. Two of the stakeholders answered being willing to pay 5000 euros of the SmartSet software and one stakeholder said 7500 euros. All of these answers show quite clearly that the price of the SmartSet software should be relatively low, preferably only 5000 euros.

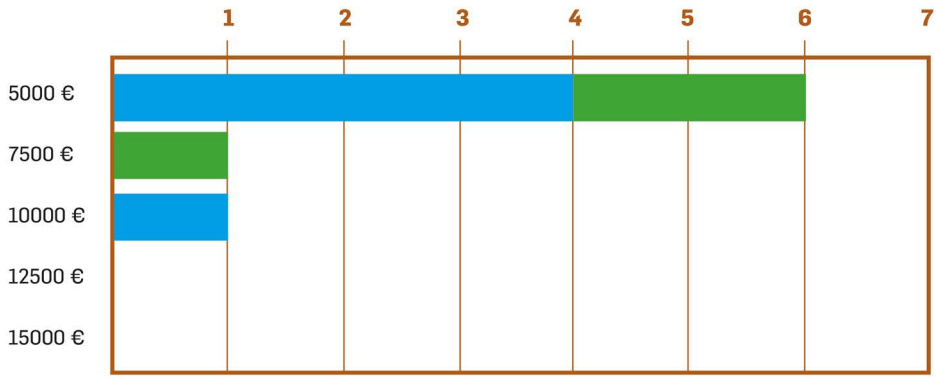


Figure 4. End users (blue) and stakeholders' (green) estimation on how much they would be willing to invest in the SmartSet software (number of answers in each option)

As mentioned, the end users also evaluated the price they would be willing to pay concerning specifically SmartSet hardware. Figure 5 shows that two of the end users answered 5000 euros and two answered 10 000 euros. Roughly we could say that the average investment to hardware would be around 7500 euros.

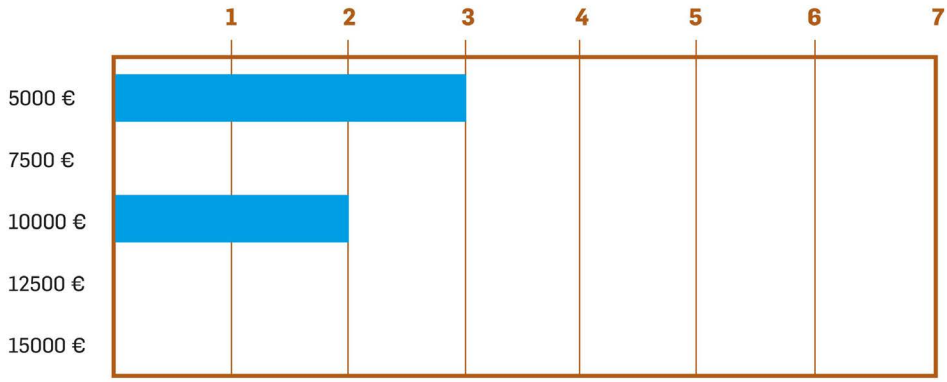


Figure 5. End users' estimation on how much they would be willing to invest in the SmartSet hardware (number of answers in each option)

Because in the first phase of user consultation we asked about liquidity concerning both software and harware together, it's not totally possible to compare the results form the first phase to this last phase. However, both user consultation phases show that the prices should be in line with the idea that SmartSet is a user-friendly and low cost solution. Although the productions' quality is professional, the price is the factor that separates SmartSet from other similar solutions. This is an ssett that could make SmartSet stand out from the crowd.

Other important factor, and in many cases the most important factor, in pricing is the personnel costs in addition to SmartSet product costs: how much customer has to and is willing to invest on personnel using the SmartSet virtual studio. Stakeholders evaluated that they would be prepared to invest 1–2 person's salary in the beginning at the training phase. Later on while operating SmartSet they would invest 3–4 person's salary. End users, however, were asked to evaluate based on their experiences in the project that how much personnel's work time is needed in order to create broadcasts with SmartSet. The average amount of trained persons needed to produce SmartSet broadcast was 2 (three end users answered 2, one answered 1 and one answered 3).

More variety was seen in answers when asked which percentage of one person's overall work time goes into operating SmartSet. The assumption is that SmartSet is only one tool for organization and its users are not assigned to only operate SmartSet but rather utilize it when needed in addition to other work assignments. Two of the end users answered that 50 percent of one person's work time goes into operating SmartSet. One end user noted that as much as 80 percent and two noted that only 10–20 percent of person's work time is spent with SmartSet. It must be pointed out that these numbers are not totally comparable with each other as there are many variables that influence to them. For example, the end user that answered 80 percent also said that in their organization only one person operated SmartSet. Therefore it's understandable that the workload is bigger when there are fewer

operators. Also, of course the percentages are highly related to the amount of productions each end user have done; the more productions there is, the more personnel and their work time is needed.

Third factor when thinking about pricing is costs for necessary training, support and updates to maintain the functionality of the virtual set. This factor will be processed in the chapter 5.9 Maintenance.

5.4 Buying decision

When asked if the stakeholder's company or organization could utilize SmartSet in their business, only one answered yes and three answered no. The one that said yes clarified that it could offer them a chance to do some special work. The reason for no-answers seemed to be more influenced by the fact that SmartSet productions are off company's objectives, so there aren't a reason to utilize not only SmartSet but any virtual studio solution in general.

The respondents were asked to contemplate reasons why their company would buy or use SmartSet, and on the other hand, why they would not buy or use the solution. The reasons for acquiring the SmartSet solution can be summarized into two main qualities: lower production costs and ease of operation. These same results were shown also in the first phase of the user consultation one year ago. Therefore the keyword still seems to be cost-effectiveness, not to forget the quality of the production: producing impressive output with less input. Cost-effectiveness includes the costs to own and the costs to operate.

Stakeholders raised up that the SmartSet solution should be at an affordable price and suit for the certain kind of projects companies do. Low budget and high quality chroma key shows were also mentioned as well as easy and effective manipulation of filming environments. In almost each of the end users' answers easiness of use is pointed out. This result shows that developers have managed to fulfill one of the SmartSet object: user-friendliness. The object of high quality with simple studio seems to also be reached as it was mentioned in many answers. In addition, it was seen that SmartSet can offer a small company an opportunity to work with a very good virtual studioa and that for educational institute it could make possible for taking the next step in digitalization and online teaching.

At the first phase of user consultation the main issues that could prevent the respondents of buying or using the SmartSet solution were price and functionality problems. Now the stakeholders raise up again the price issues, but the emphasis is on the market value. If the company don't get enough profit by using SmartSet, i.e. the price/results ratio isn't profitable, there's no reason to purchase the product. It's also mentioned, that some countries have quite a small market for this kind of virtual studio solution. Furthermore, one stakeholder noted that still using real set, not virtual set, is preferable option in most cases.

As end users have extensive experience on using the SmartSet solution, their assessment about the reasons why they would not buy or use SmartSet should be considered very carefully. Firstly, the end users bring up the fact that this is a new product and a new brand. It might affect on the buying decision that the product is not enough well known or if customers think that this new product might not

yet be stable enough. Concerning this issue, it's important to highlight developers broad experience and footing in the business although this particular product is new.

Secondly, the end users mention that for more professional environments one might need more options for personalization and including one's own virtual sets. SmartSet is a template-based system which ensures the easiness of operation and hence user-friendliness. For some customers this simplicity work well, for some it might be a reason not to buy the product. Defining the core target group precisely is one answer to this challenge.

The lack of people with needed media related skills (camera, lights, editing etc) is also pointed out in end users' answers as a reason why not to utilize SmartSet. This offers the developers a new view for the marketing plan: how to market the product in a way that it reflects the easiness of use and the needed training provided by the developers for the customers.

Additionally, the respondents rated, in a scale from 1 to 5, the importance of certain characteristics' affect on the decision to buy SmartSet. In this scale, 1 means not essential at all and 5 means very essential. The characteristics to be rated were:

- Price
- Availability of the training
- Availability of the support
- User-friendliness
- Maintenance issues
- The competence of the current staff
- Presentation videos
- Amount of virtual sets and object library
- Possibility to create own virtual sets
- Potential new markets
- Increasing the competitiveness
- Profits
- The physical space acquired

At the first phase of the user consultation, the stakeholders appreciated the most the possibility to create their own virtual sets, user-friendliness of the product, potential new markets and target groups for the company and profits. The results are of course influenced by the fact that in the first phase we got altogether 18 answers from the stakeholders and now at the last phase only 4 answers. However, as shown in the Figure 6, now the stakeholders seem to appreciate most the possibility to create own virtual sets, price and maintenance issues. Very close are also the availability of training, potential new markets and target groups for the company and increasing the competitiveness.

Issues affecting on the buying decision:	1	2	3	4	5	Altogether	Average value
Price	0	0	0	2	2	4	**4,5**
The availability of the training	0	0	0	3	1	4	**4,25**
The availability of the support	0	0	0	4	0	4	**4**
User-friendliness	0	1	1	1	1	4	**3,5**
Maintenance issues	0	0	0	2	1	3	**4,33**
The competence of your company's current staff to utilize the SmartSet	0	1	1	1	1	4	**3,5**
Presentation videos	0	1	1	1	1	4	**3,5**
The amount of ready virtual sets and object library	1	1	0	2	0	4	**2,75**
The possibility to create your own virtual sets	0	0	0	0	3	3	**5**
Potential new markets and target groups for your company	0	1	0	0	3	4	**4,25**
Increasing the competitiveness	0	1	0	0	3	4	**4,25**
Profits	0	1	1	1	1	4	**3,5**
The physical room/space that the SmartSet acquires	1	0	1	1	1	4	**3,25**

Figure 6. Stakeholders' ratings of how certain issues affect on the decision to buy SmartSet (1 = not essential at all, 5 = very essential)

In the user consultation that was done a year ago (phase 1), the end users emphasized user-friendliness, the possibility to create their own virtual sets, price and the availability of the support as reasons to buy SmartSet. Now after user experience with the SmartSet, the results are mainly the same. In the buying decision, user-friendliness is still number one issue closely followed by the amount of ready virtual sets and object library as well as price. (See Figure 7 on next page.)

One quite a big difference in the end users' opinions before and after the actual user experience is that in the first phase of user consultation the end users' average value of the importance of the possibility to create own virtual sets was 4,6. Now as they have become accustomed to the SmartSet's template-based system and done a lot of demo productions, the corresponding average value is only 2,8. Therefore we can draw a conclusion that the chosen template-based solution seems to fit very well for the assumed target group.

As the profits and the possibility to create own virtual sets are the least important factors concerning the buying decision for the end users, the stakeholders have the smallest average value in the amount of ready virtual sets and object library as well as the physical room/space that the SmartSet acquires. It must be noted that the amount of ready virtual sets and object library was in the top three for end users and in the bottom three for the stakeholders. This may be a thing that could be

Issues affecting on the buying decision:	1	2	3	4	5	Altogether	Average value
Price	0	0	1	2	2	5	**4,2**
The availability of the training	0	1	3	1	0	5	**3**
The availability of the support	0	0	3	2	0	5	**3,4**
User-friendliness	0	0	0	2	3	5	**4,6**
Maintenance issues	0	0	2	3	0	5	**3,6**
The competence of your company's current staff to utilize the SmartSet	1	0	0	3	1	5	**3,6**
Presentation videos	0	0	3	1	1	5	**3,6**
The amount of ready virtual sets and object library	0	0	1	1	3	5	**4,4**
The possibility to create your own virtual sets	0	3	1	0	1	5	**2,8**
Potential new markets and target groups for your company	0	1	1	1	2	5	**3,8**
Increasing the competitiveness	0	0	3	1	1	5	**3,6**
Profits	0	3	1	1	0	5	**2,6**
The physical room/space that the SmartSet acquires	0	1	3	1	0	5	**3**

Figure 7. End users' ratings of how certain issues affect on the decision to buy SmartSet (1 = not essential at all, 5 = very essential)

emphasized in the marketing of the solution in order to let the potential customers to know that it's an important assett.

Furthermore, the end users were asked to think how often their companies should utilize SmartSet solution to make it a profitable investment (see Figure 8).

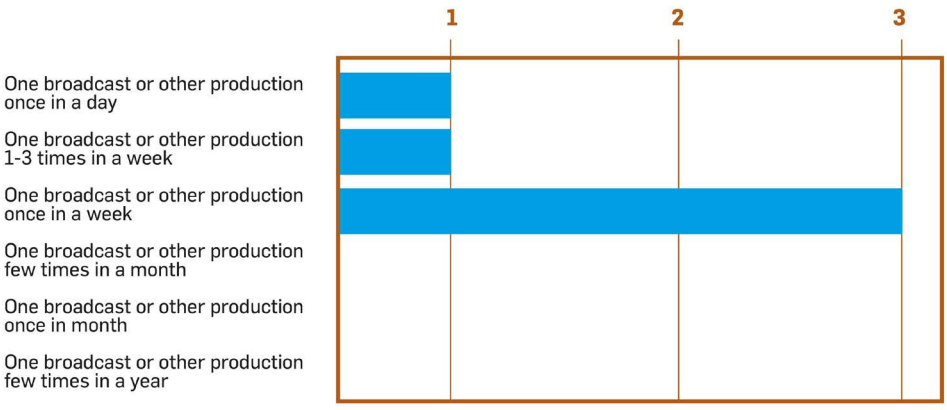


Figure 8. End users' answers on how often their companies should utilize the SmartSet solution to make it a profitable investment (number of answers in each option)

In the first phase of user consultation, only one of the end users responded that their company should utilize SmartSet daily to make it a profitable investment. Two end users thought that there should be 1–3 productions in a week, one end user said there should be 1 broadcast per week and one end user said one production few times in a month. The results have changed in some degree after the user experience. Now at the end of the project, to make SmartSet solution a profitable investment, the most popular answer is one broadcast or other production once in a week (3 answers). One end user still answered there should be one production each day and another end user said one production 1–3 times in a week.

5.4.1 COMPARISON BETWEEN REAL AND ONLINE STUDIOS

The questionnaires also included some questions that asked the respondents to think about the differences between SmartSet virtual set and real sets. We listed some claims in the subject matter and the respondents rated on a level from 1 to 5 how much they agree with the claim. In the scale, 1 means ”I totally disagree” and 5 means ”I totally agree”. The idea was to find out what could be the asset of the SmartSet solution as a virtual set in comparison with the existing real sets.

Issues to be evaluated were a little bit different for both target groups: stakeholders and end users. In the phase 1 of the user consultation, the comparison was made between real sets and virtual sets in general. In this final phase however, the question was formulated so that the respondents were asked to compare specifically SmartSet virtual studio to real sets.

How do you agree with the following statements:	1	2	3	4	5	Altogether	Average value
Acquiring SmartSet is too expensive compared to a real one.	1	2	1	0	0	4	**2**
Operating SmartSet requires specialized personnel while a real one don't.	1	3	0	0	0	4	**1,75**
Maintenance and support in SmartSet are expensive.	1	2	0	1	0	4	**2,25**
SmartSet requires much less space than real ones.	0	0	1	1	2	4	**4,25**
SmartSet allows using the same studio for different scenarios.	0	0	0	1	3	4	**4,75**
Real sets final images are more natural.	1	0	0	1	2	4	**3,75**
SmartSet's final outcome is more compelling.	0	3	1	0	0	4	**2,25**
Current SmartSet's graphics quality is excellent.	0	2	1	1	0	4	**2,75**

Figure 9. Stakeholders' comparison between SmartSet and a real set (1 = I totally disagree, 5 = I totally agree)

The results of this section of the stakeholders' questionnaire are presented in the Figure 9 (previous page). Comparison between results from phase 1 to this phase is maybe not so relevant as we now had so much fewer answers than the last time. However, overall the results seem to be parallel with the previous results with only minor changes.

The main outcome from the stakeholders answers can be summarized as follows:

- The stakeholders generally don't think that acquiring SmartSet is too expensive compared to a real one. Both of the solutions seems to have their own costs.
- Both SmartSet and a real set require special knowledge and competence from the personnel, only the needed skills vary.
- It was mainly agreed that SmartSet requires much less space than a real set, and almost all respondents totally agreed that SmartSet allow using the same studio for different scenarios. It appears that the less space needed and versatility of the software could serve as a valid marketing point for the SmartSet solution.
- It was mostly agreed that a real set offers more natural images. As a difference from the phase 1 consultation, the stakeholders now seem to feel that SmartSet's final outcome isn't more compelling than real set's outcome. It still needs to be considered whether there's a need for making the virtual set outcome more natural and realistic looking or should the "virtual look" be considered as an asset.

For the end users, there were also some additional questions compared to the stakeholders' questionnaire. Furthermore, some of the comparison answers are discussed later on in chapter 5.8 Software. End users' answers at this stage are presented in the Figure 10.

End users' answers vary only fractionally from the phase 1 answers if we only look at the average values. Nevertheless, there are some single varations in aswers that have to be considered:

- At the first phase of the user consultation none of the end users didn't totally agree with the claim "acquiring a virtual set is too expensive compared to a real one", actually more than half of the end users totally diasgreed with this statement. At his phase, however, one end user even totally agreed with the claim and less end users totally disagreed. In order to maintain the low-cost factor as a strong marketing value for SmartSet solution, the price must be adjusted in a way that it clearly differs from the real studios price.

- Concerning SmartSet's reliability compared to a real set, the focus have now shifted and more and more end users' seem to now, after user experience, think that SmartSet virtual set can be as realible as a real set.
- Also at this phase the end users' didn't agree so strongly as before with the claim that as a director working with talents/actors in a real set is easier, more natural and interactive than in the SmartSet. However, in the first phase no-one totally agreed with this claim and now one end user did. User-friendliness and easy to use assett should be further extended to better come up to the expectations.

How do you agree with the following statements:	1	2	3	4	5	Altogether	Average value
Acquiring a virtual set is too expensive compared to a real one	2	1	1	0	1	5	**2,4**
Working in a virtual set is too software based and much more complicated than working in a real set.	0	1	3	0	1	5	**3,2**
Virtual set is not as reliable than a real one.	1	1	1	2	0	5	**2,8**
Virtual sets look too artificial when compared to real sets.	0	1	2	1	1	5	**3,4**
As a director working with talents/ actors in a real set is easier, more natural and interactive than in a virtual one.	0	1	2	1	1	5	**3,4**
Working in a virtual set narrows my cinematic ideas, e.g. not enough space to operate (pan/tilt/dolly/jib) with the camera.	1	1	2	1	0	5	**2,6**
Virtual set allows realisation of ideas, that cant be realised in a real set.	0	0	1	1	3	5	**4,4**

Figure 10. End users' comparison between SmartSet and a real set (1 = I totally disagree, 5 = I totally agree)

5.4.2 MARKETING CHANNELS

In the first phase of the user consultation we stated that although the presentation videos about SmartSet didn't seem to have an important affect on the buying decision for the end users or stakeholders, for both of these groups presentation videos online were the main promotional channel they'd prefer. The secondary way to reach the target audiences was, according to the previous results, personal contact.

Figure 11 shows stakeholders new answers concerning the preferred marketing channels for SmartSet. The respondents were able to choose as many options as they wanted, not only the one they'd most prefer.

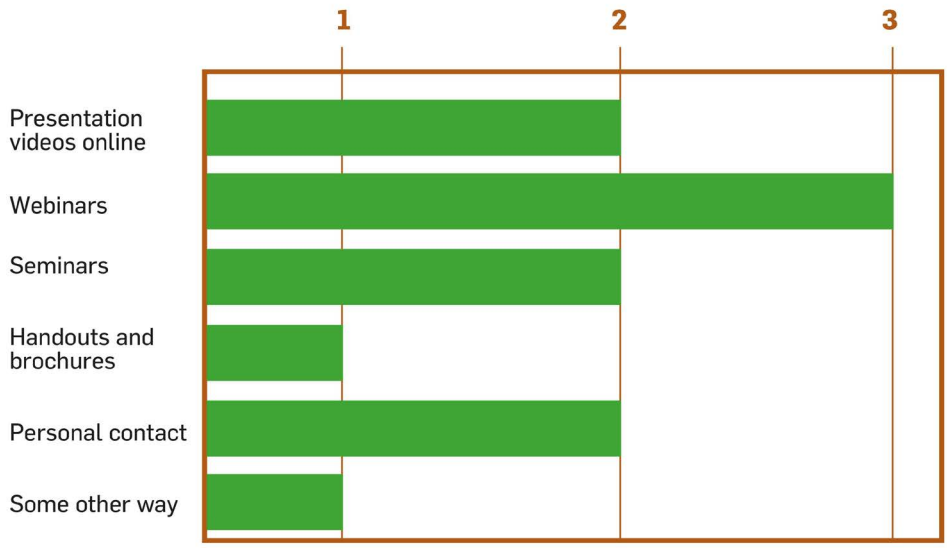


Figure 11. Which marketing channels could best help reach the target audiences according to the stakeholders (number of answers in each option)

At this phase, there was not one channel that would have clearly stood out from the others (as presentation videos did in the first phase). The most popular marketing channels however suggest that the promotional material should be rather visual and based on personal contact than just handouts and brochures. Webinars get the most popularity and other participatory marketing methods (seminars, personal contact) are close second along with presentation videos. One stakeholder even specified that: "Brief videos, that concentrate only on the most compelling aspects of SmartSet. For all further information, brochures and PDF's are good. For very technical and indepth information, personal contact and instructional videos."

5.4.3 MARKETING POSSIBILITES (CIAQ INTERVIEWS)

One of the objectives in the SmartSet project's work package 7 was to establish a 'Commercial Impact Advisory Group' (CIAG) to advise on approaches to business development. The CIAG advises on development and refinement of the business model for the SmartSet technology based on market research gathered by the consortium. In particular, the CIAG members will be asked for feedback on the requirements and needs of potential users of the SmartSet system to ensure

specifications include a good balance between low cost and high quality capabilities in an operational system which is adapted to the needs of small creative media and educational organisations.

Therefore CIAG's purpose is:

- ***Critique of our proposition.*** Impact aspires to an organisational model which blends social and commercial innovation. The Advisory Group is well placed to inform and guide our commercial proposition, properly positioning our SmartSet solution within the marketplace.
- ***Programme review.*** The skills and expertise of the Group are effectively applied to the ongoing review of our SmartSet project. This ensures proper alignment between community, client and Impact interests.
- ***Commercial rigor.*** We are well aware of the exigence level of the communities with whom we work. Our Advisory Group serves to ensure we have fulfiled the interests of these stakeholders and implemented the highest standards of risk management practices.
- ***News and information.*** Impact cannot expect to lead in these services without continuously learning from the national and international environment. The Group provides an effective channel for relevant information and networks.
- ***Dialogue and discussion.*** To continue to evolve and refine this practice, we need a constructive channel for healthy debate and discussion. The Advisory Group serves as a forum to provoke, stimulate, and challenge our practice to foster it's health and growth.

There were two Skype interview sessions with CIAG members. First sessions took place in June 2016 and the second session in December 2016. Here are the conclusions based on those interview sessions:

CIAG members had consensus on choices done and direction taken for the SmartSet solution: template-based system, simple and easy user-friendly and lowcost pricing have all got earlier "the green light" and the prototype seems to have fullfilled those promises. Therefore the next logical step was to think about the correct way to advertise and launch the SmartSet solution to different market areas. Based on CIAG interview and questionnaire material these were the main points needed to be discussed and noted while making decisions on marketing and creating "the hype":

- Whats the main benefit for potential customer; what's the main attraction, that creates the feeling "I need this so much, that I must buy it."
- Should the marketing be focused to each potential customer separately, not just a general marketing plan for all together?

- Would it be good idea to go directly to universities, companies, SME's etc to show them the SmartSet solution "in action"; this way we could create a customer-base on not only teachers but students as well etc.
- What about the case "Blackmagic's Da Vinci Resolve": potential customers are able to download a free lite version of the software with basicly the same functions like the retail version but with the limited output(in lite version end user is able to export material to maximum 1920x1080p resolution and in retail version up to 6k and above). This ideology could be implemented in SmartSet for example by limiting live broadcasting only to retail version and the same with resolutions above 1920x1080p.
- What about the case "Adobe Essentials and Adobe Pro families": end users could start experimenting with an simplier (and cheaper) "Essential" package and if needed could upgrade to more advanced "Pro" package.
- SmartSet to be introduced in media, education etc conferences (f.e. advanced technologies in education)
- Viral videos produced with SmartSet for social medias, f.e. Periscope, Facebook live etc.
- Music videos produced with Smartset including some famous artists etc.
- SmartSet training centers (similar to Lynda.com online training centers)
- There has been a lots of interest lately on AR and VR , how could SmartSet benefit of this coming "trend"?
- Would it be possible to release also a laptop version of the software instead of heavier desktop versions?
- Because SmartSet is heavily depending on readymade templates, does it mean that in the future most of the productions will look more or less similar? Because most likely in a year the template will start to look and feel outdated(depends on how often it will be used), would it be a good idea to offer annual updates for each templates?

These advices (most of them "hidden" in a question form) clearly explains the situation on how to exploit SmartSet commercially. There has to be both viral market and personalized marketing, more demos for potential customers in each potential countries needs to be produced, local distributors and sales agents need to also receive demo material and technical specifications as soon as possible. New potential market areas have to be also perceived: communies, villages and municipalities, educational institutes in all levels from children to seniors, health care companies and institutes, both big corporations and SME's, social media productions companies etc. For each of them there should be some showcases and pilot's to be able to show the potential of SmartSet in those potential businesses. Through beta testing offers demos could be easily produced without extra costs. Its also important to use local distributor because they understand best the customs, traditions and rules of each countries corporations, educational institutions, municipalities.

It's also important to send SmartSet to different trade shows and to advertise to in trade magazines. There also lots of educational conferences were this technology could be shown as a live demo sessions. Also being active in social media(viral videos, Facebook live videos, blogs etc) etc among all these other activities mentioned earlier could create "word of mouth" which would be the most important marketing plan. Therefore it's very important to finetune SmartSet and remove all of bugs etc before releasing it officially and to avoid bad word of mouth which could be fatal for a new product looking for a new markets.

Because of the current economical situation most of the companies and institutes are on hold when concerning the investments and therefore it is good time for a lowcost product like SmartSet to hit the market; companies are anyway more or less forced to digitalize their services.

5.5 Target groups

Some questions about the target groups of the SmartSet productions were targeted only for the end users. The current customer groups of the end users include for example schools, students, small and local tv, YouTube users. At the first phase of the user consultation, these target groups were expected to be the main consumers of the material produced with the SmartSet technology during and after the project.

After active production of demos during the SmartSet validation process, the end users have now defined more specific main cnsumers of the material produced with the SmartSet technology:

- Web pages, video on demand, education.
- Tourism offices (travel news).
- Santa Claus tourism and industry operators (included our own productions).
- Industrial companies (corporate communication).
- It's our viewers. When we can make a presentation of our programs in a goodlooking studio as a virtual studio, it will lift your programs to a higher level.
- Students, teachers and internal corporate communications.
- If we have many videos, we can use this software for the presentation before we are bradcasting the videos. We are a TV-channel, so we use it in creating many programmes.

The end users were also asked to think about if they gained some totally new customer groups by producing material with SmartSet. One end user didn't answer to this question. Two of the end users said no, but the other one of them pointed out that this has been too short time period and in the long run it's very possible to reach even new target groups that are not now a part of their clientele. Other two respondents mentioned the following new target groups for their organizations:

- The education option is very considerable option for us because of the price of the SmartSet and because it's easy to start using it.
- Internal corporate communications were something unexptected.

The end users were then asked to contemplate, according to their knowledge gained through the project, how their organization could reach these new target

groups. At the first phase of the consultation this questions seemed to be hard to answer when no-one had actual experience of productions with SmartSet. After the demo production experience, the end users raised up the following ways to possibly expand their clientele in the future with the help of SmartSet:

- It will depend on how many templates will be developed, but our idea is to open small media workshops around the world in the Remar's schools.
- By informing potential customers via existing production made by SmartSet.
- A goodlooking picture and some seriously made content will help us to be better and keep our viewers. In that case the Smartset is a good solution.
- By producing both recorded and streamed online materials and sharing those materials and user materials with potential target groups.
- We can use a little bit different programmes, but we can't reach new target groups with it.

Concerning the target groups in marketing of the SmartSet solution, the end users were asked if they felt that the solution could be marketed and targeted evenly for the representatives of both genders. As it was agreed also in the user consultation phase 1, all of the end users still share the opinion that the solution is marketable for both genders. Respondents didn't see any difference between genders and pointed out for example that creativity don't depend on gender and SmartSet's user-friendliness suits equally for both genders.

As the end users' opinion was that the product is gender-neutral, they didn't seem to find any point of why or how it could be better marketed for both genders. One respondent raised up a noteworthy point that this suitability for any gender could be even further emphasized by showing both genders in marketing material especially in more technically oriented roles (not only as a talent in front of camera).

5.6 Content

The end users were given a task to consider different strengths, weaknesses, opportunities and threats of the SmartSet content. The answers are displayed in the Figure 12. For marketing the SmartSet solution, it's important to emphasize the strengths and opportunities and limit down the weaknesses and threats in the development work.

SWOT analysis concerning SmartSet content in the first phase of user consultation showed that it's strengths are "simple, fast, cheap" and we noted that this description outlines the main points how the solution could be marketed contentwise. However, the strengths even at the first phase included also innovativeness, visuality and variability that could also be the main key points in developing and marketing the product. At the end of the project, SWOT analysis shows a clear strengths of the product: cheap, easy to operate, visuality, quality of productions and professional looking studio. It's even mentioned that SmartSet is a flexible tool for production compared to real studio environments.

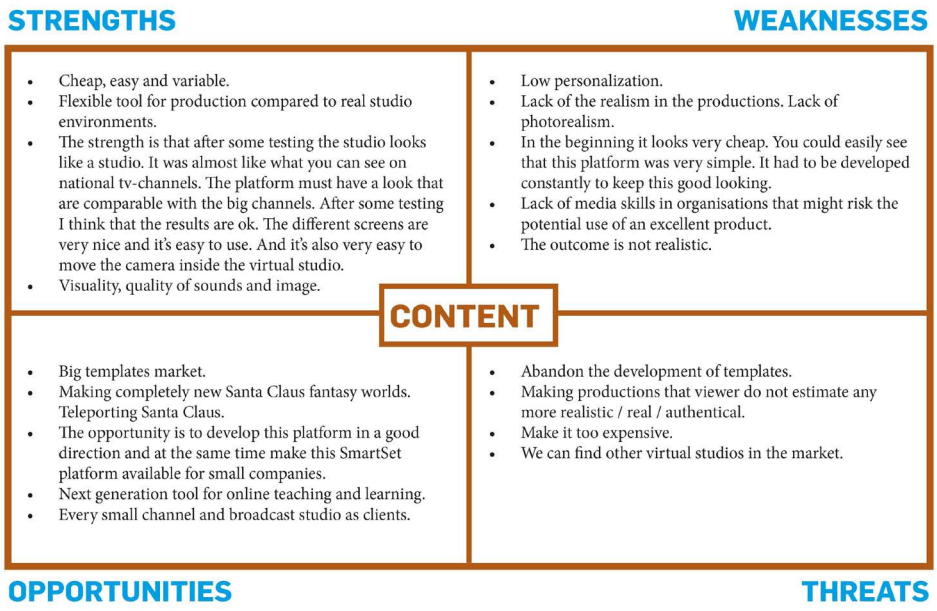


Figure 12. End users' SWOT analysis concerning the SmartSet content

In opportunities, the respondents saw in the first phase some possibilities to find new customer groups. Also, simplification of studios (small space needed)

and transportability were seen to play a vital role in the usage of the SmartSet. Now after user experience, the end users see much more potential for the SmartSet: Templates can offer broader markets. SmartSet can be the next generation tool for online teaching and learning. SmartSet can help in creating new (fantasy) worlds and make teleporting possible. And as an important asset if was thought that smaller companies can be the clients for SmartSet.

The issues concerning the content (weaknesses) that were raised up in the phase 1 were Windows-based system, the lack of user-friendliness and the idea of the solution being technology dependent. Now at this phase, however, most of the weaknessess that came up were related to a some degree to the fact that the outcome may not be realistic enough. It's noted that constant development is needed in order to avoid the "cheap and unrealistic" look that might occur. Low personalization can also be a weakness for some, and it's also pointed out that lack of media skills in organizations could risk the potential use of the product.

At the phase 1, end users thought that a threat could be that the SmartSet solution could easily become too technical and hard to achieve the know-how competence. Based on the SWOT analysis now at the end of the project we can clearly see that this threat has been avoided so far (according to the answers in Strengths-section). Now at this point the end users evaluate that possible future threats could be if the product will become too expensive, if the outcome is not realistic enough or if the development of the templates will be abandoned. It's also mentioned as a threat that there are other similar virtual studios in the market. As was pointed out also in the user consultation report in the phase 1, to stand out from the competitors the developers have to think how to market this new solution in a way that that it offers something new as well as offering a solution for current needs of the companies.

The stakeholders and end users also considered what kind of content their organization could produce by using SmartSet. The most potential way to use SmartSet was considered being different kinds of online productions, for example tv and internet shows, news, magazines, video blogs etc. Educational productions were also mentioned. The variation between different options for content was now narrower than in the first phase of user consultation, assumably because there were so much fewer stakeholder answers and therefore not so much different business branches represented in the sampling.

In the first phase of user consultation we noticed the target groups saw the usage of SmartSet in somewhat traditional ways. We predicted that as the SmartSet project goes forward into demo phase, it offers an opportunity to test different ways to utilize the SmartSet solution and then these examples can work as marketing material to show the future clientele new and innovative ways to do productions with SmartSet.

Now at this phase we asked the end users to contemplate more specifically the potential for making new kind of content by utilizing SmartSet after their user experience. They visualized ways to use SmartSet outside the normal and

traditional material that would be the obvious usage of their company. The answers included the following:

- Low price virtual studio rental.
- Events and shows.
- Final solution for a small tv's.
- Making new Santa Claus Fantasy worlds for on demand productions (with new innovative templates).
- Making innovative live stream.
- Converting the SmartWeather template to completely other use.
- It's easy to use SmartSet to produce commercials and films for the industry and others that are looking for a film with their own identity because it's so easy to insert logos in the studio setting.
- For youth-magazines: we want to start programmes with 10–15 year-olds where they can use this software for promoting their videos.

The respondents also made estimation on the division between their need for recorded and live productions (from a total of 100 percent). Even in the first user consultation phase it was revealed that the usage of the SmartSet would be most likely be based on the recorded productions. The same result could also be seen at this phase of the consultation. Stakeholders answers devided almost evenly between live broadcasting and recorded broadcasting, inclining a litlle bit more for the recorded material. End users on the other hand didn't really see themselves using live broadcasting that much. Few mentioned that they only do recorded material, and as it's best live broadcasting was seen to cover maximum 20–25 percent of all of the organization's productions made with SmartSet. Consultation's first phase resulted in an outcome that there's a need for both, live and recorded productions, and one or the other isn't substantially more preferred than the other. This second phase however seems to argue that more emphasis should probably be put in the recorded productions.

5.7 Hardware

Even though SmartSet is more software-based than hardware based solution at least from the developer's point of view, SmartSet is set to be a complete virtual studio solution including as well the necessary hardware: desktop computer with competent video and audio embedding cards, green screen, camera, microphones, audio delay and media recorder.

During first phase of user consultation when implementation of the virtual studio hardware had only just started but not yet finished in all end user locations, the questionnaire feedback was slightly bicentric; on the one hand feedback was detailed based most likely on the earlier experiences with virtual studio technology or expectations and prejudices, and on the other hand end users felt that they weren't able to answer hardware related questionnaire questions. Therefore the feedback in this final user consultation phase is even more important concerning hardware.

Results from the SWOT analysis from the first phase one year ago showed that one of the main strength of the hardware was considered to be it's very basic setup without too specific hardware elements, which makes SmartSet more user-friendly, especially when only one computer is required to run virtual studio. Same equipment could be also used in other kind of productions as well and for post-production, if needed, and this was also seen as an opportunity. In weaknesses end users had concern on the reliability of the virtual technology. Therefore in threats end users mentioned their concern of possible hardware failure to endanger the whole production. Because virtual sets don't require huge studio stage rooms (which is also important marketing-wise), end users showed also some concern on possible overheating issues while using lighting, fast computer and other hardware in somewhat small spaces. In the same time the lack of need for large studio spaces was seen also as an opportunity, which is easy to notice in virtual set vs. a real set comparison.

Figure 13 shows the SWOT analysis now in the last user consultation phase after end users have gained important knowledge about hardware functionalities during their demo productions. We can still see, that even now after the project the end users see it as a strength that there's no need for big studios. Despite the fact that studios can be set up to a quite small room, it was mentioned that studio is still good and professional looking. According to end users' opinion, price of the hardware wasn't considered too expensive, and on a plus side they mentioned that hardware used in SmartSet can be esily used for various other tasks too. It's also important to notice that the hardware was considered to be simple to assemble.

While analyzing the hardware opportunities, it was mentioned that there's room for expanse and the prices are always going rather down than up, i.e. costs can be low also in the future. Other opportunity is the fact that it's easy to develop new, good looking virtual studios. As mentioned already in the strengths, there were few mentions about the multi-function of the hardware. End users encourage developers to use this viewpoint also as a marketing assett.

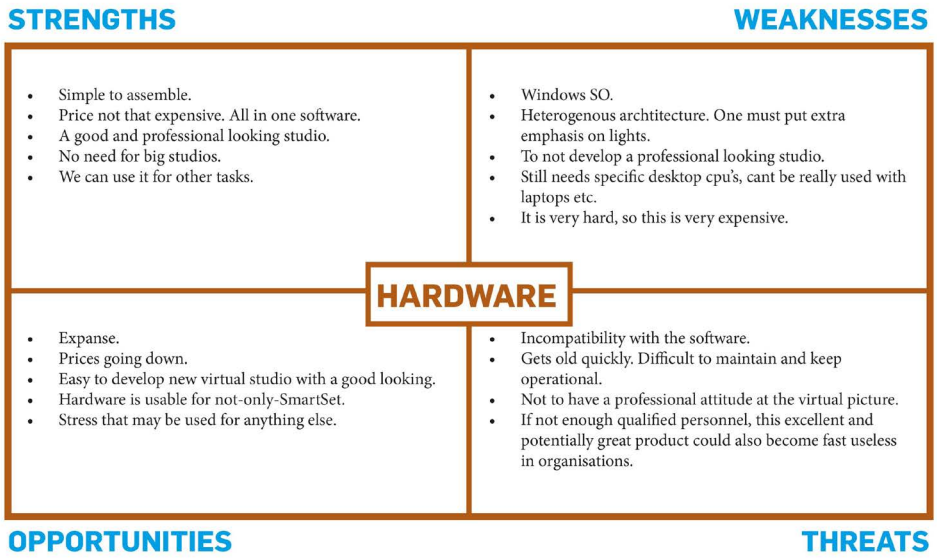


Figure 13. End users' SWOT analysis concerning the SmartSet hardware

One of the weaknesses from end users' perspective seems to be the heterogenous architecture of the hardware which means that there's not only one way to set up and use the system. Also proper lighting need special expertise. One weakness in the future can also be that the SmartSet hardware still needs specific desktop cpu's and can't be used with laptops etc. This would be a valid point for development in the future.

Also in the threats it's mentioned that incompatibility with the software can cause problems (as mentioned already in the weaknesses). Hardware also gets old quickly and isn't updatable the same way as software, so it can be difficult to maintain hardware and keep it operational, which obviously leads to new purchases and therefore extra expenses for the company.

End users also evaluated different hardware requirements for a cost effective virtual set system. As shown in the Figure 14 end users thought that 4K standard compatibility is the most essential requirement. Close second in their estimation is professional quality lighting set. Figure however shows that all of the mentioned requirements are quite essential for the SmartSet as the average value for essentialness is 3,4 as it's lowest.

Requirements for a cost effective virtual set system:	1	2	3	4	5	Altogether	Average value
4K standard compatibility	0	0	0	3	2	5	**4,4**
Use of wide angle view in order to simulate camera pan, tilt and zoom	0	0	2	2	1	5	**3,8**
Professional quality green screen (if compared to standard, non-expensive models)	0	1	0	2	2	5	**4**
Professional quality lighting set (if compared to standard, non-expensive models)	0	0	1	2	2	5	**4,2**
Professional audio equipment: mixer, microphones, delay boxes etc. (if compared to standard, non-expensive models)	0	0	3	2	0	5	**3,4**

Figure 14. End users' evaluation for possible requirements for a cost effective virtual set system (1 = not essential at all, 5 = very essential)

End users were also asked in the questionnaire if their organization have need for any specific 3rd party hardware or software solution in addition to the complete SmartSet solution. As it was the case also in the first phase of the user consultation, after the user experience with SmartSet 80 % of the end users (4 out of 5) still answered "yes".

Most mentioned 3rd party hardware was a teleprompter. Post-production softwares were also mentioned in general, and more specifically Adobe Premiere, Adobe After Effects and Adobe Audition. On of the end users pointed out that Wireless controller for a teacher/student to control pictures/slides/videos in SmartSet environment with for example iPad was needed. One also hoped for some tool to personalization of the templates.

5.8 Software

Even though the questionnaire data concerning software issues in the first phase of user consultation was again a bit bicentric, because lack of experience with the software, there was already a clear vision on the strengths and opportunities of the SmartSet solution: user-friendliness and simplicity were keywords. Also the possibility to produce up-to-date professional quality material was important to end users, which they had seen in the demo productions produced with developer's other software. Reliability issues and user-friendliness were main topics in weaknesses and threats; end users were worried about buggy and unstable software but also doubted their own knowledge and skills on using the software.

After the user experience through demo productions, end users now had better understanding in evaluating different SWOT aspects concerning software in the end of the project (Figure 15). The results show that SmartSet has managed to fulfill the end user expectations from the first phase, as we now can see, that the simpilicity and easiness of use is mentioned many times. Other strengths mentioned are for example visuality and quality of sound and image as well as software-based templates that are easy to develop if needed.

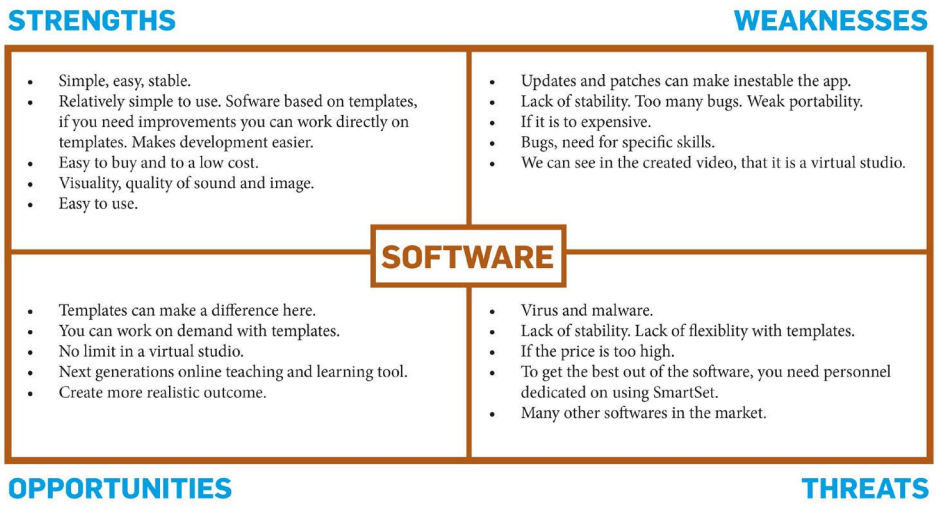


Figure 15. End users' SWOT analysis concerning the SmartSet software

Template-based system was mentioned few times also in the opportunities section. Furthermore the end users pointed out that there are no limits in a virtual studio. Usability of the SmartSet in other productions than only traditional

broadcasting can also provide an opportunity for the developers, especially as a valid marketing point.

Concerning weaknesses, the end users pointed out two main issues: software's instability (e.g. during updates) and possible bugs. These are important observations that developers must take into account and make sure before releasing the final product that these kind of problems won't occur. In addition, it's mentioned that if the price get too high it can be a weakness. It can also be considered as a weakness that the outcome looks like the video has been made with a virtual studio. However, this can be easily turned to an assett as well, if marketed correctly.

Too high price and stability issues are mentioned also in the threaths of software. Other threaths raised up were viruses and malware which are always important things to consider conserning any software. Lack of flexibility with templates can also turn out to be a threat, although at the same time it is a factor that makes the software easy to use. Another threats can be that SmartSet don't stand out from other similar softwares or the personnel operating it can't utilize SmartSet to it's full potential.

Addition to the SWOT analysis, end users evaluated how much they agreed with some software related issues comparing SmartSet virtual studio and a real studio. Figure 16 shows the results of this comparison at the final phase of the user consultation process.

How do you agree with the following statements:	1	2	3	4	5	Altogether	Average value
Real sets final images are more natural.	1	0	1	2	1	5	**3,4**
Virtual sets final images are more compelling.	0	0	2	3	0	5	**3,6**
Current virtual sets' graphics quality is excellent.	0	2	1	0	2	5	**3,4**
Virtual sets allow to integrate graphics easily which is a common requirement.	0	1	2	0	2	5	**3,6**
Special effects that virtual sets provide are often required.	0	2	2	1	0	5	**2,8**
Current virtual sets relay on expensive camera tracking systems.	1	2	0	1	1	5	**2,8**
Trackerless virtual sets, not using camera tracking systems, provide poor results.	0	2	2	0	1	5	**3**
Cheaper and easier to calibrate tracking systems will make a huge difference.	0	1	0	1	3	5	**4,2**
Modeling professional virtual scenarios is a costly process.	0	0	1	2	2	5	**4,2**

Figure 16. End users' comparison between a virtual studio set and a real studio (1 = I totally disagree, 5 = I totally agree)

There were few issues that were commonly for the most part agreed upon. These statements were that ”cheaper and easier to calibrate tracking systems will make a huge difference” and modeling professional virtual scenarios is a costly process”. Both had average value of 4,2. The weakest average value (2,8) was given for two statements that were ”special effects that virtual sets provide are often required” and ”current cirtual sets rely on expensive camera tracking systems”.

Furthermore, end users contemplated software requirements for a cost effective virtual set system (Figure 17).

Requirements for a cost effective virtual set system:	1	2	3	4	5	Altogether	Average value
Authoring tool for creation of basic scenarios based on existing sets of assets	0	1	1	1	1	5	**3,5**
Internal chromakeying in the software	0	0	0	2	3	5	**4,6**
Talent casted shadows on virtual objects	0	1	1	2	1	5	**3,6**
Talent capture colour adjustment for better integration	0	1	0	3	1	5	**3,8**
Tracked talent insertion over recorded tracked footage	0	1	2	1	1	5	**3,4**
Talent tracking on the green-screen and translation into virtual movement	0	0	2	2	1	5	**3,8**
Importing 3d-models and 3d-animation in to templates	0	1	2	2	0	5	**3,2**
Creation of simple primitives inside the application	0	2	3	0	0	5	**2,6**
Editing materials and textures of imported 3D objects	0	0	3	1	1	5	**3,6**
Simple animation of elements done inside the application	0	2	2	1	0	5	**2,8**
Interface for creation and management of different virtual cameras and camera shooting positions during production stage	0	1	1	2	1	5	**3,6**
Lens calibration wizard	0	0	2	2	1	5	**3,8**
Basic talent interaction with virtual objects	0	1	2	1	1	5	**3,4**
Simulation of defocus both on the scene and on the talent based on its' position	0	1	3	0	1	5	**3,2**
Integration and play of video clips in the virtual scenario	0	0	0	1	4	5	**4,8**
Capture of more than one video source and integration of more than one talent	0	1	0	3	1	5	**3,8**
Materials improvements based on shaders	0	1	3	1	0	5	**3**
Full scene based effects based on shaders	0	1	4	0	0	5	**2,8**
Management of fonts and insertion 2D and 3D texts	0	0	2	0	3	5	**4,2**
Design of patterns of events to be triggered during production	0	0	2	2	1	5	**3,8**

Figure 17. End users evaluation of a possible requirements for a cost effective virtual set system (1 = not essential at all, 5 = very essential)

In the first phase of user consultation, the most valued requirement was to have an internal chromakeying in the software, even though end users are also able to use external chromakeying solutions with the SmartSet. Interface for the production stage had also clear importance for end users, and based also to both end user and stakeholder interviews, interface should be developed as user-friendly and simplified as possible in where design of patterns and integrated video clips etc. could be triggered easily. End users showed also lots of interest on how to enhance talent's integration to the virtual environment by being able to adjust and cast shadows and adjusting talents color and contrast.

At this final phase of the user consultation, integration and play of video clips in the virtual scenario was voted to be the most essential requirement instead with an anverage value of 4,8. Internal chromakeying in the software was still rated to a close second with an average value of 4,6. Management of fonts and insertion 2D and 3D texts was the third requirement that gained an average value of higher than 4 (4,2).

The lowest average values were given to full scene based effects based on shaders (2,8), simple animation of elements done inside the application (2,8) and creation of simple primitives inside the application (2,6). All other requirements got an average value of at least 3. These results can serve as a guideline for the developers on which software requirements are most important to develop and which of them have less importance for the users.

5.9 Maintenance

When talking about professional hardware or software solutions, the maintenance, support and updates have a great importance: after purchasing something customer needs maintenance for the hardware and updates for the software to get the most out of the product and even for years to come.

Stakeholders were asked in the questionnaire how much they would be ready to invest on maintenance and support in addition to SmartSet solution costs. Three of the stakeholders answered to this question, and the variation between the answers was huge: one said 700 euros, second 1000 euros and the third 15 000 euros in a year. It's hard to draw a conclusion based on these answers as they vary so much.

Stakeholders and end users also answered to a question of is it a prerequisite to have a SmartSet maintenance services in their own countries. At the first phase of the user consultation 100 % of the end users answered "no" and 72 % of the stakeholders answered "yes" instead, so the results were conflicting. Now in the last phase of user consultation, half of the stakeholders answered "yes" and the other half "no", as shown in the Figure 18. Most of the end users still stated that there's no need for a local maintenance, but one end user said there should be maintenance services located in their own country.

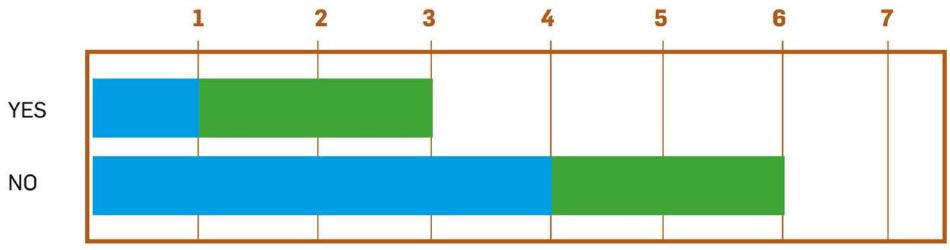


Figure 18. End users' (blue) and stakeholders' (green) answers on whether or not there is a prerequisite to have a SmartSet maintenance services in their countries (number of answers in each option)

Reasons for why online maintenance is enough included video calling possibilities and remote desktop solution. The explanation why local maintenance support should be available was that it speeds up solving problems and also it would be helpful for selling and setting up the SmartSet solution for the not-media-related companies without knowledge of needed skills.

In the case that problems would appear, end users expected to get maintenance and support between some hours and few days; rough average would be in 24 hours (see Figure 19). These answers were explained more detailed in open questions and as a summary we can say that: If working on recorded productions there is usually more or less time to solve possible problems but while on live broadcasting technical problems could endanger the whole production already in few seconds or minutes.

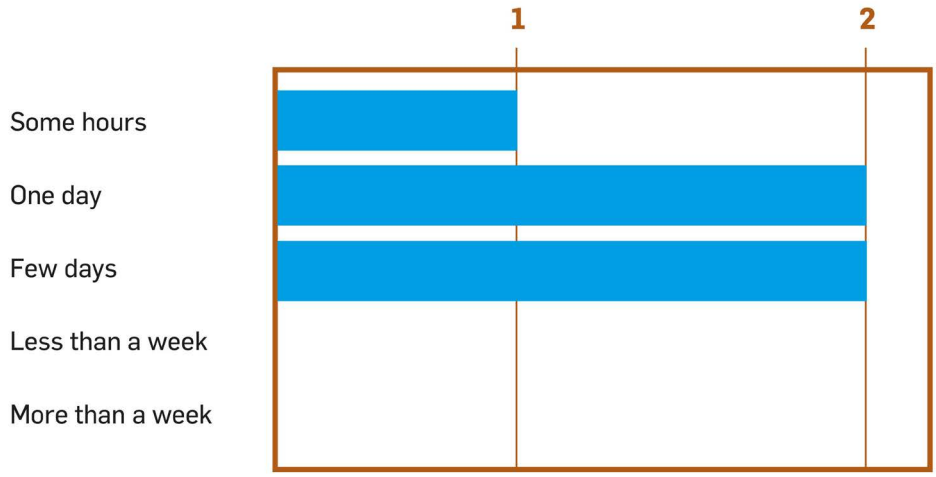


Figure 19. End users' answers on how long they would be able to wait for the maintenance if problems have appeared (number of answers in each option)

Only 40 % of the end users' organizations are equipped and prepared for sudden technical problems. The two end users that said they were equipped to react on sudden technical problems clarified that 1) they have a continuity room with auxiliary video feeds and 2) hardware-based problems are solved with backup technics but online problems (internet slowing down etc) are harder to solve as there's no backup. All three end users that weren't equipped for sudden technical probelms noted that they are not doing live broadcasting so this isn't such a problem for them after all.

Nowadays almost every single person who has bought some digital device (e.g. handy, tablet, laptop) or software knows, that those devices or software need to be updated time to time for better performance and possible add-ons. As shown in Figures 20 and 21, the most of end users (80 %) wanted to get updates for SmartSet once in 3-6 months and 40 % of them were willing to pay extra for those updates.

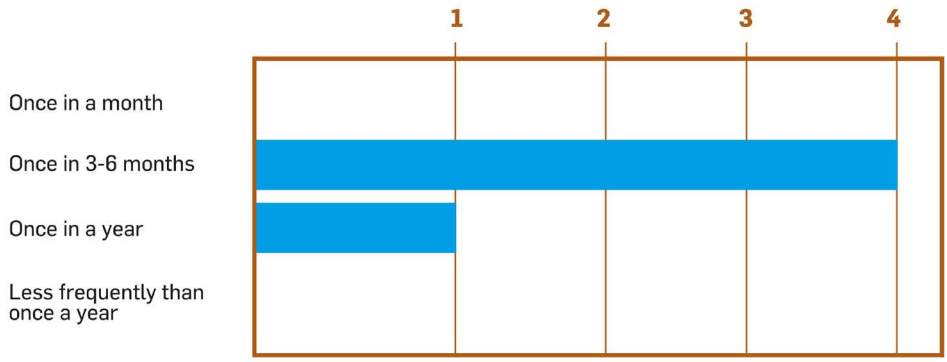


Figure 20. End users' answers on how often software should be updated (number of answers in each option)

Figure 21. End users' answers on if they would be willing to pay extra for updates (number of answers in each option)

In the first phase of the user consultation process, 60 % of the end users believed, that they were able to update the software on their own without the maintenance. Now after user experience with SmartSet, all five end users said that they are capable to do updates on their own (Figure 22).

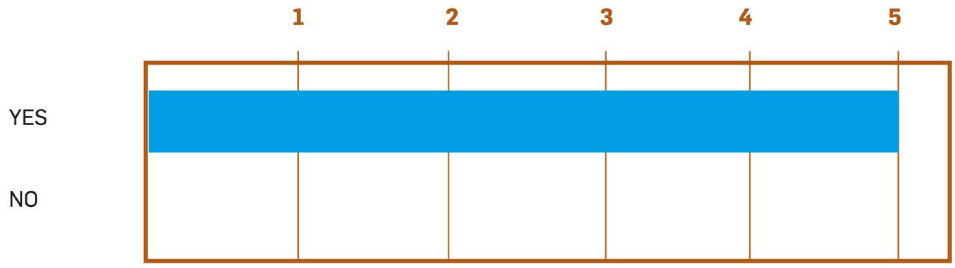


Figure 22. End users' answers on whether or not their organization would be able update the software on their own (number of answers in each option)

5.10 Novelty of the SmartSet

As explained in the project deliverable D4.1 SmartSet Validation Plan, the SmartSet validation process has succeeded when following qualities have been reached through demo productions:

- Professional quality both in recorded and live broadcast material
- Simple and user-friendly template-based solution
- Reliability of the SmartSet solution including both hardware and software
- SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution.

These criteria are most important factors while evaluating if the SmartSet solution is ready for the market. During the validation process, end users have evaluated these criteria concerning each of the separate templates. As a part of the user consultation, the now evaluated the same criteria concerning the whole SmartSet concept. As Figure 23 shows, we are definately on a right path as all of the average values for different validation criteria are at least 4.

Issues affecting on the buying decision:	1	2	3	4	5	Altogether	Average value
Professional quality both in recorded and live broadcast material	0	0	1	3	1	5	**4**
Simple and user-friendly template-based solution	0	0	1	2	2	5	**4,2**
Reliability of the SmartSet solution including both hardware and software	0	0	1	2	2	5	**4,2**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	0	0	1	1	3	5	**4,4**

Figure 23. End users' evaluation about the success of different validation criteria (1 = poor, 5 = excellent)

Stakeholders were also asked to do the same kind of evaluation based on these validation criteria (Figure 24). Their average values were approximately 3 in each cathegory, but stakeholders' evaluation is mostly based on the first impressions,

not actual user experience as it was the case among the end users. Lower scores can however help the developers to improve their marketing material of SmartSet in order to better transmit these qualities if they are now not yet transmitted correctly.

Issues affecting on the buying decision:	1	2	3	4	5	Altogether	Average value
Professional quality both in recorded and live broadcast material	0	0	2	0	2	4	**3,2**
Simple and user-friendly template-based solution	0	0	2	1	1	4	**3**
Reliability of the SmartSet solution including both hardware and software	0	0	3	0	1	4	**2,8**
SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution	0	0	2	1	1	4	**3**

Figure 24. Stakeholders' evaluation about the success of different validation criteria (1 = poor, 5 = excellent)

The SmartSet project is of course throughout the way wanted to figure out how to make the SmartSet solution a ”game changer”. All the respondents were asked if they feel, at the end of the project, that the SmartSet solution developed is a game changer: 7 answered yes, 2 answered no. The reasons behind these answers give more insight concerning where the development of the solution should be targeted in the future.

The ones that considered the SmartSet as a game changer offered for example the following reasons:

- There is nothing like this in the market.
- Hard to say. We do not really have points of comparison. However this kind of tool could be very useful for the creator of on-line content having limited budget since the on-line content creation have a really big boom.
- Because its easy to use, and it look great and I hope the price its not to high.
- It could be used in so many different kinds of productions and target groups.
- I think it is a new place for this software, and is the best route.

On the reverse side, the reasons why we are not offering a game changer are the following:

- Too many existing or future technological innovations in similar direction.
- I dont know enough about the ”Game”:) I think in order to be a game changer, SmartSet should offer a very real looking 3D images and composites. In todays world, every artifficial looking 3D image is a big NO. SmartSet should aim to eleminate as much as possible the feeling of the ”greenscreen” image.

6 CONCLUSIONS

The vision in the SmartSet project has been to develop a low cost virtual studio solution that, despite being ten times less than the cost of comparable solutions on the market, has the same quality of high cost solutions currently used by larger broadcast media companieus but with a simple and limited functionality. In this way the project has increased the competitiveness of the European creative industries, particularly in the broadcast media sector. This report has summarized the results of the SmartSet validation process with end users as well as detailed the outcome of the user consultation process with both end users and stakeholders.

The main object of the overall validation and consultation process was to gain information about specifications of the SmartSet solution at the beginning of the project in order to compare the end users first impressions to actual user experiences during the project. After the project, the end users now have more experience in using the actual SmartSet hardware and software. It was important to evaluate if the early expectations and final experiences have met, or possibly changed, during the project. Validation activities have helped to monitor that the requirements are met now when the SmartSet solution is ready.

6.1 SUMMARY OF THE VALIDATIONS RESULTS

The objective of the validation was to ensure that SmartSet solution includes all the needed elements and it's operation is flawless. The validation process has been a continuous dialogue between the developers and end users and the data gathered during the validation process was an important tool to further develop the SmartSet to get the final product.

Participants in the SmartSet project consist of:

- developers of the SmartSet software,
- end users who are also the SmartSet project partners with developers,
- stakeholders who are professionals of the broadcasting or production field or other relevant industry, and
- Commercial Impact Advisory Group (CIAG) which is formed from the group of stakeholders to share more general opinion among professionals in the creative industry concerning the commercial potential of SmartSet product.

The project partners represent the end users in the project. These partners are:

- Lapland University of Applied Sciences (Finland)
- The Association Remar España – Solidaria TV (Spain)
- BonumTV (Hungary)
- Hallingdølen AS (Norway)
- Joulupukki TV Oy (Finland).

All of the project end users were involved in the validation process by supplying data of each of their demo made with SmartSet prototype. The data was gathered with a common template that was provided to the partners by Lapland UAS. Provided feedback and information affected the development process of the ready solution. The stakeholders and CIAG members were consulted when needed.

With the objective to get the best possible quality vs. price ratio, SmartSet hardware setup is designed based on semi-professional equipment. The functionalities of hardware characteristics were tested during the validation process to define best combination of low-cost pricing and professional quality for the hardware. Other important issue was also to validate the reliability of the hardware in demo productions to serve best SmartSet software and to make the virtual studio solution complete.

The functionalities of software characteristics were tested during the validation process to define perfect mix of user-friendliness, professional quality and reliability of the software through different kinds of demo productions. It's also important to keep in mind the commercial impact of the final virtual studio solution.

As explained in chapter 3, the idea in SmartSet was to develop seven different SmartSet templates: SmartNews, SmartMagazine, SmartMagic, SmartDebate, SmartWeather, SmartEducation and SmartTeleport. As all of these templates have their own characteristics and functionalities, the validation process was carried out separately for each template.

These conclusions will conclude data from validation phases 1-3 for each template separately. Even though each template had their own characteristics and functionalities (also problems and issues), there were also a few common issues, f.e. problems to save projects correctly, to calibrate the camera and to set the actor correctly and getting pixelated image when using zoom with Full HD cameras meaning that the resolution wasn't high enough.

SmartMagazine-template was originally designed Hallingdolen in mind. Hallingdolen is an established newspaper publisher planning to expand their services to online news broadcasting; therefore Hallingdolen took an active role in developing this template. Six demos were produced during validation of SmartMagazine template. As being one of the very first templates developed during the project, SmartMagazine had already been tested by Hallingdolen in TV broadcast when the actual validation process started with other end users. Therefore it had privilege of being validated by all end users and it was from the very beginning pretty problem free (except having the common SmartSet problems explained earlier in this chapter). The biggest criticism it actually got was from its main innovation of using cubes as for the walls; sometimes images got distorted because of the cubes and therefore image looked "unfinished". But this was of course a matter of taste. Based on the data from the final project phase (3), the

average score for SmartMagazine at the end of the project is 4.0 which means grade very good.

SmartDebate was designed TV debate programs in mind. This means, that this template would be also ideal for programs with more than just one talent on screen, e.g. debates, interviews etc. Because first version of the SmartDebate wasn't released before the phase 1 report, there were just very few demos produced with it. Even though SmartDebate was one of the least used templates during SmartSet project, the feedback from end users was good. The biggest criticism was about the interface of the Stormlogic/eOndemand that was not in the line with the rest of the SmartSet interface especially when considering the userfriendliness. This functionality got also criticism in the data for other templates as well. For the phase 2 report the lack of customization and personalization of the set was seen as an weakness of the template but these issues have been improved in the later versions of the template. Based on the data from the second project phase (2), the average score for SmartDebate at the end of the project is 3.5, which means grade good/very good.

SmartNews has been same time one of the oldest and the most used template in SmartSet project. Originally it has been designed for news broadcasting but it has also been in other kinds of projects, f.e. to produce educational course material and instructional material for a corporation's internal communications. Total 7 demos were produced with SmartNews-template. As being tested by all end users and during all validation phases, there is much validation data for SmartNews-template. The main issues were in the beginning the missing full screen function for video playback, inability to change sets screen sizes and the scaling of images on monitors (often distorted images with varying colours caused by software's auto-streching); this issue caused a need to use 3rd party software (e.g. Adobe Photoshop) to re-scale needed images to fit correctly in SmartSet. Overall inferface got also a bit mixed feedback in the beginning: in generally the direction we were heading was userfriendly and even attractive but still needed lots of "tuning". Feedback for template-based system was also a bit mixed, meaning that it enabled possibility to produce material easier and faster but sametime some of the objects and features should not have been locked, e.g. screen sizes. Camera calibration was also seen too complicated. The biggest issues with SmartNews were bugs in software: most of end users were unable to save their projects correctly and therefore lost lots of time and effort. There were also often reports about missing and disappearing camera presets, playlist thumbnails etc and the software tended to crash quite easily. But thanks to the several demos by active end users and creative cooperation with the developer most of these issues and bugs got fixed. Based on the data from the final project phase (3), the average score for SmartNews at the end of the project is 4 which means very good. What is to be noted, that this template was seen as a very usable for different kinds of productions.

SmartWeather was released as the last template near the end of the project and therefore there are only phase 3 validation data from a single demo production.

This template's purpose was to provide a professional quality template for weather forecasts. This template was validated by Bonum TV who has several weather forecast broadcasts on daily basis. The only mentioned issue concerned the ability to resize monitors, missing video playback functions and inability to hide the globe. Also camera calibration got some criticism of being too complicated to get desired results. Based on the data from the final project phase (3), the average score for SmartWeather at the end of the project is 4,8 which means grade excellent. "We think, the design is very userfriendly, and it's easy to change everything, so it is very handy. The user surface is also userfriendly! We think, everything is good in this template!" (Bonum TV's validation template).

SmartMagazine-template was originally designed Joulupukki TV in mind. Joulupukki TV produces and manages all the videos of Santatelevision (Santa Claus Television You Tube Channel) and it's based in the official home town of Santa Claus in Rovaniemi, Finland, which is also a touristic attraction because Santa Claus Village is in Rovaniemi where you can meet the official Santa Claus. As Rovaniemi is visited by too much tourists it is not easy for Joulupukki TV to have a TV set in Santa Claus Village, so they needed a virtual set to produce their videos easier and not needing too much time for planning them. Therefore Joulupukki TV had especially active role on developing SmartMagic-template with the developer. SmartMagic-template was released a bit later than some other templates and therefore there weren't phase 1 validation data. 5 demos were produced with SmartMagic-template.The main issues concerning the SmartMagic-template were with color correction, freezing problems of the software, over-exposed virtual set lights, aliasing problems and saving the project, playlists and presets problems. Full screen playback mode got creative ideas of a banner or counter telling the remaining time of the video clip and for a slider to control the full screen's playback audio. Camera calibration was also often mentioned in the validation data causing problems to end user disabling the use of projection mode instead of sticker mode. The biggest challenge with SmartMagic was to create the warm, christmas-like atmosphere of Santa Claus' magic laboratory and to loose the artificial mood of 3D graphics; also challenging was to mix real set elements with virtual ones, f.e. tables, books etc and even Santa Claus as a talent created own challenges, f.e. with the beard, size of Santa etc. But by the end of the project the quality of productions had improved a lot and the set got a good mix of virtuality and reality. Based on the data from the final project phase (3), the average score for SmartMagic at the end of the project is 3.5 which means grade good/very good.

The idea of SmartTeleport was to enable end users to place their talent in to the prerecorded video material. This placing of a talent is called teleportation. SmartTeleport-template was released a bit later than some other templates and therefore there ain't phase 1 validation data. SmartTeleport has been used quite rarely in demo productions most likely because of it has been created for a very specific use and need, and therefore it differs from other templates.There were also

quite a few reported issues concerning SmartTeleport: colour correction tool wasn't working and caused a need to a skin's colour correction in Adobe Premiere, dragging of files from internal browser didn't work and using shadows was complicated. De-focusing function caused unwanted results. Also some useful ideas were mentioned in validation reports including a collection of lower thirds for end users to choose from, and an idea to include a live input option in SmartTeleport. Based on the data from the final project phase (3), the average score for SmartTeleport at the end of the project is 3 which means grade good. SmartTeleport got the lowest score of validated templates most likely because it has been used so rarely by end users. Therefore further development is recommended before releasing this template officially for sales.

SmartEducation-template was developed together with Lapland UAS, and the main idea was to create an virtual classroom for both online, streamed lectures and recording course materials. During the project, the template was used also for Lapland UAS' internal communications, student course works and presentations etc. SmartEducation was released near the end of the project and therefore there ain't phase 1 and 2 validation data available. SmartEducation-template was validated by Solidaria TV and Lapland UAS and 3 demos were produced with it. As being validated for a relatively short time, SmartEducation-template has got quite a lot validation data and ideas to improve the template. The main issues concerned the design of the set: more setting options were needed for roof, walls, screen sizes, floor, band on the floor etc and most of those issues for the next versions of the template. Camera calibration got again critics and caused also some lower-quality "moments" in the production, StormLogic/eOndemand – function also needs to be still finetuned towards userfriendlier "SmartSet-direction". There were also issues with the autoscaling of images and videos when using playlists and therefore 3rd party software was needed for scaling picture correctly in SmartSet. Because Lapland UAS use fullHD camera (Sony EX3) in SmartSet, the resolution of camera isn't enough for creating close up – shots in SmartSet; the image gets easily very pixelated when zooming in. Especially in teaching the close up's are important and therefore 4K would be suggested as a standard camera resolution for SmartSet. Based on the data from the final project phase (3), the average score for SmartEducation at the end of the project is 4,5 which means grade very good / excellent. What is to be noted, that this template was seen as a very usable for different kinds of productions. "The template looks great, we like the colours and the design in general." (Solidaria TV / validation template)

All the templates (and therefore SmartSet software) were functional and production-ready by the end of the project. Some functions still needs some fine-tuning before the official release of SmartSet for the sales but the major bugs and issues have been fixed and removed by the active cooperation of end user and the developer. More detailed information about validation results can be found from chapter 4 "Validation phase test results".

To be able to monitor how SmartSet's development was progressing based on users needs and requirements, developers of the Smartset had produced a report on fixed issues and improvements after each validation report. In those reports conclusions for the developers were based on Smartset demo productions user data gathered and analysed by Lapland UAS. These developers feedback reports can be found in Appendix 1.

6.2 SUMMARY OF THE USER CONSULTATION RESULTS

User consultations were collected by carrying out a questionnaire with both end users and stakeholders. Results from the phase 1 of user consultation are presented in the project deliverable D2.2 User Requirements Definition. These results were the baseline for this final validation phase test results analysis that includes the last phase user consultation.

In this final phase 3, the end users and stakeholders were once again consulted via the same kind of questionnaire as in the beginning of the project. During this phase the end users gave their concluding feedback about the SmartSet, its pros and cons and development suggestions based on their experience how the expectations from phase 1 actualised during the phase 2 (demo productions). In short: is there a market for SmartSet.

The user consultation was based on 11 themes: 1) background information, 2) personnel's competence, 3) financial issues, 4) buying decision, 5) target groups, 6) content, 7) hardware, 8) software, 9) other solutions and add-ons with SmartSet, 10) maintenance and 11) validation criteria. The goal was not only to find out the specific requirements concerning the SmartSet software and hardware but also to figure out needs of the current markets and possible ways to make the solution better marketed and targeted for the right audience.

In the final user consultation, all of the project participants were taken along and their opinions and views were valued. End users had the most important role as they now had actual user experience of the SmartSet virtual studio after several demo productions. Each partner has utilized the solution in a role of an end user, and therefore they have gained a lot of valuable information on for example how user-friendly the solution is and how it can be used – and also marketed for potential new target groups.

Webropol-questionnaire was sent to all of the end users (5) and stakeholders (13) of the SmartSet project. As a result, we got 5 responses from the end users and 4 responses from the stakeholders. The detailed results of the user consultation are displayed in the chapters 5.1–5.10, but in summary, we can state the following:

All of the respondents considered their companies having at least some knowledge in using virtual 3D studios, and many stated having average or good knowledge; in general the end users had now more experience and knowledge than the stakeholders. End users' knowledge had grately improved during the

project, corresponding with the amount of demo productions each company made.

As end users now have experience in utilizing Smartset, they could better evaluate what kind of education and training was needed in their organizations before taking SmartSet into active use. If the end user had previous experience for example in using 3d softwares or television productions, they saw that only few hours basic training was enough as the software is quite straightforward. It was also mentioned that SmartSet project gave end users good training in using green screen, chroma key and so on. General knowledge of studio work was also gained through reading tutorials and watching instructions (YouTube) and webinars. Active usage of the SmartSet software also served a ”training” session, as many thing were learned by doing and doing again.

In the SmartSet, pricing of the product, both software and hardware, has an essential role when thinking about potential market for the product. Most of the end users estimated that they would pay 5000 euros of the software. One end user was even willing to invest 10 000 euros. Two of the stakeholders andswered being willing to pay 5000 euros of the SmartSet software and one stakeholder said 7500 euros. All of these answers show quite clearly that the price of the SmartSet software should be relatively low, preferably only 5000 euros.

The end users also evaluated the price they would be willing to pay concerning specifically SmartSet hardware. Two of the end users answered 5000 euros and two answered 10 000 euros. Roughly we could say that the average investment to hardware would be around 7500 euros.

The respondents were asked to contemplate reasons why their company would buy or use SmartSet, and on the other hand, why they would not buy or use the solution. The reasons for acquiring the SmartSet solution can be summarized into two main qualities: lower production costs and ease of operation. These same results were shown also in the first phase of the user consultation one year ago. Therefore the keyword still seems to be cost-effectiveness, not to forget the quality of the production: producing impressive output with less input. Cost-effectiveness includes the costs to own and the costs to operate.

In the user consultation that was done a year ago (phase 1), the end users emphasized user-friendliness, the possibility to create their own virtual sets, price and the availability of the support as reasons to buy SmartSet. Now after user experience with the SmartSet, the results are mainly the same. In the buying decision, user-friendliness is still number one issue closely followed by the amount of ready virtual sets and object library as well as price.

One quite a big difference in the end users' opinions before and after the actual user experience is that in the first phase of user consultation the end users' average value of the importance of the possibility to create own virtual sets was 4,6. Now as they have become accustomed to the SmartSet's template-based system and done a lot of demo productions, the corresponding average value is only 2,8.

Therefore we can draw a conclusion that the chosen template-based solution seems to fit very well for the assumed target group.

In the first phase of user consultation, only one of the end users responded that their company should utilize SmartSet daily to make it a profitable investment. Two end users thought that there should be 1–3 productions in a week, one end user said there should be 1 broadcast per week and one end user said one production few times in a month. The results have changed in some degree after the user experience. Now at the end of the project, to make SmartSet solution a profitable investment, the most popular answer is one broadcast or other production once in a week (3 answers). One end user still answered there should be one production each day and another end user said one production 1–3 times in a week.

At this last user consultation phase, there was not one preferred marketing channel that would have clearly stood out from the others (as presentation videos did in the first phase). The most popular marketing channels however suggest that the promotional material should be rather visual and based on personal contact than just handouts and brochures. Webinars get the most popularity and other participatory marketing methods (seminars, personal contact) are close second along with presentation videos.

The SWOT analysis of the SmartSet content (made by the end users) showed that clear strengths of the product are: cheap, easy to operate, visuality, quality of productions and professional looking studio. It's even mentioned that SmartSet is a flexible tool for production compared to real studio environments. In opportunities, the end users see a lot of potential for the SmartSet: Templates can offer broader markets. SmartSet can be the next generation tool for online teaching and learning. SmartSet can help in creating new (fantasy) worlds and make teleporting possible. And as an important asset if was thought that smaller companies can be the clients for SmartSet. At this phase most of the weaknessess that came up were related to a some degree to the fact that the outcome may not be realistic enough. It's noted that constant development is needed in order to avoid the "cheap and unrealistic" look that might occur. Low personalization can also be a weakness for some, and it's also pointed out that lack of media skills in organizations could risk the potential use of the product. The end users also evaluated that possible future threats could be if the product will become too expensive, if the outcome is not realistic enough or if the development of the templates will be abandoned. It's also mentioned as a threat that there are other similar virtual studios in the market.

The SWOT analysis of the SmartSet hardware shows that after the project the end users see it as strength that there's no need for big studios. Despite the fact that studios can be set up to a quite small room, it was mentioned that studio is still good and professional looking. Also, price of the hardware wasn't considered too expensive, and on a plus side they mentioned that hardware used in SmartSet can be esily used for various other tasks too. Multi-function of the hardware was mentioned also as an opportunity. Other opportunities included e.g. the fact that

it's easy to develop new, good looking virtual studios. One of the weaknesses from end users' perspective seems to be the heterogenous architecture of the hardware. Also proper lighting requires special expertise. One weakness in the future can also be that the SmartSet hardware still needs specific desktop cpu's and can't be used with laptops etc. This would be a valid point for development in the future, because also in the threats it's mentioned that incompatibility with the software can cause problems. Hardware also gets old quickly and isn't updatable the same way as software, so it can be difficult to maintain hardware and keep it operational, which obviously leads to new purchases and therefore extra expenses for the company.

End users also evaluated different hardware requirements for a cost effective virtual set system. They thought that 4K standard compatibility is the most essential requirement. Close second in their estimation is professional quality lighting set.

The SWOT analysis results of the software show that SmartSet has managed to fulfill the end user expectations from the first phase, as we now can see, that the simpilicity and easiness of use is mentioned many times. Other gths mentioned are for example visuality and quality of sound and image as well as software-based templates that are easy to develop if needed. Template-based system was mentioned few times also in the opportunities section. Furthermore the end users pointed out that there are no limits in a virtual studio. Usability of the SmartSet in other productions than only traditional broadcasting can also provide an opportunity for the developers, especially as a valid marketing point. Concerning weaknesses, the end users pointed out two main issues: software's instability (e.g. during updates) and possible bugs. These are important observations that developers must take into account and make sure before releasing the final product that these kind of problems won't occur. Too high price and stability issues are mentioned in the threaths of software. Other threaths raised up were viruses and malware that are always important things to consider conserning any software. Lack of flexibility with templates can also turn out to be a threat, although at the same time it is a factor that makes the software easy to use. Another threats can be that SmartSet don't stand out from other similar softwares or the personnel operating it can't utilize SmartSet to it's full potential.

Furthermore, end users contemplated software requirements for a cost effective virtual set system. At this final phase of the user consultation, integration and play of video clips in the virtual scenario was voted to be the most essential requirement instead with an anverage value of 4,8 (out of 5). Internal chromakeying in the software was still rated to a close second with an average value of 4,6. Management of fonts and insertion 2D and 3D texts was the third requirement that gained an average value of higher than 4 (4,2). The lowest average values were given to full scene based effects based on shaders (2,8), simple animation of elements done inside the application (2,8) and creation of simple primitives inside the application (2,6).

When talking about professional hardware or software solutions, the maintenance, support and updates have a great importance: after purchasing something customer needs maintenance for the hardware and updates for the software to get the most out of the product and even for years to come. Stakeholders and end users also answered to a question of is it a prerequisite to have a SmartSet maintenance services in their own countries. Half of the stakeholders answered ”yes” and the other half ”no”. Most of the end users stated that there’s no need for a local maintenance, but one end user said there should be maintenance services located in their own country. Reasons for why online maintenance is enough included video calling possibilities and remote desktop solution. The explanation why local maintenance support should be available was that it speeds up solving problems and also it would be helpful for selling and setting up the SmartSet solution for the not-media-related companies without knowledge of needed skills.

In the case that problems would appear, end users expected to get maintenance and support between some hours and few days. These answers were explained more detailed in open questions and as a summary we can say that: If working on recorded productions there is usually more or less time to solve possible problems but while on live broadcasting technical problems could endanger the whole production already in few seconds or minutes. Most of end users (80 %) wanted to get updates for SmartSet once in 3–6 months and 40 % of them were willing to pay extra for those updates. Now after user experience with SmartSet, all five end users said that they are capable to do updates on their own.

The criteria for successful SmartSet validation process requires that the following qualities have been reached through demo productions:

- professional quality both in recorded and live broadcast material
- simple and user-friendly template-based solution
- reliability of the SmartSet solution including both hardware and software
- SmartSet solutions usability for the different kinds of creative media, news and educational etc productions in the SME market range as a low-cost virtual studio solution.

These criteria are most important factors while evaluating if the SmartSet solution is ready for the market. During the validation process, end users have evaluated these criteria concerning each of the separate templates. As a part of the user consultation, the now evaluated the same criteria concerning the whole SmartSet concept. Results demonstrate that we are definately on a right path as all of the average values for different validation criteria are at least 4 (out of 5).

Finally, one of the SmartSet project’s main goals has been to figure out how to make the SmartSet solution a game changer. All the respondents were asked if they feel, at the end of the project, that the SmartSet solution developed is a game changer: 7 answered yes, 2 answered no. Explanations for positive response included SmartSet’s uniqueness, versatility, user-friendliness and the fact that it

offers a chance to create online content also for the companies with limited budget. Reason for "no" answers was mainly the fact that there's many existing or future technological innovations in similar direction. Therefore it's essential for the SmartSet to find it's strengths and stand out from the crowd with it's unique low-cost and user-friendly possibilities.

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Appendix 1: Developers feedback reports

REPORT 1:

VALIDATION FEEDBACK

1. GREEN SCREEN AND LIGHTS

Functionality	Conclusions for the developers	Brainstorm response
Green screen and lights	Green screen and lights need a tutorial for setting up the lighting correctly. This way end users would accomplish a professional quality green screen chroma keying.	There is plenty of information on the Internet on this question. We will add a small introduction to this issue in the overall SmartSet manual.

2. CAMERA AND OPTICS

Functionality	Conclusions for the developers	Brainstorm response
Camera and optics	For camera and optics it would be advisable to search for cheaper 4K cameras for both entry and advanced user levels SmartSet packages. Therefore solution should be working also with only HDMI output 4K cameras (not only SDI output cameras). This way the zoom limitations of the FULL HD cameras could be avoided -> operating the virtual cameras would be easier-> quality better. Blackmagic 4K cameras seems to need a lots of light so other camera options would be advisable to be considered.	The market is evolving very fast, prices are decreasing and new interesting devices and cameras are appearing every month. Blackmagic for example has released the Micro Studio Camera 4K, which is already compatible with the SmartSet setup. The only difficulty here may be finding good enough 4K cameras with HDMI output. Also the SmartSet selected 4K framegrabber do not have HDMI ouput, so using this kind of cameras would imply the use of new framegrabbers.

3. COMPUTER

Functionality	Conclusions for the developers	Brainstorm response
Computer including graphic card and SmartSet software	These issues could be caused by computer, graphic card, drivers, software etc. Therefore more research and testing needs to be done to be able to define which component is causing which specific problem. It's very important to release as much bugfree version of the SmartSet solution as possible. For video playback issues the maximum bitrate for video files should be determined to avoid playback issues (freeze frames). Some overload issues causing freeze frames etc. Other issues most likely more software- than hardware-related.	It is solved. Saving problems are not there anymore. This is due to the eStudio engine architecture, in order to render the virtual scenario in real time, video decoding is performed with less hardware resources. In the new future, slightly faster computers will make this problem disappear. Nowadays a very good solution is selecting a proper codec. Explanation video has been provided on the SmartSet Youtube channel.

4. CONFIG VIEW. SET

Functionality	Conclusions for the developers	Brainstorm response
Config view: set	This part of the interface should be simplified and fine-tuned. Finetuning for the interface(bigger "config" and "mixer" buttons), the lights on the set's roof look too artificial and configuration of the walls is somewhat complicated(too many similar looking layers).	The already existing templates have simplified their interfaces and have been improved by adding new functionality. The buttons "config" and "mixer" disappear. Now the tool exposes one single interface.

5. CONFIG VIEW. ACTOR SETINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: actor settings	This function seems to work fine but minor adjustments to could be done (sliders instead of numbers and adding talent on/off function to mixer view's "actions".	After different trials sliders have been discarded as a good option to move the actor in an accurate way. The actor control interface has been moved to the new single interface.

6. CONFIG VIEW. PLAYLISTS

Functionality	Conclusions for the developers	Brainstorm response
Config view: screens playlists and duration settings	These issues seems to be related to Mixer View's playlist functions. This functionality worked fine but could be developed by adding full screen-option for the playback videos and images, and by adding transitions.	The playlists buttons now show preview thumbnails of videos automatically. The possibility to launch videos in fullscreen has been added to SmartSet. Now fading can be performed manually, not inside but between two different playlists.

7. CONFIG VIEW. CAMERA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: camera settings	Everything fine.	-

8. CONFIG VIEW. CAMERA CALIBRATION

Functionality	Conclusions for the developers	Brainstorm response
Config view: camera	Camera calibration had a	The calibration procedure

calibration settings	very mixed feedback on usability (meaning that some user's finds calibration too complicated). Therefore better tutorial videos needs to be prepared especially for the entry level users.	has been fairly simplified and it will be explained in the SmartSet overall manual. Now, the calibration objects won't be required anymore.

9. CONFIG VIEW. CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: chroma settings	Chroma settings seemingly worked fine for all end users; a minor finetuning could be done to make settings a bit simplified. There could be also a short tutorial video to show how different settings effect on talent.	The SmartSet manual will deal this question. Video tutorials will be prepared by user partners.

10. MIXER VIEW. PRESETS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: presets	Mixed feedback on usability: some find it easy and some not-so-easy to set new camera presets. There are also bugs which need to be fixed. There is a big difference between Infinity Set and SmartSet when choosing camera presets, so maybe there are some functions in Infinity that could be implemented better to SmartSet as well. There were also two very well hidden function-panels (go zero & camera defocus) which existance end users realized during the meeting	The SmartSet manual will deal with camera presets. Camera hidden panels are now exposed by default. One of them gives control for camera angles and position, while the other one deals with defocus parameters.

	in the Finland; these functions could have effect on future demos in positive ways. It's fairly easy to create camera presets (shots) but end users clearly wanted a bit similar preset-system like in SmartSet's predecessor, Infinity Set. The camera tool has been found inflexible and inaccurate.	

11. MIXER VIEW. ACTIONS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: actions	There could be more actions (f.e. talent shadow on/off, screen lights on/off etc). Otherwise everything fine.	Action panel is not meant to contain specific template interfaces. Its main objective is to allow users configuring their own actions in one panel. The SmartSet manual will provide explanations on how to configure and use action interface.

12. MIXER VIEW. STORMLOGIC, ONDEMAND AND PAGES

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: StormLogic, eOnDemand and pages	Most of the end users didn't use this functionality for first demos. No issues with this functionality but the use of this funcionality could be clearer. Now its more like "trying and hoping to set it right and if not, lets try something else".	Stormlogic and eOnDemand has been simplified considerably, reducing the numbers of steps needed to create a page. The SmartSet manual will provide explanations on how to configure and use StormLogic, eOnDemand and pages interfaces.

13. MIXER VIEW. PLAYLIST AND FILEBROWSER

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: playlists and file browser	Playlist and file browser got mixed usability feedback. The main issues were missing details of videos in the playlist, thumbnails etc. For longers videoclips it would be good have possibility to pick the start/end points; then there wont be need for trimming videos with 3rd party software. High-bitrate also caused freeze frames. The main issue was the scaling of the images because now the software scales the images incorrectly and there is then need to scale pictures in 3rd software (even in that case its hard to find the correct resolution and scale that fits correctly in SmartSet). No issues with this functionality but could be finetuned by adding clarifying details to the file player interface.	The playlists buttons now show preview thumbnails of videos automatically. Now, videos in the playlist have the option to select the starting and the ending frame of the playback. Video playback freeze frames are also related to the validation feedback number 6. Now, no matter the template, all the screens in SmartSet have the same aspect ratio. They are intended to show 16:9 images. Users are expected to provide such aspect ratio images but if they don't fit, they are just stretched to fill in all the screen area. The SmartSet manual will provide explanations on how to configure and use the playlist interface.

14. MIXER VIEW. CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: chroma settings interface	Chroma settings interface worked fine. No issues with this functionality though end users did not use this function very much.	-

15. OVERALL INTERFACE.

Functionality	Conclusions for the developers	Brainstorm response
SmartSet Overall Interface	Overall inferface got a bit mixed feedback: In generally the direction we are heading is usefriendly and even attractive but still needs some fine tuning (there are still some more complex settings/functions which are more Infinity Set-stylish). Overall interface is simple and easy to use but could be enhanced by visual design (f.e. use of different colors/contrast etc). Stormlogic and loading the pages seems to be not aligned with the logic of the overall Interface so there must some some adjustments to encourage end users to use those functionalities for more professional quality demos.	Improvements have been done in the interface so it is now friendlier. StormLogic and eOnDemand are placed now together on the interface, so the interrelation is displayed more clearly. eOnDemand has been greatly simplified. The overall interface has been modified, and some more descriptive icons have been included.

16. TEMPLATE BASED SYSTEM.

Functionality	Conclusions for the developers	Brainstorm response
Template based system	Template-based system got also a bit mixed feedback meaning that it enables possibility to produce material easier and faster but some of the objects and features should not be locked (f.e. screen sizes etc). Seems that some end users had problems to personalize	SmartNews added some options to customize the scenario, now logos can be positioned and walls displaced. SmartMagazine added options like screens animation, 3D text, icons, and some customizable colors.

	sets according to their ideas. End users are overall satisfied with the template based system but some minor functions mentioned earlier are required.	

17. SAVING THE PROJECT

Functionality	Conclusions for the developers	Brainstorm response
Other functionality (explain): Saving the project	This was the one of the biggest issues on the feedback because saving the project caused crashes, missing data and presets etc. In the end end users had to often restart the project from the scratch to be able to produce the content which is very time-consuming and frustrating. What's more interesting is that not all the end users faced those issues. Saving the project is also a problem for some users of this template (same with SmartNews). Those problems are required to be fixed 100% before the release of the official SmartSet solution (and better if during the project).	It is solved. Saving problems are not there anymore.

18. FREEZE FRAMES AFTER SCREEN SAVER

Functionality	Conclusions for the developers	Brainstorm response
Other functionality (explain): Freeze frames after screen saver turned on	This issue could be most likely fixed by Windows configuration and settings.	Some operative system services, like screensaver, antivirus, program updates, mail clients, etc. need to be disabled in order for any real time application to run properly.

REPORT 2:

VALIDATION FEEDBACK

1. GREEN SCREEN AND LIGHTS

Functionality	Conclusions for the developers	Brainstorm response
Green screen and lights	Green screen and lights need a tutorial for setting up the lighting correctly. This way end users would accomplish a professional quality green screen chroma keying.	There is plenty of information on the Internet on this question. We will add a small introduction to this issue in the overall SmartSet manual.

2. CAMERA AND OPTICS

Functionality	Conclusions for the developers	Brainstorm response
Camera and optics	For camera and optics it would be advisable to search for cheaper 4K cameras for both entry and advanced user levels SmartSet packages. Therefore solution should be working also with only HDMI output 4K cameras (not only SDI output cameras). This way the zoom limitations of the FULL HD cameras could be avoided -> operating the virtual cameras would be easier-> quality better. Blackmagic 4K cameras seems to need a lots of light so other camera options would be advisable to be considered.	The market is evolving very fast, prices are decreasing and new interesting devices and cameras are appearing every month. Blackmagic for example has released the Micro Studio Camera 4K, which is already compatible with the SmartSet setup. The only difficulty here may be finding good enough 4K cameras with HDMI output. Also the SmartSet selected 4K framegrabber do not have HDMI ouput, so using this kind of cameras would imply the use of new framegrabbers.

Functionality	Conclusions for the developers	Brainstorm response
Computer including graphic card and SmartSet software	Computer freeze quite much times when you close the software and a few times when you go from mixer mode to configuration mode. Software freezed once during the production and computer needed to be restarted.	The change from mixer mode to configuration mode is not longer a problem. And the freeze has been fixed when closing the application. On successive versions this error has not occurred again.

4. CONFIG VIEW. SET

Functionality	Conclusions for the developers	Brainstorm response
Config view: set	SmartMagazine: If we use it, and we modify the places (positions) the software can not memorize it. (If we heighten or widen it, and go to the "mixer mode", it doesn't keep the positions. The PLAY/PAUSE button's status is not clear. (If we watch it, we can't decide, if it is ON or OFF.) SmartDebate: No lights setup and no way to personalize the set with a logo or changing the colors, and cannot hide the table	As the software changed to a single interface, the camera position should no longer be a problem. The playlists have been improved. Now you can know their status, only watching the color of the playlist. SmartDebate has been improved adding an option to hide the table and personalize the logo. But at the same time is the cheapest template, so strategically is interesting that has fewer options than the other templates. We will take into account the proposals to future and more complex templates.

5. CONFIG VIEW. ACTOR SETINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: actor settings	All worked fine with the actor	We have developed a color

	settings; minor problems with colour of the skin (contrast, hue settings). Talent had unrealistic skin colour and needed to be fixed in post-production(Adobe Speedgrade colour correction). We can't use perfectly the "calibration", and therefore we have some mistakes in the working.	correction tool that allows changing some parameters of the video input, for example: white balance, brightness, contrast, levels of gamma, Hue, Saturation and Luminance. The calibration procedure has been fairly simplified and it will be explained in the SmartSet overall manual.

6. CONFIG VIEW. PLAYLISTS

Functionality	Conclusions for the developers	Brainstorm response
Config view: screens playlists and duration settings	Everything fine.	-

7. CONFIG VIEW. CAMERA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: camera settings	Everything fine.	-

8. CONFIG VIEW. CAMERA CALIBRATION

Functionality	Conclusions for the developers	Brainstorm response
Config view: camera calibration settings	Camera calibration had a very mixed feedback on usability (meaning that some user's finds calibration too complicated). Therefore better tutorial videos needs	The calibration procedure has been fairly simplified and it will be explained in the SmartSet overall manual. Now, the calibration objects

	to be prepared especially for the entry level users.	won't be required anymore.

9. CONFIG VIEW. CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Config view: chroma settings	Presets of preconfigurations will be nice. Had problems with talent's hair meaning, that there were some digital noise which was more visible when talent was moving. Talent's chroma settings(color, contrast etc) are a bit complex for a beginner user, maybe there could be some pre-set presets? Chroma keying crashed once and software needed to be restarted. Chroma key settings didn't have any effect on chroma process but was solved by restarting the software. For somebody in the media who has worked in virtual studios is simple to configurate but for a beginner maybe will be hard to get a good final result.	Chromakey presets are not a generic solution. The final result depends on several parameters: the lights, the camera or the green screen color. The ChromaKey cannot be simplified more without taking out functionality and quality to the final result. The SmartSet manual will deal this question. It will offer a step-by-step procedure on how to use it. Video tutorials will be prepared by user partners.

10. MIXER VIEW. PRESETS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: presets	SmartNews: Sometimes it freezes and if you have 3,4,5... presets it	The problem with the presets it is fixed. The SmartSet manual will

	only appears one of them The problem is to move the camera to a new position, using the controls is very difficult, will be better if the mouse can move the camera as in the config view, using the 3 buttons of the mouse. I miss to change the fly duration of the camera in the mixer view.	deal with camera presets. The camera system is intended to be smooth and so the movement has been optimized for doing that. The fly duration can now be changed in mixer mode.

11. MIXER VIEW. ACTIONS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: actions	There could be more actions (f.e. talent shadow on/off, screen lights on/off etc). Otherwise everything fine. Theres is nothing interesting here, maybe if you can add some other actions like play a video or move a screen…	Action panel is not meant to contain specific template interfaces. Its main objective is to allow users configuring their own actions in one panel. The SmartSet manual will provide explanations on how to configure and use action interface.

12. MIXER VIEW. STORMLOGIC, ONDEMAND AND PAGES

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: StormLogic, eOnDemand and pages	Works fine but is too confuse to load and assign a number and move to a action. We can't change the font style. I think, that it's important. SmartDebate: Nothing happens in this	Stormlogic and eOnDemand has been simplified considerably, reducing the numbers of steps needed to create a page. The SmartSet manual will provide explanations on how to configure and use StormLogic, eOnDemand and pages interfaces.

	template when you load the page into the list and not showing the lower third or the other GC.	We will add the option to change the font of the StormLogic templates. This error no longer happens in the last version of the software.

13. MIXER VIEW. PLAYLIST AND FILEBROWSER

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: playlists and file browser	If will be an option including fullscreen would be better. Sometimes playlists freezes and it only shows one picture or video when there is more than one. I had some (but expected) problems with scaling images for screens because they are getting scaled automatically to wrong aspect ratio. Playlist and file browser got mixed usability feedback. The main issues were missing details of videos in the playlist, thumbnails and other bugs. The main issue was the scaling of the images because now the software scales the images incorrectly and there is then need to scale pictures in 3rd softwares(even in that case its hard to find the correct resolution and scale that fits correctly in SmartSet). SmartMagazine: I can't see, how the buttons stay. is it play, or loop, or	A new functionality has been developed. Now there are 3 buttons in the "Scene" panel that allows putting an entire playlist in fullscreen. The problem with the playlists should already be fixed. Now, no matter the template, all the screens in SmartSet have the same aspect ratio. They are intended to show 16:9 images. Users are expected to provide such aspect ratio images but if they don't fit, they are just stretched to fill in all the screen area. The SmartSet manual will provide explanations on how to configure and use the playlist interface. The playlists have been improved. Now you can know their status, only watching the color of the playlist. Related with the distorted images, this is because the screen is made from 5 monitors at different heights. We have developed a new

	what? I think, the button should stay ON if I push it. Sometimes playlists freezes and it only shows one picture or video when there is more than one. Images with text fonts had an distorted looks (picture). SmartDebate: The play button should keep on green while the video is playing, no timecode of the video SmartMagic: Sometimes playlists freezes and it only shows one picture or video when there is more than one	mode that allows flattening the screens.

14. MIXER VIEW. CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: chroma settings interface	Chroma settings interface worked fine. No issues with this functionality though end users did not use this function very much.	-

15. OVERALL INTERFACE.

Functionality	Conclusions for the developers	Brainstorm response
SmartSet Overall Interface	The tabs are hidden and maybe wold be better to make easy to show this menus.	Improvements have been done in the interface so it is now friendlier. StormLogic and eOnDemand

	Just the stormlogic and the way to load the pages in the project is not friendly at all.	are placed now together on the interface, so the interrelation is displayed more clearly. eOnDemand has been greatly simplified. The overall interface has been modified, and some more descriptive icons have been included.

16. TEMPLATE BASED SYSTEM.

Functionality	Conclusions for the developers	Brainstorm response
Template based system	Sometimes is hard to change colours of objects. Template-based system got in generally fine feedback meaning that it enables possibility to produce material easier and faster but some of the objects and features should not be locked (f.e. screen sizes, object colours etc). SmartDebate: I miss more personalization like change colors, include logos and change the screen size.	All the templates have been improved to allow personalizing them. All but SmartDebate and SmartTeleport have the option to change the colors. The reasons to not allow it are a strategic one for SmartDebate (it is the cheapest one) and in SmartTeleport there isn't anything to change, so has no sense.

17. SAVING THE PROJECT

Functionality	Conclusions for the developers	Brainstorm response
Other functionality (explain): Saving the project	This was the one of the biggest issues on the feedback because saving the project caused crashes, missing data and presets etc. In the end end users had to	It is solved. Saving problems are not there anymore.

	often restart the project from the scratch to be able to produce the content which is very time-consuming and frustrating. It does not save properly.	

REPORT 3 / FINAL REPORT FROM 09.01.2017

1. GREEN SCREEN AND LIGHTS

Functionality	Conclusions for the developers	Brainstorm response
Green screen and lights	You can get dark picture and noise if don't illuminate well the talent.	This is not related to the software tool itself but to the hardware configuration. Depending on the user skills, technical support can be hired in order to setup the system. Internet is also a great source of information regarding lighting for photo and video studios.

2. CAMERA AND OPTICS

Functionality	Conclusions for the developers	Brainstorm response
Camera and optics	When doing zoom ins and outs in SmartSet, FULL HD quality and resolution is not always enough.	SmartSet is intended to be used with 4K cameras. Even if full HD cameras are compatible with the system the virtual camera zoom range is reduced in this case.

3. COMPUTER

Functionality	Conclusions for the developers	Brainstorm response
Computer including graphic card and SmartSet software	Computer freeze quite much times when you close the software.	Solved. (SmartSet 2.1.0-64323)
	When you change between different lower thirds, sometimes get freeze like a frame.	The performance of the application has been greatly improved and this issue and others related to the frame rate have been completely solved.

4. SETTINGS: SET

Functionality	Conclusions for the developers	Brainstorm response
Settings: Set	SmartEducation: Colour of the roof should be adjustable f.e. If I would like to have a dark roof, and/or sometimes it could be also removed	Solved. A new interface allows for roof color changing. It is still not possible to remove it completely, because there is nothing behind it.

	with on/off “action”.	
	SmartEducation: Band on the floor. If i want to change it to darker color nothing really happens (it uses only some shades of light colors on white), i would like to be able to have it in any color and shade (even total white or black) ; same kind of settings like for the round centre of the floor.	Solved. (SmartEducation 1.1.13)
	SmartEducation: Adjustable size and color for chairs.	Solved. (SmartEducation 1.1.13)
	SmartEducation: There are lights on the roof but because they don’t have any real function, could they be removed with on/off switch in “actions" or in the "set settings”, and could the color of lights be adjusted.	Solved. (SmartEducation 1.1.13)
	SmartEducation: Needs some more objects to fill the space a bit (with on/off function).	Templates can vary in price, flexibility and complexity. Even a service for custom templates creation will be provided.
	SmartEducation: Is it possible that lights could have function meaning, that they could have some real effect on the set’s lighting .	There is a new option to change the intensity of each light in real time.
	SmartEducation: All the walls should be able to be moved if needed.	There is a new option to move some of the walls on SmartEducation.
	SmartEducation: Circle of the floor: Mirror effect on/off as action or in set settings.	The interface includes a slider, alpha, for this object which allows increasing or reducing the reflection effect.
	Calibrate it's the most confusing thing at the moment.	The calibration procedure has been fairly simplified and it is explained in the SmartSet overall manual.

5. SETTINGS: ACTOR SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Settings: Actor settings	Setting the actor in projection mode is difficult and takes long time to get	The camera calibration procedure has been greatly simplified and it is well

	good images.	explained in the SmartSet overall manual. Once the camera is well calibrated the projection mode is fairly easy to setup.
	Modify the actor size in projection mode that can't be done, and depending the set, it looks so small in our opinion	The camera calibration procedure has been greatly simplified and it is well explained in the SmartSet overall manual. Once the camera is well calibrated the actor size will be precise and natural.
	The shadow is sometimes difficult to set up and doesn't look natural, also while moving the camera	The camera calibration procedure has been greatly simplified and it is well explained in the SmartSet overall manual. Once the camera is well calibrated the shadow behavior becomes completely natural. Mostly when using projection mode.

6. SETTINGS: SCREENS, PLAYLISTS AND DURATION SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Settings: Screens playlists and duration settings.	SmartEducation: In this set you must note than the size and position of the screens are in the set tab and the content of the screens are in the screens tab.	This is a common practice; all the templates follow the same structure. Positions and sizes are normally defined in a pre-air phase, while contents are modified while recording.
	Sometimes, a "Cross reference" error appears, not allowing changing pictures in playlists.	Solved. (SmartSet 2.1.2-64929)
	SmartMagic: When we use floating screens depending on the height of the screen the roof "eats" them.	These parameters are configurable; The size and position of the screens can be modified in order to avoid that.

7. SETTINGS: CAMERA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Settings: Camera	Everything fine	-

settings		

8. SETTINGS: CAMERA CALIBRATION

Functionality	Conclusions for the developers	Brainstorm response
Settings: Camera calibration and settings	Calibrating camera should be made easier and more clear. Tutorial videos explaining the calibration procedure.	The camera calibration procedure has been greatly simplified and it is well explained in the SmartSet overall manual. Also, now, the calibration objects won't be required anymore.

9. SETTINGS: CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Settings: Chroma	Very important including the color tab to adjust the video and the presets tab.	The Advanced Chroma Key has a grading color functionality that allows that. It has also a preset panel to save configurations.

10. MIXER VIEW: PRESETS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: Presets	SmartNews: Sometimes it freezes and if you have 3,4,5... presets it only appears one of them (Demos 1 & 2)	Solved. (SmartSet 2.1.2-64929)
	Thumbnails for both presets and playlist files sometimes disappear or doesn't add them at all (but file will be in the list but without thumbnail); usually restarting software solves the problems and thumbnails are visible again.	Solved. (SmartSet 2.1.2-64929)
	SmartTeleport: When reset camera, a full screen image is not matched with the output screen	Solved. (SmartTeleport 2.1.1)

11. MIXER VIEW: ACTIONS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: Actions	SmartEducation: Would be ok to use presets window more effectively, f.e. on / off switches for lights, chairs etc in presets list. Now it is pretty unused space in the interface.	More controls have been added to give better controls over the scenary elements.
	Sometimes we cannot record actions dragging and dropping, and the same happens when we try to modify the order of the images in playlists	Solved. (SmartSet 2.1.2-64929)

12. MIXER VIEW: STORMLOGIC, ONDEMAND AND PAGES

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: Stormlogic, OnDemand and pages	Adding, saving and specially renaming StormLogic pages doesn't always work; Storm logic function should be somehow simplified to endorse end users to use more otherwise great-looking function.	Stormlogic and eOnDemand has been simplified considerably, reducing the numbers of steps needed to create a page.
	SmartEducation: Would be great to have some sort of an interactive chat function, etc. For live communication between teacher and student.	Not in the scope of the project. It will be studied for future releases.
	Lowerthirds are still really difficult to set up, a preview is needed to know what are we changing on the pages before launch it. When working with pages it is quite difficult to simply see which one you need and you need to save the whole template to record the names of this pages or actions.	SmartSet has been simplified in many ways, for example removing the preview display. This greatly reduces the operation complexity at a cost, graphics cannot be defined while recording. Still the 2D user interface allows for introducing new content while having a simple preview of it.
	Give the possibility of change the fonts.	Solved. (SmartDebate 3.0.11) (SmartEducation 1.1.13) (SmartMagazine 3.0.14) (SmartMagic 3.1.3) (SmartNews 3.0.20) (SmartTeleport 2.1.1)

		(SmartWeather 1.0.3)

13. MIXER VIEW: PLAYLIST AND FILEBROWSER

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: Playlist and filebrowser	Sometimes playlists freezes and it only shows one picture or video when there is more than one (DEMO 1 & 2)	Solved. (SmartSet 2.1.1-64372)
	Sometimes, different playlists shows the same thumbnails, but they really have different images each one.	Solved. (SmartSet 2.1.2-64929)
	Would be possible to add a group of images/video at once (adding multiple files) to the playlist, because now I had to add them one-by-one to the playlist.	It is a good suggestion but, due to the existing interface architecture, not easy to implement directly. A new display list interface configuration is under development that will allow for this and other capabilities.
	Is it possible to add some files to f.e. First page (1-16) and then to page 3 (33-48) WITHOUT filling all the numbers between pages; now the software doesn't allow me to categorize files on different pages and I have to fill pages in numerical order.	It is a good suggestion but, due to the existing interface architecture, not easy to implement directly. A new display list interface configuration is under development that will allow for this and other capabilities.
	When video files ends, playlist starts again from the number 1 (which is a problem if having 60-70 files and playing video clip in the middle of the list...and suddenly it starts to play again from the beginning).	Solved. (SmartSet 2.1.0-64323)
	Just include an "autostart" option for the playlist in the fullscreen buttons will be nice.	All the fullscreen buttons resume the playlist linked to it. If the video is stopped, it plays it. If the video is playing, it does nothing.

14. MIXER VIEW: CHROMA SETTINGS

Functionality	Conclusions for the developers	Brainstorm response
Mixer view: Chroma settings	I don't think really needs this panel because you have already in the config tab.	This panel is the simplified version of the complete chromakey interface. Its purpose is to be used in the daily use of the tool.
	Don't understand why are shown several inputs preview in this tab, it suppose just 2.	This interface shows all the video inputs the system has available by license. Its purpose is to display all the video inputs status in a common place.
	The color correction tool doesn't work. So we have to use adobe premiere to get a better skin color.	Solved. (SmartSet 2.1.2-64929)

15. OVERALL INTERFACE

Functionality	Conclusions for the developers	Brainstorm response
Overall: Interface	When choosing projects it is a bit hard to read the project from the list when they are on black font on dark gray background.	Solved. (SmartSet 2.1.2-64929)
	Possibility to have a full screen for the preview screen, sometimes it is too small and because of all the buttons it can't be really resized as bigger; maybe a similar solution like in Adobe Premiere where with key combination the preview screen will become fullscreen?	A new feature called "Display Output" has been developed. It allows to have a second window with the desired size.
	Better now with everything in the same view, just don't understand why control panel and OnDemand are separate, maybe better hide those buttons.	Those buttons allow changing the content of the Form panel, switching between the "eOnDemand" or "Set" information.
	The "Actor" window disappeared not letting us modify the "type" window.	Solved. (SmartSet 2.1.0-64323)
	The "Height" of the talent in calibration mode, sometimes disappears.	Solved. (SmartSet 2.1.0-64323)
	Dragging and dropping actions still	Solved. (SmartSet 2.1.1-64372)

	not appear in the action window until the action window is refreshed.	
	Sometimes pop ups the window saying "License not found".	This situation can happen when some hardware is removed or added. For different hardware configurations a different license is needed.
	Dragging from internal browser doesn't work	Solved. (SmartSet 2.1.1-64372)
	The "Form" window content sometimes disappear	Solved. (SmartSet 2.1.0-64323)
	Moving the camera with the mouse sometimes is locked and it doesn't allow to move free	Solved.
	It would be useful to have sliders to control the audio of the recorded files (actor/ actress) and the videos in "fullscreen".	Post-producing programs was not a planned feature in SmartSet, but after the validation process and taking into account the obtained results, future versions of the tool will take into account this capability and will provide this and other features.

16. TEMPLATE BASED SYSTEM

Functionality	Conclusions for the developers	Brainstorm response
Template based system	Sometimes is hard to change colors of objects.	Solved. (Solved 2.1.2-64387)
	Limited to the Brainstorm ideas and this is good most of time but for more professional profile user will miss more flexibility.	Templates can vary in price, flexibility and complexity. For cases where users need more flexibility there is a more flexible tool named InfinitySet. A service for SmartSet custom templates creation will be provided.
	SmartMagic: The roof looks unnatural.	Solved. (SmartMagic 3.1.3)
	SmartWeather: Add the capability of modify the "Videowall back" size.	Solved. (SmartWeather 1.0.4)
	SmartWeather: Made the view/hide of the map happen slow.	Solved. (SmartWeather 1.0.4)

	SmartWeather: In some occasions when trying to cull the "Globe", it does not work.	Solved. (SmartWeather 1.0.4)

17. OTHER FUNCTIONALITY

Functionality	Conclusions for the developers	Brainstorm response
Other functionality	It does not save properly.	Solved. (SmartSet 2.1.1-64372)
	Sound quality is in generally OK but could be better and more professional by choosing better hardware for the SmartSet solution	The proposed audio setup has been chosen to provide good results and to be affordable, but it is the decision of the customer to acquire a better solution.
	There is some delay between the image with the actor and the voice	With the audio delay that issue should be correctly solved.
	There is an outline on while using defocus between the talent and background	This occurs under specific defocus configurations. Selecting the appropriate parameters the effect disappears.
	When working with recorded chroma files or full screen videos it would be useful to have some kind of banner or something that tells you the time that remains until the end of the video. And more controls like rewind and advance in the video.	Post-producing programs was not a planned feature in SmartSet, but after the validation process and taking into account the obtained results, future versions of the tool will take into account this capability and will provide this and other features.

The vision in the **SmartSet project** is to develop a low cost virtual studio solution that, despite being ten times less than the cost of comparable solutions on the market, will have the same quality of high cost solutions currently used by larger broadcast media companies, but with a simple and limited functionality. The project will increase the competitiveness of the European creative industries, particularly in the broadcast media sector.

The SmartSet project objectives include mapping and prioritising the user requirements for the virtual studio solution to be developed. This report is based on the user consultation process with the end users and stakeholders of the SmartSet project to determine the functionality requirements for product development and integration. The research set out to detail a range of user requirements which will feed into the virtual studio specification.

SmartSet

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