Deliverable 6.3 User Trial Results

Editor: Katarina Stanoevska, University of St. Gallen (CH)

Other contributors:

Frederic Junker – University St. Gallen

Mar Rodriguez – RBB

Lotte Belice Baltussen, Evelien Wolda – Sound & Vision

Mieke Leyssen – CWI

13.05.2014

Work Package 6: Scenarios

LinkedTV

Television Linked To The Web

Integrated Project (IP)

FP7-ICT-2011-7. Information and Communication Technologies

Grant Agreement Number 287911

Dissemination level[1]	PU
Contractual date of delivery	31st March 2014
Actual date of delivery	13th May 2014
Deliverable number	D6.3
Deliverable name	*User Trial Results*
File	*LinkedTV_D6.3.docx*
Nature	*Report*
Status & version	*First version, v1.0*
Number of pages	75
WP contributing to the deliverable	WP6
Task responsible	*University of St. Gallen (CH)*
Other contributors	*RBB* *Sound & Vision* *CWI*
Author(s)	*Katarina Stanoevska, University of St. Gallen (CH)* *Frederic Junker, University of St. Gallen (CH)*
Reviewer	*Dorothea Tsatsou, CERTH; Lyndon Nixon, MODUL*
EC Project Officer	*Thomas Küpper*
Keywords	*User trial, first screen, second screen, chapters, persons, places*
Abstract (for dissemination)	*User trials were prepared and conducted in the first quarter of 2014 in order to assess the appropriateness of the innovative functionalities of the second screen demonstrator developed in Y2 of the LinkedTV project. A sample installation of LinkedTV*

[1] • PU = Public
• PP = Restricted to other programme participants (including the Commission Services)
• RE = Restricted to a group specified by the consortium (including the Commission Services)
• CO = Confidential, only for members of the consortium (including the Commission Services))

	was set up at three different locations: at Rundfunk Berlin Brandenburg (RBB), Sound & Vision (S&V), and at the University of St. Gallen (USG). The LinkedTV installation included a TV showing sample content ("main screen") and an tablet ("second screen") showing chapters of the program as well as semi-automaticaly acquired additional information about persons, topics and places depicted in the program on the main screen. In total 24 participants took part in the trial at all three locations (9 at RBB, 5 at S&V and 10 at USG). To assess the appropriateness of the LinkedTV features, the trial participants were provided with a "hands-on" opportunity to use the LinkedTV Application and were observed while using the installation. The participants also filled in a questionnaire at the end of the session.

Table of contents

List of Figures

List of Tables

1 LinkedTV: Scenarios for Future Linked Television

This deliverable reports on user trials held in the first quarter of 2014 to assess the utility and appropriateness of the innovative functionalities of the second screen demonstrator developed in Y2 of the LinkedTV project. However, the most salient outcomes regarding usability and UI will be reported here, so that these outcomes can be taken into account for the next round of User Interface designs, which will then again be subjected to a round of user tests. The user trials provided independent users with the opportunity for "hands-on" testing of the LinkedTV second screen application. The user trials were held for both scenarios for which the player and demonstrator was developed: Interactive News (leading partner: RBB) and the Tussen Kunst & Kitch (TKK) scenario (leading partner: Sound and Vision). The interactive news scenario was tested at RBB and the University of St. Gallen and the TKK scenario at Sound and Vision.

1.1 History of the document

Date	Version	Name	Comment
	V0.0	Katarina Stanoevska-Slabeva	First proposal for structure of the deliverable in the project Wiki
18.03.14	V0.1	Lotte Baltussen, Evelien Wolda	Created initial document and user trial set-up sections
18.03.14	V0.2	Frederic Junker	Expanded description of goals; description of user trial set-up by USG
21.03.14	V0.3	Mieke Leyssen, Lotte Baltussen	Included results of user trials at S&V
24.03.14	V0.4	Lotte Baltussen, Katarina Stanoevska-Slabeva	Expanded user trial results, refined structure
26.03.14	V0.5	Lotte Baltussen, Mieke Leyssen	Expanded user trial results, review
26.03.14	V0.6	Frederic Junker Katarina Stanoevska-Slabeva	First calculation of quantitative results and interpretation of results

Date	Version	Name	Comment
27.03.14	V0.7	Katarina Stanoevska-Slabeva	Review and minor changes on quantitative data
04.04.14	V0.7	Mar Rodriguez	Summary of trials at RBB as contribution to various chapters of the deliverable
05.04.14	V4.0	K. Stanoevska-Slabeva Frederic Junker	Consolidation of partner inputs and first version of summary of quantitative and qualitative input from the online survey
15.04.2014	V4.0	Lotte Baltussen	Review of consolidated version, new input regarding analysis of results and interpretation
16.04.2014	V5.0	Katarina Stanoevska-Slabeva Frederic Junker	Added elements of new structure, new structure, and overall analysis of “First impression”, “Recommendation” and “Target Audience”
17.04.2014	V5.0	Katarina Stanoevska-Slabeva Frederic Junker	Added analysis of “Not understood”, and “Attention among first and second screen”
18.04.2014	V5.0	Lotte Baltussen	Review and corrections
22.04.2014	V6.0	Katarina Stanoevska-Slabeva	Completed all sections related to analysis. Included some missing input from RBB provided on the 21st of April, 2014
23.04.2014	V6.0	Mieke Leyssen	Proofreading
23.04.2014	V6.0	Katarina Stanoevska-Slabeva	Input from suggested corrections from proof reading Final formatting of 6 tables, addition of missing content
29.04.2014		Dorothea Tsatsou	QA Review
02.05.2014		Katarina Stanoevska-Slabeva	Corrections based on QA Review, Final version for second QA review
08.05.2014		Lyndon Nixon	Second QA

Date	Version	Name	Comment
11.05.2014		Katarina Stanoevska-Slabeva Frederic Junker	Final Version
12.05.2014	final	Martha Merzbach, Heike Horstmann	Final formatting and check

Table 1: History of the document

1.2 Glossary for the document

Concept	An entity, a notion of some person, place or other thing perceived in the TV program
DoW	Description of Work
FAQ	Frequently Asked Question
Main screen	The TV screen (or computer screen) displaying TV or video program
RBB	Rundfunk Berlin Brandenburg
S&V	Sound & Vision
Second Screen	Tablet on which additional information is displayed and which is used in parallel with the main screen
TKK	Tussen Kunst & Kitch
UI	User Interface
USG	University of St. Gallen
WP	Work Package
Y2	Year 2

2 Goals and Set-Up of the Trials

2.1 Goals

User trials were prepared and conducted in the first quarter of 2014. In order to experience the LinkedTV features, the trial participants were provided with a “hands-on” opportunity to use the LinkedTV Application. The LinkedTV installation included a TV showing sample content (“main screen”) and a tablet (“second screen”) showing chapters of the program as well as semi-automatically acquired additional information about persons, topics and places depicted in the program on the main screen.

The main goal of the user trials was to assess the appropriateness of the innovative features developed in the LinkedTV project for the purpose of retrieving useful / informative background information on aspects of and items seen in TV content. These features were presented through the two second screen demos developed in Y2 of the project: the news and the Tussen Kunst & Kitch (TKK) demo (see also [OL13]). As the evaluated second screen demos were first testable prototypes developed based on previous user studies (see [RHH13]), the consortium was in particular interested to understanding how the users perceive the LinkedTV second screen demos and their functionality and what meanings the LinkedTV Application has to them.

The goal of the user trials was not to determine the usability and user interface (UI)-related implementation quality of the prototypes developed in the LinkedTV project. Special evaluation related to usability is planned end of year three of the project. However, the most salient outcomes regarding usability and UI will be reported here, so that later usability trials can build upon this.

2.2 Methodology

2.2.1 Subject of the LinkedTV Trial

As mentioned above, subject of the “hands-on” trial were the two second screen demos developed in Y2 (for a technical description see D3.6, [OL13]): the news demo and the TKK demo. The news demo was based on a typical news show broadcasted by Rundfunk Berlin Brandenburg (RBB) on a daily basis. It was set up and provided to users at RBB and at the University of St. Gallen (USG). The TKK demo was a typical Dutch TKK episode provided to users at S&V. The set up included a TV - “main screen” - showing sample TV content (a typical episode of daily news and the Dutch TKK) and an iPad (“second screen”) on which the LinkedTV Application was running. The TV show on the main screen and the LinkedTV Application were automatically synchronised (for details see [OL13]) and the second screen provided additional web information to the TV content.

The functionality that was subject to the user trials can be divided in two types: functionality that was running automatically in the background and on which the user did not have any

influence and functionality that the user was able to activate and use through the second screen application. The first category involved the following:

1. Detection of concepts as persons, objects and places from the TV material at the main screen by LinkedTV's advanced video/audio analysis functionalities.
2. Creation of queries, searching for and collection of additional online information related to the concepts discovered in point 1.

The user was able to assess the automatic features by judging if their results met his expectation. The second type of functionality is illustrated in Figure 1 on the example of the TKK application and involved the following features (see also Figure1):

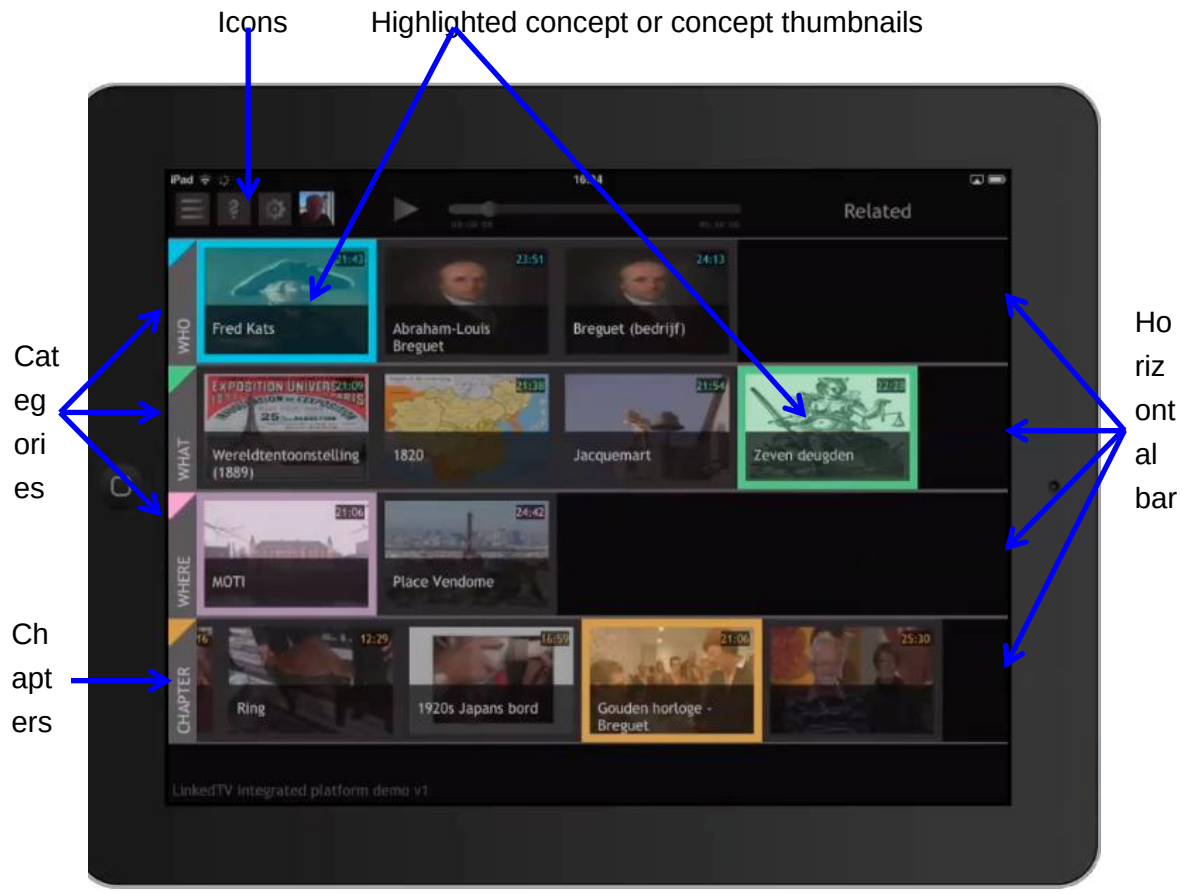

Figure 1: Screen shot of the starting, 1st overview interface of the TKK second screen application with the main active items available to users on the second screen for interaction. The same structure and components were available also for the news demo

1. Structuring and making the additional information about places, persons, objects and other ***concepts*** detected in the TV content (see point 1) accessible through three separate ***horizontal bars*** representing the ***categories*** "WHO", "WHAT" and "WHERE" (see also Figure 1). The specific choice and design of the three categories was based on the results from the requirements analysis presented in D3.5 of the project [RHH13].

2. Segmentation of the TV content and related additional information in ***chapters*** accessible through a fourth ***horizontal bar*** on the second screen (see the fourth horizontal bar in Figure 1 at the bottom of the second screen).
3. Display of additional information from white-listed Internet sources (i.e. Wikipedia) for relevant detected ***concepts*** described in point 1, upon request of the user on the second screen. The additional information is displayed in two steps: First, on a 2nd "Summarizing" interface (see example screen shot Figure 2) of the second screen, which contains a short summary of the additional information together with links to selected external sources of additional information.

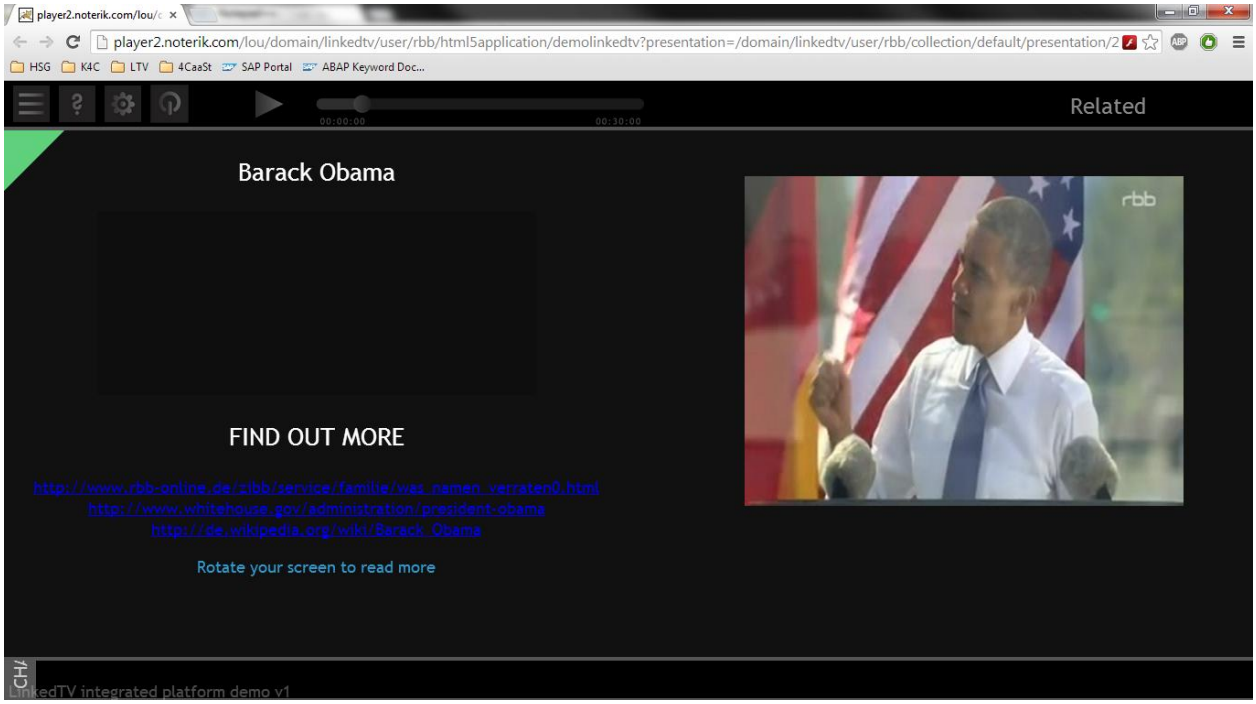

Figure 2: Screen shot of the 2nd „Summary" interface of the second screen application

Second, the actual additional information from external online sources is presented on the 3rd interface of the second screen (see Figure 3). The user can get to the 3rd interface by tilting the tablet when on the 2nd interface of the second screen (see instructions in Figure 2).

Figure 3: Screen shot of the 3rd interface of the second screen containing the external additional information (here a Wikipedia page)

4. Selecting a ***chapter*** and skipping to it on the main screen (see Figure 4). This functionality was operative and enabled the user to watch the TV content in a non-linear way by choosing chapters that are interesting to him.

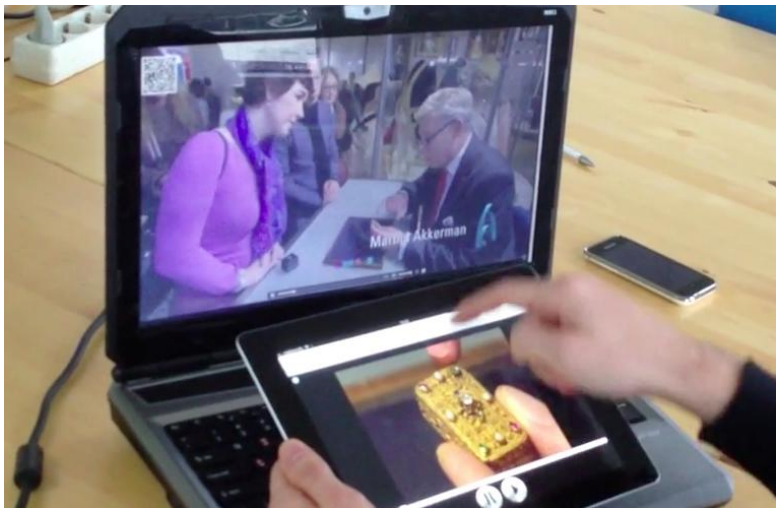

Figure 4: Screenshot of skipping to a chapter on the main screen (copied from D3.6 [OL13])

Besides these basic features of the LinkedTV Application, further functionality for dealing with both the chapters and additional information were available in different stage of implementation and completeness. These are in particular:

1. Bookmarking of chapters and concepts together with the related additional information. It was possible to use this function, but its operation was only simulated in the available prototype for testing.

2. Sharing of chapters and concepts with social connections via email and social network sites. This function was also only simulated in the available prototype.

2.2.2 Evaluation Methodology

The evaluation was based on a “hands-on trial” by external users that have not been involved in the project. Users were given for the first time the opportunity to use and directly interact with the LinkedTV Application. The main methodology for collecting the user feedback was the qualitative research method observation. In general, qualitative methods are typically used in information systems research to understand the perception of an information system by its users, the context in which the system is implemented or developed, and the process by which changes occur or outcomes are generated (see also [KM05]). They usually focus on the description, interpretation and explanation of events situations, processes and outcomes, rather than the correlation of variables. Qualitative research methods also tend to be used for understanding a particular case or for comparison of a small number of cases, rather than for generalization to a specific population. They are useful for systematical collection of so called “anecdotal” evidence and turning the experiences they describe into data that can be rigorously collected and analysed (see also [KM05]).

Observation can be designed as “participant observation” and “passive” or “non-interactive observation” [WA08]. While “passive observation” happens without the knowledge of the testing person and the observer is concealed, “participant observation” is based on an active involvement of the observer during the evaluation [PS96]. The “participant observation” allows the observer to ask questions for clarification of what is taking place and to engage in informal discussion with the application user. As the LinkedTV Application is in an early stage of development, the “participant observation” was chosen in order to get in depth insights as well as to be able to help users in case needed. While the users were using the LinkedTV application they were observed and the observer noted down findings in a pre-structured observation protocol (see Appendix A), which is a typical approach for collecting observation data (see also [WA08]). The observation protocol provided guidance to the observers on which activities of the users they should focus their attention and also provided an efficient way of collecting the observation data (for instructions how to build observation protocols and examples see [WA08] and [PS96]).

The “participant observation” was furthermore combined with the “Think-aloud” approach (see also [SBS94]). This is a technique that is useful for finding out what is going through a person's mind when they are performing a task, how they approach problem solving, how easy it is to use the system, how they decide when a search is complete, how they evaluate information, etc. The technique involves asking the person to perform the task as they would normally, but to also explain by talking aloud what he is doing and why. The typical instruction to users are: "*Talk aloud while you are working, letting me know what is going through your mind while you work: What you are looking at, what you are thinking, questions that come up, why you are doing what you are doing, etc. Anything that comes*

into your head. If you start to read something you see, please read aloud." (Cited from http://ils.indiana.edu/faculty/umikerse/L503/L503iub/thinkaloud.html)

In order to cope with privacy and ethical requirements with respect to observation and treatment of user data, a specific consent form was designed and signed by each user who participated in the trial (see Appendix B). In the consent form the user is explicitly asked to allow observation as well as recording of the trial session with him/her. Under consideration of the user consent, each trial session was either audio or video recorded. All personal data of users were anonymised during the analysis and will be destroyed latest on the 31.12.2014.

The findings recorded in the observation protocols were clustered based on similarity of the qualitative statements of the users and where possible quantified first for each location and then overall for all three locations. After the observation, the user was furthermore able to provide additional, summarizing feedback answering closed and open questions in a short online survey. The closed questions were based on the wide-spread scale for measuring attitude – the Likert scale with 5 items (from 1 “like it very much” to 5 “don’t like it at all”). Based on the input from the users means and deviations were calculated for each location and for all users in total. The answers to the open questions were clustered and a summary interpretation was developed. The results of the semi-structured interview were also clustered (see also [MH94]).

Results were aggregated and interpreted at several level of abstraction: per location, per specific scenario (news and TKK) and in total for all three locations together. Based on the feedback from users and the findings, implications for further development in the project were deduced.

2.2.3 Evaluation Procedure

Each user trial lasted 60 - 90 minutes and followed this procedure:

1. The moderator and the observer, both LinkedTV researchers conducting the user trials, introduced the participant to the aims and scope of the LinkedTV project and explained the goal of the trial.
2. The participant filled out a consent form (see Appendix B).
3. The participant’s first assignment was to interact freely with the LinkedTV installation and to use it as s/he would use it in a real-world scenario. After this, three more specific assignments were completed (see Appendix A). The observers wrote down the actions of and opinions by the participant. For this, the talk-aloud method was used. This entails that participants had to speak out loud about what they did, why they did it and what they thought. If needed, the observers also asked questions that enabled users to clarify their understanding and opinions. At USG, the discussion with the participant was captured with a voice recorder to ease analysis of the user trials’ results. At Sound and Vision, and RBB the participant’s actions with the second and main screen were additionally recorded on video to capture user-interface-interaction during task completion. However, their face was not recorded, in order to

ensure the participant's privacy and to make them feel more at ease with being recorded on video.

4. After the assignments, the participants first filled out a short online survey about the main features of the LinkedTV Application (for a screen shot of the online questionnaire see Appendix C).
5. Finally, the moderator had a short concluding face-to-face interview with the participant about the LinkedTV functionality, including whether the participant would be ready to pay for such a tool or if the participant misses features not included so far (please see the last page of Appendix A for details).
6. At the end, all participants were given a small gift and their travel costs were reimbursed.

In accordance with the consent form (see Appendix B) all information about users were anonymized and all records will be deleted by 31.12.2014.

During the trial all three locations received technical support from Noterik, the developer and technical responsible of the two second screen demos. The application mostly ran smoothly, even though some participants used the application at different locations at the same time. *Unintentionally,* due to a technical inconsistency eight of the ten participants in St. Gallen were presented by the "curated" version and two with the automatic version of the application with more additional data. The "Curated" or as it can also be called the "edited" version (see Figure 5) is based on semi-automated annotation and enrichment. Before presented on the second screen there was a manual selection of the automatically collected additional information as well as clustering of the additional information in the three categories "WHO", "WHAT" and "WHERE". Thus, this version provides less additional data that is better structured into the three mentioned categories.

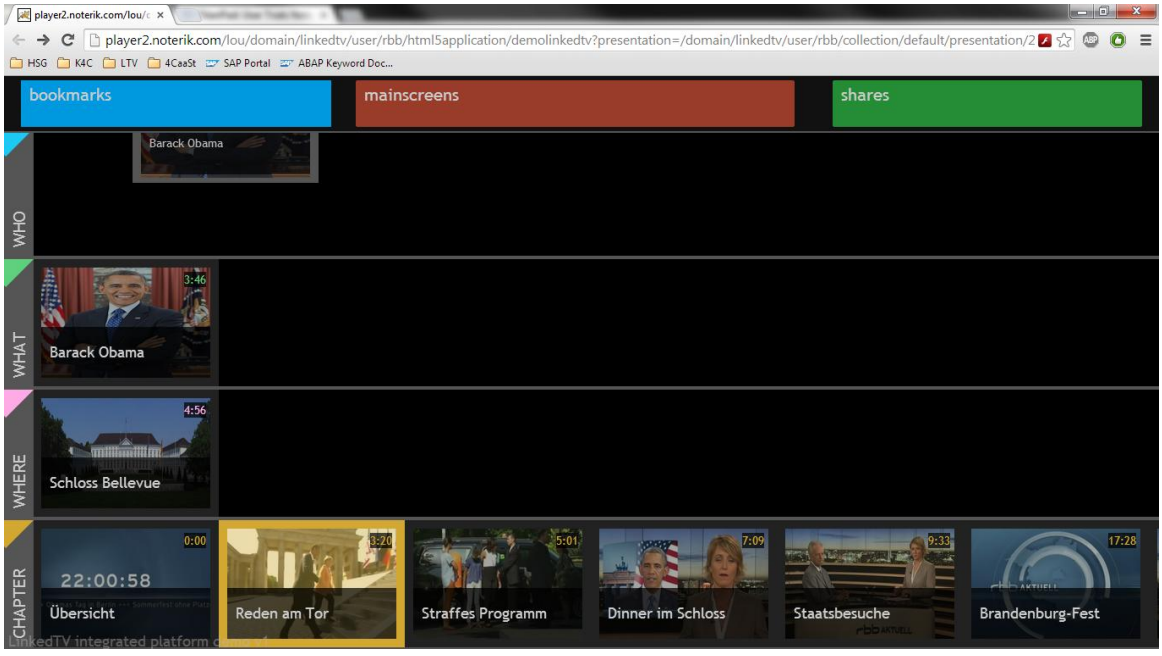

Figure 5: Screen shot of the „Curated" version of the news Linked TV demo

The fully automated version provides more additional information and contains more bugs. For example, some of the tags provided on the fields that present additional information were incomplete or wrongly spelled. This unintended technical inconsistency happened only during the trials in St. Gallen. The team in St. Gallen had no impact on the version that was presented to the users. At the two other locations the same “curated” version of the LinkedTV demos was presented to the users.

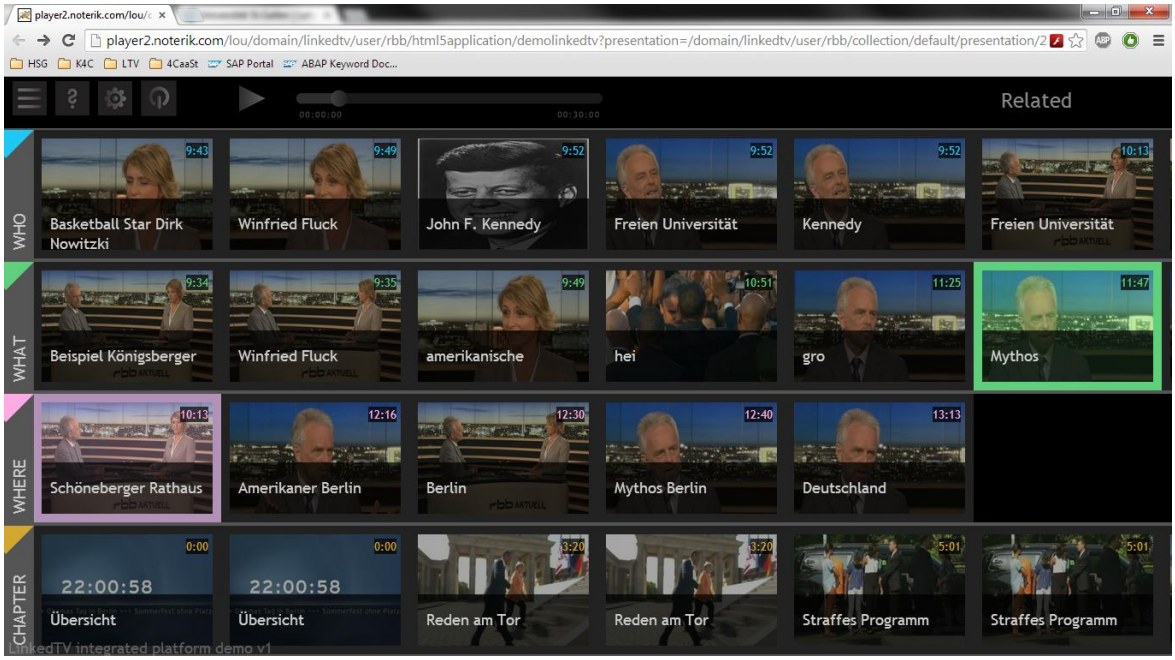

Figure 6: Screen shot of the „Automated“ version of the news LinkedTV Application

2.2.4 Set-up of the user trials at RBB

RBB evaluated the news scenario. The trial participants were recruited with the help of an agency that recruited a general pool of users interested in new Internet and television technologies. From this pool 42 potential participants were chosen, from which 10 users who met the criteria for the LinkedTV trial were invited to the trial. The criteria the participants had to meet were: to watch RBB at least three times a week, to own a tablet and to use it on a frequent basis. The selected users were contacted first over mail and the second time on the phone.

For each test the observers spent one hour with the participants. Some of the participants stayed longer because they were really interested on further development of the application and provided some ideas how they would like to have the LinkedTV Application as “companion” for their favourite TV shows.

2.2.5 Set-up of the user trials at University of St. Gallen

Given that the University of St. Gallen is located in the German speaking part of Switzerland, the trial team in St. Gallen employed the news programme of Rundfunk Berlin-Brandenburg (RBB) as the TV content shown during the user trials. The target users and use case to be evaluated by means of the user trials was the daily news as a type of TV program with very

high information density. Thereby, the LinkedTV functionality of enabling TV watchers to drill and delve deeper into particular aspects shown on the main screen is particularly well applicable and testable.

Participants were recruited via email, as well as via the student body[2] and university clubs[3]. The only conditions that users had to meet were: to watch news on TV at least from time to time and to either poses or be familiar with the usage of tablets. A total of 10 persons were considered that fulfilled these requirements. The moderator (Katarina Stanoevska-Slabeva) was accompanied by an observer (Frederic Junker).

In St. Gallen it was necessary to refresh the application on the second screen in the browser with four out of 10 participants and the application had to be completely restarted twice during the sessions with two different participants.

2.2.6 Set-up of the user trials at Sound and Vision

Sound and Vision (henceforth: S&V) focused on the Hyperlinked Documentary for the user trials, which is based on the Tussen Kunst & Kitsch television programme[4] (similar to BBC's Antiques Roadshow) of Dutch broadcaster AVRO. The participants recruited for the trials had to either know or watch Tussen Kunst & Kitsch (henceforth: TKK), or other cultural programmes. Furthermore, participants were required to own or at least know how to operate a tablet, since otherwise the tests would be too frustrating.

Participants were recruited via Sound and Vision's website[5] and social network channels[6]. They could sign up through an online form (see Appendix D: Sign-up form), in which they were asked to give information on their age, interest in cultural heritage programmes, media literacy, second screen usage and availability. In total, there were 10 people that signed up. Three of them were colleagues or acquaintances of the LinkedTV researchers responsible for executing the trials, so they were not selected. One other person rarely used a second screen or tablet and was only available on timeslots that overlapped with other participants that did own tablets. So, six participants were selected, one of whom could in the end not make it due to illness. Thus, five tests were held on location at Sound and Vision in the end.

The general methodology described above was followed, and the moderator (Lotte Belice Baltussen, S&V) was always accompanied by an observator (in one case, Evelien Wolda, S&V, the other cases, Mieke Leyssen, CWI).

---

[2] http://myunisg.ch/de/

[3] http://myunisg.ch/de/studentenschaft/vereine.html

[4] http://avro.nl/tussenkunstenkitsch/

[5] http://www.beeldengeluid.nl/blogs/research-and-development/201402/tussen-kunst-kitsch-test-ons-tweede-scherm

[6] https://twitter.com/lottebelice/status/438223562789642240

3 Results

3.1 Trial population and profile of participants

In total 24 users of the 25 invited users participated in the trials at all three locations: 9 at RBB, 10 at USG, and 5 at S&V. 11 of the 24 users were female and 13 were male. The ages ranged overall from 23 to 65. 19 of the 24 users were tablet owners. More details about the users who participated at each location are given in the following three sub-sections.

3.1.1 RBB

Originally ten participants confirmed their participation to test the LinkedTV Application. At the end nine people participated in the trials, the tenth person didn't come. The participant set consisted of 1 woman and 8 men, ages ranged from 23 to 56. The following table (see Table 2) provides an overview of the participant profiles:

User code	Gender	Age	Tablet Owner	RBB viewer
RBB1	Female	23	yes	Yes
RBB2	Male	53	yes	Yes
RBB3	Male	56	yes	Yes
RBB4	Male	47	yes	Yes
RBB5	Male	48	yes	Yes
RBB6	Male	51	yes	Yes
RBB7	Male	25	yes	Yes
RBB8	Male	48	yes	Yes
RBB9	Male	56	yes	Yes

Table 2: Overview of profiles of trial participants at RBB

3.1.2 University of St. Gallen

In total 10 participants took part in the trials at the St. Gallen location (see Table 3). All 10 participants were Ph.D. students working at research institutes of the University of St. Gallen or affiliated research labs of one company. All 10 participants were familiar with news, were watching TV news at least from time to time and had already experiences in using tablets. Since virtually all TV watchers are familiar with the daily news, this requirement did not exclude any of the user trials' participants. Six of the participants were female and four male. The ages ranged from 25 to 34 with 50% of the participant being under 30 years old. None of the participants was watching news regularly over the TV, but all participants were doing this from time to time. Seven participants owned a tablet, however all confirmed to have experiences in using a tablet.

User Code	Gender	Age	Occupation	Tablet Owner	Watches news on TV
USG1	male	34	Research assistant	yes	from time to time
USG2	female	33	Project Manager	yes	from time to time
USG3	female	32	Research assistant	no	Regularly
USG4	male	31	Research assistant	yes	from time to time
USG5	female	28	Research assistant	yes	from time to time
USG6	male	26	Research assistant	yes	from time to time
USG7	male	28	Research assistant	no	from time to time
USG8	female	33	Research assistant	yes	from time to time
USG9	female	29	Research assistant	yes	from time to time
USG10	female	25	Student	no	from time to time

Table 3: Overview of trial participants in St. Gallen

3.1.3 Sound and Vision

Five people participated in the user trials at S&V (for an overview see Table 4). They all owned a tablet and often used it. Two participants indicated that they frequently watched TKK; two other mentioned they sometimes watched the program and one person never watches TKK. The participant set consisted of 1 male and 4 female, ages ranged from 23 to 65.

User code	Gender	Age	Occupation	Tablet Owner	TKK viewer
S&V1	male	51	Consultant healthcare and culture sector	yes	yes
S&V2	female	26	MA student- New Media	yes	sometimes
S&V3	female	23	Ma student- Film and Televisions studies	yes	sometimes
S&V4	female	43	Journalist& writer	yes	no
S&V5	female	65	Primary school teacher (currently retired)	yes	yes

Table 4: Overview of trial participants at S&V

3.2 Results observation

This chapter provides an overview of the results of the observation. Subchapter 3.2.1 summarizes the feedback of the users regarding their first impression of the LinkedTV Application. Subchapter 3.2.2 provides an overview of results related to the user understanding of the LinkedTV Application and subchapter 3.2.3 the experiences of the users with the navigation with the LinkedTV Application. Subchapter 3.2.4 presents the experiences related to the offered content. Important aspects of the LinkedTV Application as access and consumption of additional information were considered in the sub-chapters from different perspective. This inevitably resulted in some repetition of the findings in the different sub-chapters.

3.2.1 First impression

3.2.1.1 First approach towards main and second screen

At the beginning of the trial, users were asked to give their first impressions of the application. Given the two screens at their disposals (the tablet and the main screen showing the programme), it was important to understand how users would deal with the two screens and how they would divide their attention among them. The following observations were made at the three locations (see also Table 5):

Description (code)	RBB	UNISG	S&V	Total
First on main, later only second		6	1	7
Focuses on main screen. Only glances on second screen	2	1	3	6
First on second, later on main	1	1		2
Immediate focus on second screen		2	1	3
Switches between looking at main and second screen	6			6
Total	**9**	**10**	**5**	**24**

Table 5: First approach and attitude towards first and second screen

RBB – Six out of nine users switched very often between the two screens. Two focused on the main screen and only glanced at the second screen, not touching it. One participant focused first on the second screen and then shifted between main and second.

USG – Six of the ten users focused on the second screen after a first glance on the main screen. Two users focused first on the second screen and then on the main screen. One user focused on the main screen and only glanced on the second and two user immediately focused on the second screen. After the first reaction nine of the users started to switch between looking at main and second screen. When focusing for a longer period on the main screen users switched to the typical “lean-back” position of passively watching TV and changed in the “lean-forward” active position to look at and use the second screen.

S&V – Three of the five participants focused on the main screen and only glanced at the second screen, not touching it. One participant focused on the main screen at first and after a while ignored the main screen and focused on the second screen. The other participant did not pay attention to the main screen, only the second screen.

Summary of findings related to first impression: Confronted with the LinkedTV Application, users re-acted quite similar at all three locations. At all three locations, the majority of users started with looking at the main screen and then glanced on the second screen not touching it or trying to use it. After that, most of the users switched very often looking among the first and the second screen. In total three users at two locations focused immediately on the second screen. The users that immediately focused on the second screen where at all locations the youngest and probably the most tablet affine users.

Interpretation: The focus of the first user attention indicates which of the screens might be considered as leading in the content consumption experience. Given the free choice where to focus the attention, the majority of users have chosen intuitively the main screen for the

first exploration and to see what the programme is about. The main screen indeed frames and provides the context for the additional information. However, as there are no control and coordination information on the main screen, users need to often switch their attention between the main and second screen in order to be able to understand the relationship between the content on them and to be able to discover and consume the offered additional information properly.

Implication: In order to facilitate a faster and easier understanding of relation among the content on the main screen and the offered additional information, the LinkedTV Application needs to better guide the user through the content consumption experience. One approach in this direction might be to place more control on the main screen, which is actually framing and providing context to the additional information. For example, some of the users suggested to have an indication on the main screen when and for which chapter additional information is available on the second screen. In such a situation the user could switch to the second screen only if he is interested in the offered information. Another solution suggested by two participants at Sound and Vision was to only show very little and more visual information on the second screen while watching the programme, which can easily be bookmarked. Then, the viewers can explore more information after the show is over, so they are not distracted while viewing the programme.

3.2.1.2 Understanding the role of second screen

At all three locations all users understood the purpose of the system from the very beginning and indicated that the second screen would present additional information for the TV program. Besides this common finding there were following specific findings regarding the overall understanding of the role of the second screen:

RBB – When participants looked at the second screen, they noticed that concepts (persons, places) which were mentioned or shown in the video were also displayed and highlighted in the second screen. All participants indicated that the amount of related information items shown in the second screen was enough but not too much. As additional information all participants expected to find some sort of text, links to further information, pictures and related videos (also from RBB, YouTube, etc.)

USG – The main programme starts with an overview of news that will be presented in the show. It takes more than three minutes for a first change on the second screen. As a result users were able to notice the first change in the chapter horizontal bar after more than three minutes, when the highlighted colour changed to the second chapter. It took also a few minutes for users to understand that highlighted chapter thumbnails are related to concepts mentioned in the current program. All users understood that the second screen provides additional information. However, it was not clear to all of them from the beginning how the additional information was related to the program and categorized in the different categories. This impression was enforced also by the fact that some concepts as “Obama” appeared in the two categories “WHO” and “WHAT” at the same time.

S&V – When participants looked at the second screen, they noticed that items that were mentioned and shown in the program were also presented in the second screen. This connection was stressed by the coloured bounding boxes around currently mentioned items. Almost all participants indicated they did not know what kind of information would be presented to them. Several expected different videos, since timestamps were presented in the keyframes of the items on the second screen.

Interpretation: To summarize, the main role of the second screen to present additional information was clear for most users, but a more in-depth understanding of the relationship among the main program and the second screen as well as among concepts and categories took some time.

Implication: The main functionality and goal of the LinkedTV Application should be better explained, so that users can easier understand. A clear categorization of the concepts is a key for fast understanding of the meaning of the concepts by users.

3.2.1.3 Overall first impression

The users either used a specific attribute to summarize their impression of the LinkedTV Application such as for example “good”, “attractive” or “interesting”, or they just described their impression in a descriptive way. The overall first impression of users was different at the three locations. Table 6 provides an overview of user statements clustered according to the same attribute used by users. To provide an authentic insight the statements are only classified according to similarities.

Attributes used by users to express their impression	User comments	RBB	UNISG	S&V	Total
Likes the application	Second screen not overloaded with information and likes the horizontal bars with categories and chapters	3	2		5
Good	Likes that topics are displayed in horizontal bars (RBB)); similar to other apps (HSG)	4	1		5
	Likes to have chapters of the show with topics on the tablet	1			1
Attractive		1			1
Interesting	(1)Even though user would look for additional information related to other concepts than offered; (2) Interesting but too costly to really provide all relevant additional information, Interesting, but also confusing - concepts I hear in the program, I don't find immediately; (3) Interesting but it might be too structured and pre-defined		7		7
	(1) Too much information/details on second screen; (2) Did not know what to expect			3	3
	Clear structure			1	1
	Likes the overview. Thinks key frames represent videos			1	1
	Total	**9**	**10**	**5**	**24**

Table 6: Overview of authentic attributes and statements users used to describe their first impression of the LinkedTV Application

RBB – Three of the users liked the application; four denoted it as “good” and one user as “Attractive”. All participants indicated that the amount of related information items shown in the second screen was enough but not too much.

USG – The majority of the users in St. Gallen found the LinkedTV Application interesting, one rated it as “good” and one user liked the application. Even though the evaluation of the majority of the users was mainly positive, three of the users that saw the curated version of the application mentioned explicitly that the pre-defined selection of topics and additional information might be too structured and too pre-defined. One user that also saw the curated version explicitly mentions that he might be interested in other topics than those presented. Another user was looking for a different chapter than the concepts offered on the second screen. The two users provided with the automatic version were in general more confused, required more time to understand the application and liked the application less. Indicative was also that several users associated the LinkedTV Application with other TV apps that they know or with their typical search behaviour for additional information while watching TV. The specific statements were: one user compared the interface to the Zattoo[7] interface, while several users compared the LinkedTV Application with their habits to follow up the discussion about TV topics on Twitter.

S&V – The users at S&V rather described their first impression in words than summarizing it in one attribute (see last three lines with a different colour in Table 6). Three of the five users evaluating the TKK application explicitly stated that there is too much information and details on the second screen.

Interpretation: The difference in the overall impression for the LinkedTV Application might be due to the different genres. News programs are characterized with dense information about many concepts such as events, persons, places and topics. While the news related to each concept or person are presented in a condensed and short form, the subjects of the TKK show are explained more in depth in the program itself. One user at S&V for example even mentioned: “*The expert is intriguing while he talks, so I would not look up information while he is explaining something.*” Thus, the need for additional information seems to differ. TKK users prefer rather to see much less information during the show and more afterwards, although even then the amount of information should be reduced and ideally be based on their preferences for specific topics and types of objects. On contrary, as the results in RBB and St.Gallen show, news audiences require more information. The results in St. Gallen even stress that also the choice of concepts for which additional information is presented is of high relevance. 40% of the St. Gallen users that were presented with the curated version would prefer additional information for other concepts than those presented by the application.

[7] See www.zattoo.com

Implication for the LinkedTV Application: The question about the first overall impression of users was asked, after the users were confronted with the application for the first time. The users were able to experience the way how concepts detected in the TV program on the main screen were presented on the second screen as well as to get an idea how many concepts and what kind of concepts might get detected.

The opposite findings for the two different applications indicate that users might find different concepts interesting depending on the specific genre of the main program. Different criteria might be used to determine relevant concepts depending on the specific genre of the main program. This is explored in more depth also in section 3.2.4.1.

Furthermore, the trials show that while watching the main program users might get individual associations which concepts are interesting to them and for which they would like to have additional information. Three out of five users at S&V thought there is too much information, while 40% of the users at USG experienced the selection of offered concepts too limiting and pre-defined. Possible solutions to improve this would be: To focus on quality than quantity in the choice of concepts and to classify concepts. Furthermore, personalisation might help to overcome the inflexibility of pre-defined selections of concepts for which additional information is offered to the users. Another solution might be to give the users more freedom to choose or enter search queries.

The association of users to existing experiences and other TV apps as well as social media imply that LinkedTV applications have to be up to the standard of prevailing TV apps on the market and provide connection at least to Twitter.

3.2.1.4 Division of attention among screens

At all three locations all participants had difficulties with dividing their attention between the main screen and the second screen while the original TV content was playing on the main screen. As soon as users get involved with the additional information in more depth they get disconnected from the main screen. At RBB and S&V all participants agreed that the app would be more suitable to use ***after*** viewing the show. During the live show they want to focus on the program and don't want to be disturbed with too much information on the main screen or on the second screen. The following statements of users at S&V illustrate this finding: "*I noticed that I was distracted by the second screen. It is possible that once you are used to the application you can do both at the same time." And "I didn't pay attention to the main screen."*

USG – At USG, the loss of attention to the main screen was experienced in two steps: When the user switches the focus from the main screen to the second and just looks at the second screen, he can still follow the main program by listening to the voice of the main screen. In this situation most of the users in St.Gallen did not consider the second screen as destructive. However, as soon as the user gets involved in trying to access the additional information on the second screen as well as to read it, the connection to the main screen is lost. Most users stated that they lost the program and that they have difficulties to get back

to it. The statement of one user can illustrate this finding: “If I read, I miss everything on the main screen.” One user explicitly stated that it is good to have the choice to use the second screen or not and mentioned that she would probably put the second screen away in order to consume the content on the main screen or would use it only during advertising breaks.

Implication: In order to limit the loss of attention and to enable consumption of the content on both screens several approaches were suggested by the users and might be applicable:

- To provide more control elements on the main screen. As proposed by several participants at least the possibility to pause the main program while consuming the additional information in depth, would enable them to consider the content on the main and second screen.
- To provide additional information in a form that it can be consumed fast and at the same time while listening to the main screen. This can be achieved by providing more pictures than text and only short summaries. However, this solution might be rather suitable for shows as the TKK show when the same chapter is present in the main program longer, than for news shows were concepts are changing very quickly during the program.
- To optimize the presentation of additional information for consumption after the main program was consumed. This approach would also meet the suggestions of a majority of users that considered using the application after watching the main program.

3.2.1.5 Target audience and program

After the users got the first impression of the program, we wanted to know from them who the target users of the application might be. The users provided answers in two ways: by stating the age range of potential target users, and by describing the potential target users through specific characteristics. Some users mentioned even several target groups. At the three locations the following specific answers were received:

RBB – At RBB most of the users considered “Everyone (4x)”[8] or “People under 65 (3x)” as potential users, Furthermore, the following target groups were mentioned additionally: “Younger audience (2x)”, “Technology versed audience (1x)”, and “People with higher education (1x)”.

USG – At USG four users considered children and younger persons as a suitable potential target audience. One of them explicitly considered the possibility to provide a pre-selection of additional information as suitable to control the information consumption of children. One user mentioned that target users might be better described by their motivation rather than age. One user explicitly mentioned persons with age in the range 14-40 years, three users considered technology affine and tablet users as a suitable target audience and one user

[8] The numbers in brackets denote how many timest he specific answer was mentioned.

explicitly mentioned that single TV watchers are more likely to find the LinkedTV Application useful than persons who watch in groups.

S&V – At S&V the results were as follows: TKK viewers (5x); art history lovers (3x); people that tend to use apps (1x); a younger audience (1x); and highly educated people (1x).

Summary and interpretation: At S&V the majority of users considered the potential target group for the TKK LinkedTV demo clearly among the TKK viewers and more general among art lovers. The users at RBB and USG considered a broader target group as potentially interested – in general users below 65 years, technology affine and tablet users. Furthermore, users expected that viewers with higher education can be more interested than viewers with lower education. This difference in the opinions is again due to the different genres: news are of a broader interest and have in general a broader audience, while shows as TKK are watched by persons interested in arts and TKK.

Implication: The suggested potential target audiences by users provide an indication for the potential market for the LinkedTV Application. For TV shows that are thematically more focused the potential target audience for a LinkedTV Application will probably be among the existing audience base of the specific TV show. The number of users that already use a tablet and are technology affine might provide an indication how big the potential market for a LinkedTV Application might be based on figures for existing audiences.

For TV shows that are more general interest as news or documentaries and similar, the number of potential users might be higher and will rather depend on education and affinity to technology than on age. One user believed also that the readiness to use the LinkedTV Application could be determined by motivation to consume TV content and find additional information, rather than by age demographics. This finding was also enforced by the fact that several users explicitly mentioned that all users below 60-65 years might be interested in using the LinkedTV Application.

Even though age seems to be less important, some users subjectively judged that children, youth and young adults (“digital natives”) might be suitable audiences for specific programs provided with a LinkedTV Application. The pre-defined provision of additional information was considered as suitable for presenting educational programs to children with a specific advantage to pre-select editorially the suitable additional information for the children. “Digital natives” were considered as a suitable audience as they are considered to consume additional information “bite by bite”.

Also, one user at USG indicated that single TV watchers are more likely to find the LinkedTV Application useful than persons who watch in groups.

Summary of Results Regarding Target Program Besides suggesting the target groups, users at the USG also provided some input for which type of TV shows the LinkedTV Application might be suitable.

The users agree that the LinkedTV Application is especially useful on the one hand for knowledge-oriented TV programs such as documentaries, reportages, political programs, how-to, and quiz shows, and on the other hand for TV shows such as news that contain mainly timely and up-to date information. Sports programs are also considered a good application domain, where the LinkedTV Application can be used to display statistics and background information on athletes and teams or even provide most attractive and spectacular fragments of sports matches or athletes. Many users believe that the sharing/bookmarking features of the LinkedTV Application make it useful for TV programs which already motivate users to gossip/discussion, e.g. entertainment programs and how-to programs, such as cooking shows or travelling shows.

However, the users have very mixed opinions on the suitability of the LinkedTV Application for movies / soap operas as a type of TV content. One user believes that *stars and celebrities* as a related type of TV program is also relevant to less educated people.

Implication: The LinkedTV functionality is considered to be useful in particular for knowledge-oriented types of TV content as reportage, documentary, quizzes, and how-to-programs. For this type of shows the suitable additional information seems to be rather additional, explanatory knowledge then timely and up-to date additional information. The second group of shows might be news and entertainment as sports, stars and celebrities where rather up-to date content is required.

3.2.2 Understanding the user Interface

3.2.2.1 Connection between main and second screen

There are several connections between main and second screen that need to be known and understood to properly use the application:

1. “Task division connection” – This connection refers to the division of tasks between main and second screen: The main screen provides the program while the second screen provides the access to the additional information as well as the partitioning of the main program in chapters.

2. “Content connection” – This connection refers to the logical and semantic connection between the content and the main and the second screen. It is important to understand that concepts, persons and places mentioned or shown in the main program are the concepts for which additional information is provided in the respective categories on the second screen.

3. “Chapter and program connection” – This connection refers to the segmentation of the main program in chapters and the fact that those chapters can be watched in a non-linear way and can be consumed independently of each other.

4. “Coordination connection” – This connection refers to the coordination between the main and second screen. The content synchronization among both screens is supported automatically. Some additional coordination is possible only through the second screen with

the possibility to change the content on the main screen by skipping to different chapters through the chapter horizontal bar on the second screen. This coordination enables users to watch the main program and access the additional information in a non-linear form.

At all three locations quite similar results related to understanding the connections between main and second screen were achieved:

RBB – At RBB users were able to quickly understand the “Task division” and the “Content Connection”, but needed additional instructions in order to understand the “Chapter/program” connection.

USG – At USG all users understood the “Task Division” and “Content Connection”. However, depending on how users approached the application, they needed more or less time to understand the “Content Connection”. Users that focused on the main screen with the curated version required less time even though all had to wait three minutes before a change in highlighted chapters was visible on the chapter horizontal bar. Users that focused on the second screen were not able to get the “Content connection” without help from the moderator, as they completely missed the content from the main screen. Also users confronted with the automatic annotated version (see section 2.2.5 for explanation) needed more time and were confused. Most of the users had difficulties to recognize the relation among chapters and the main program. The time information provided on the chapter thumbnails presented in the chapter horizontal bar was also confusing for most of the users. It was difficult to distinguish if the time is the starting time in the main show or if the time indicates how long each chapter is. Five of the ten users thought chapters are separate videos and not parts of the same program. The “Chapter/program” connection was realized after users got additional explanations. All users were not able to realise the “Coordination connection” and needed help in order to realise its existence and to be able to use it.

S&V – Three of the five users noticed the “content connection” among the main and second screen. These were the users that also focused first on the main screen. One user that focused on the second screen immediately did not understand the “Content Connection” between the main and second screen. This user completely missed the connection. One user did not understand the “Content Connection” due to technical problems in synchronisation among main and second screen during his trial.

Interpretation: Even though all users understood the division of tasks among screens and the “Content connection”, this required a high cognitive involvement of users. This was due also to the fact that the synchronization was not perfect. In addition, during the trial the users were not able to understand the “Coordination Connection” themselves. Furthermore, it was difficult for several of the users to realize the “Chapter/program “connection. This is due on the one hand how the LinkedTV Application is communicated. When confronted with the claim “With LinkedTV you will get additional online information for TV programs” users do not per se expect that they will also get the program as chapters. On the other hand there was no help or support built in the application to support users to understand this easier.

Implication: The question is in which form LinkedTV wants to support the content consumption experience and how the application is communicated to the user. There are two possibilities:

- The user listens to the main program and hears or sees something for which he would like to have additional information about and tries to sport the chapter on the second screen. The risk in this approach is that the user might never find what he looks for. In this kind of usage situation it would be helpful to have an indication on the main screen for which concepts additional information is available.
- The user watches and gets attracted to what is offered as additional information on the second screen. This usage pattern requires that the user constantly divides attention among the main and second screen to find out if there is something interesting for him/her. It also requires higher cognitive involvement of the user to pay attention to both screens at the same time with the higher risk to frustrate the user if nothing of the offered information at the end is interesting for him.

Given the different genres and the different meaning and characteristics of the information provided in the two programs news and TKK, it might be that different approaches are suitable for different genres. The news programs are providing a lot of details but in a condensed form, and the information is related to current happenings. Thus, news is also the kind of program that has a certain short time of relevance, as each day there are new news. Thus, the first option where the user listens and reacts to something that interests him might be more relevant for the news show. Compared to the news, the TKK show contains knowledge based information, which is of long lasting relevance and will probably not change. At the same time the density of new concepts mentioned in the program is lower and there might be more room for exploring additional information on the second screen during and after the show. Thus, the second approach might be more suitable for the TKK program, where the density of new information is lower and the user needs to less often switch attention among first and second screen. Also in this usage situation, indication of concepts for which information is available on the second screen would improve the ease of use of the LinkedTV Application.

3.2.2.2 Overall structure

Subject of the evaluation in this part of the trial was the main structure and visualization of categories and chapters in horizontal bars. In total four horizontal bars were presented to the users: three for the categories “WHAT”, “WHO” and “WHERE” and the fourth one for the chapters.

All users, at all three locations, liked the structure and considered it intuitive and easy to understand. However at each location users also gave specific remarks that are summarized below:

RBB – Users at RBB understood the structure, but had difficulties to distinguish categories and chapters. Compared to the findings of S&V users, RBB users did not consider that there is too much information in the horizontal bars.

USG – The overall structure in horizontal bars was liked by all users. Several noticed that the same concepts are displayed at the same time in different categories. Also difficulties occurred in distinguishing categories and chapters.

S&V – Except of one user, the remaining four users noticed the different categories. Two users explicitly would prefer less categories and less information. One user thought only the first row is applicable and concentrated at the beginning on it.

Interpretation: In summary the proposed overall structure in horizontal bars was understandable and intuitive for users at all three locations. The question is rather how many categories and how much information should be presented. Users of the news application considered the provided information as sufficient or would like to have even more information. Users at S&V considered the LinkedTV Application to provide too much information. Furthermore, as also the next section confirms, the difference among chapters and categories was not clear to users.

Implication: The basic structure in horizontal bars can be kept, as all users confirmed it. For each genre a separate decision is necessary with respect to how many and which categories are relevant. A distinction in the visualization among chapters and categories should be made in order to point out the difference between these two concepts.

3.2.2.3 Categories/Colours

With respect to the question if users like and understand the colours applied in the LinkedTV Application, the following specific feedback was received:

RBB – Seven out of nine users liked the colours and three of them found them helpful. Only one user mentioned that they are not needed. The remaining eight participants all mentioned that the use of different colours for different categories was useful.

USG – The majority of users likes the colours even though two think that they are not really necessary. One did not understand the colours and one did not notice them. Only one user explicitly did not like the colours. Two users explicitly mentioned that they would rather have a white background and one of ten users explicitly liked the black background.

S&V – At this location one user did not understand the colours; one took a while to understand; three of the five users understood the role of the colours, but one of them did not think they are useful.

To summarize, in general slightly above 50% of all users at all three locations liked the colours. About one third considered them as not needed.

Implication: To keep the colours as a mean to visualize different meanings of elements on the screen. An option to be considered is that a minority would rather like to have a white background for the application.

3.2.2.4 Categories versus chapters

Regarding the understanding of the difference among categories and chapters, the following feedback was provided:

RBB – What the participants didn't understand was the difference between the items inside the category bars and the items inside the chapter bar. All of them thought they were the same kind of “objects” with the same kind of additional information behind. There were two reasons for this misunderstanding: firstly, the chapter bar is exactly the same as the category bars it only differs in colour and in the label and secondly, the timestamps which were presented in all the keyframes of the items on the second screen were a source of confusion, because not only chapter thumbnails had time stamps but also the thumbnails of the concepts presented in the horizontal bars of the categories.

USG – The majority of users needed additional explanation to understand chapters and their role and their differences compared to categories. Once explained, users liked the chapters. Three of the ten users even explicitly mentioned at the end of the trial that chapters were the most interesting innovation in the LinkedTV Application (see section 3.3.1.2). Three users suggested visualizing the chapters differently, for example in a larger horizontal bar and two users suggested to put them on top of the screen instead at the bottom. One user indicated that the labelling of the chapters was quite strange and impedes the understanding of the role of chapters. For example he asked:” What does “Straffes Programm” mean?”

S&V – Three of five users did not understand right away the different nature of the chapters and were confused. They considered chapters as categories. One of the users tried explicitly to deal with chapters in the same way as categories.

Interpretation: To summarise, at all three locations users had difficulties to understand the differences among categories and chapters. The specific role of chapters was at the end understood by users, but only with additional explanations. This is due to several reasons: 1) Equal visualisation of chapters as categories; 2) Similar labelling with time stamps on thumbnails of chapters and concepts (for illustration see figure 1); 3) The less intuitive labelling of the chapters compared to the labelling of concepts in the three categories. For example one chapter in the news application was labelled as “Straffes Programm” and it was difficult for users to attach any meaning to this label, before they heard in the main program that Obama and his family had a dense program during their visit in Berlin. In this case also the picture on the respective chapter thumbnail was not intuitive and explanatory. In case of the TKK application chapters are dedicated to art objects discussed in the main TV show. Thus, the chapter labels and the picture on the chapter thumbnail was more explanatory and representative for the main content by referring to the specific object (see also Figure 1) discussed in the main show.

Implication: Given that LinkedTV is promoted as providing additional information for TV program, users do not expect to find chapters. However, chapters are the basis for bookmarking and clustering the additional information and as such important part of the functionality offered by the LinkedTV Application. Given this they need to be better visualised and explained. Furthermore, the labels of the chapters need to be more intuitive and providing more guidance to users. Also a better coordination and visualization of activities related to chapters is necessary (see also section 3.2.3.5).

3.2.2.5 Not understood by users

The users mentioned a number of different aspects of the LinkedTV Application which they did not understand yet, or understood only after experimenting with the LinkedTV Application for a longer time than they would normally be ready to spend to get familiar with a new tool.

All users did not understand the following:

- The aspect most frequently mentioned by users at all three locations was the actual possibility to skip to a chapter of own choice on the main screen and to watch the main program in a non-linear way with the help of provided chapters in the chapter horizontal bar. All users needed help to understand this. Further aspects related to chapters that were not understood were: the meaning of time information on the chapter thumbnails; the difference of chapters and categories; and the difference among highlighted and not highlighted chapters. Overall it can be concluded that neither the chapters nor the functionalities related to them were understood.
- The need to double tap on the chapter thumbnails to get access to the additional information was also not understood by all users.
- What the possibility to “share” means. The majority of users expected a real time chat with other users watching the program as well as access to Twitter and tweets related to the program.
- The meaning of the icons in the upper left corner of the 1st overview interface of the second screen (for illustration see Figure 1).

Some users explicitly asked:

- Why some items are highlighted?
- Why persons are in the “WHO” and “WHAT” category?
- What is the difference among categories and chapters?
- How to get back from the additional information to the 1st overview interface of the second screen?

Overall the least understood aspect of the LinkedTV Application was the chapters and the functionality related to them.

3.2.3 Navigation

The assessment of the navigation of the LinkedTV Application involved the evaluation of the following functionality:

- Viewing concepts presented on the 1st overview interface of the second screen
- Accessing additional information on the 1st overview interface of the second screen
- Viewing additional information on the 2nd interface of the second screen application
- Viewing additional information by accessing external sources
- Going back to the 1st overview interface of the second screen from the interface containing external information
- Browsing chapters
- Skipping to chapter on the main screen in a non-linear way.

The results of the evaluation for each of these navigation functionalities are described in the following subchapters.

3.2.3.1 Navigation related to viewing concepts on the 1st interface of the second screen

At all three locations users quickly started to slide through the concepts provided in the horizontal category bars. Despite of the easy access to the concepts, several open questions were noticed by users:

RBB – Participants mostly focus on the highlighted items and try to select these. Several users thought at the beginning that only highlighted concepts are active. One user was irritated by the time code on the chapter thumbnails. Two users noticed that persons are sometimes displayed in the categories “WHERE” and “WHAT”.

USG – All users intuitively started to slide over the concepts. Only half of them paid attention to the highlighted concepts. Several problems were noticed by users: All users (curated and automatic version of the LinkedTV Application) noticed that sometimes persons are provided in not just the “WHO” category but also in the “WHAT” categories even at the same time. Two users of the curated version were confused to see “Nowitzki” as one concept. Nowitzki is mentioned only once as one of the guests at the Obama dinner and many users missed that sentence in the main program and were confused to get additional information about Nowitzki, without seeing the relation of this person to the main program. One user of the curated version did not find the relevant topics he would have liked to have. She mentions: “I hear Airport Tegel, but the application still highlights “Berlin”. Is this because the airport is in Berlin or because Obama’s visit was in Berlin? Can I get information related to the airport Tegel?” Another user hears Guantanamo and expects information about this topic, but it is not available. Two users were looking for a connection among concepts of different categories and if there is a vertical connection among concepts. The two users that were trying the automatic version of the application (for illustration see Figure 6) had problems to

understand missing or broken labels on the topics as well as to quickly find concepts mentioned in the main program.

S&V – Similar to the reaction of users at RBB, at S&V participants mostly focus on the highlighted items and tried to select these. Several participants thought that they could only select the items that were currently highlighted. Some users missed some concepts by focusing only on the highlighted ones. When they tried to look also at the not highlighted concepts, they figured out that they could also get more information about the other items. One user noticed that museum was presented in the "WHAT" category.

Interpretation: As discussed also in sections 3.2.1.2 and 3.2.2.1 users were able to quickly understand the connection among the main content as well as categories and concepts and were able to navigate through the concepts. However, users experienced several problems at all three locations that made them unsecure. These can be summarized as follows:

- Difference among highlighted and not highlighted concepts
- To hear and see concepts in the main program, but not see a related concept on the second screen.
- Wrong categorization of concepts (for example persons in "WHAT" and "WHERE" categories)
- To see concepts on the second screen that they have missed on the main screen

Implication: UI and offered functions should be better explained. This might be achieved with providing additional instructions or by providing short instructions within the interface. More coordination among main and second screen might help users to be able to better consume the additional information. Some of the problems experienced are related to the quality of annotation and the choice of concepts to which additional information is displayed. This holds for both versions of the LinkedTV Application – the curated and the automatic version, even though the experienced problems in the automatic version were higher. The experienced problems indicate that a better quality in identifying relevant concepts is necessary. Furthermore, relevant concepts might differ for different genres. All this implies a semi-automatical annotation with editor decision about relevance of concepts. This aspect will be discussed in more detail in section 3.2.4.1.

3.2.3.2 Navigation related to accessing additional information on the 1st overview interface of the second screen

The additional information was presented to users on the second screen in two steps:

- First, on the "2nd summary" interface of the second screen application (for illustration see Figure 2) a short summary of information about the selected chapter is presented. This short summary usually involved a picture of the chapter, links to additional web information together with the instruction to tilt the screen (for a screen shot see also figure 2); and

- Second, the presentation of the actual external additional information, which is presented in the so called 3rd interface of the second screen application (for illustration see Figure 3). The additional information was in most cases a Wikipedia page and in some cases a link to an official website of a person (for example this was the case with the additional information for Michele Obama).

To access the additional information, at all three locations all users first tried a single tap and a long tap to open the information behind the “WHO”, “WHAT” and “WHERE” concepts, before figuring out (or being told) to double tap. They all mentioned this is not intuitive and throughout the test they kept trying a single tap first because that is the standard way to navigate on the tablets they own and it takes a lot of time to re-learn to navigate applications or programmes.

Users also had to understand the difference among the highlighted and not highlighted concepts within the horizontal bars. At The University of St. Gallen the users concentrated on the labelling and tried to connect labels of the concepts on the thumbnails with the topics mentioned in the program on the main screen. They paid less attention to the highlighted topics. Two of the five users at S&V thought that only the highlighted topics can be taped on. One user thought that only the single tap is necessary for activating the topics.

Implication: Navigation should be designed according to common tablet usage patterns. Unusual navigation frustrates the users, requires higher cognitive efforts to be understood by users, and enforces the loss of attention to the main screen.

3.2.3.3 Navigation related to viewing additional information from external sources

After a double tap on a chapter thumbnail on the 1st overview interface of the second screen, the users arrive at the 2nd interface of the second screen containing a summary of the available additional information. When viewing the 2nd summary interface of the second screen and the provided summary of additional information, participants at all three locations tried to open the link leading to more additional information by tapping on it. However, the tap on the links did not result in any action, because in the tested version of the LinkedTV Application (both curated and automatic version of the news as well as the curated version of TKK) there was no functionality implemented behind the links. The users were confused and frustrated that the tap on the link didn't work.

At **RBB**, after the unsuccessful try to open the link, two of the users tried to swipe, when that didn't work they were frustrated and said so. Two of them asked for some kind of contextual help or FAQ to use the application and stated that was indispensable in this case because the way of navigating through the application didn't conform to what they were used to. Only one user saw after a while the request to turn the tablet, the rest had to be told. All of them were surprised that this was the way to get there.

The users at the **USG** applied the same behaviour and had the same problems. Two users that tried to swipe the screen with additional information, after their single tap on the links did not work, were thrown out of the application. The majority had to be told to tilt the screen.

Compared to RBB and USG, at **S&V** some users saw the request to turn the tablet immediately, others needed to be told. After being unsuccessful in opening the link, some users also tried to swipe and were frustrated that it didn't work. They thought that turning the tablet is a nice idea, but that it complicated the interaction and preferred a single tap or swipe.

Implication - Navigation has to be designed and implemented in a way that is familiar for users and according to typical tablet usage patterns.

3.2.3.4 Going back form the screen with additional information to the 1st overview interface of the second screen

After the users arrived at the page with additional information from external sources and looked at the information, the next step was to go back to the 1st overview screen of the second screen. In order to achieve this, the users needed to tilt the tablet back in the previous position. Trying to go back to the overview led to the same behaviour at all three locations. At all three locations users tried to achieve the goal to go back to the 1st screen by applying the typical navigational approach for tablets. Users tried to turn again the tablet or swipe back. As a result of this action, two users at USG were thrown out of the application. Some of them (for example two at RBB and two at S&V) were looking for a back button. The right procedure would have been to tilt the tablet back in the previous position. Some users figured that out themselves others succeeded after being told. During the trials with several users the Wikipedia page remained on the screen after users have tilted the tablet back. In order for these users to proceed, an intervention from the observer was required.

Implication: Also in this case the navigation has to be designed in a way familiar to users and according to typical tablet usage patterns. Furthermore, the case when the user would go back and forth to consume information from several external sources has to be considered.

3.2.3.5 Browsing Chapters

At all three locations, all users could easily swipe to browse through the different chapters. However, for most of the participants at all three locations, it was not immediately clear what the thumbnails in the chapter layer represent and some believed it has the same functionality as the concepts shown in the category layers (WHO, WHAT and WHERE). Therefore they suggested that these should be visualized differently from the categories (e.g. three users out of ten at USG), or moving the chapter bar to the top and giving it a different weight e.g. using for it a different labelling or graphic component.

At **USG** specific findings were that most of the users were confused about the time stamp on the chapter thumbnails and had difficulties to understand its meaning. At the same time some users had difficulties to understand the meaning of some of the labels on the chapter thumbnails. The labels of the chapter thumbnails are set automatically during the video fragmentation and should provide a short association to both the chapter content and the part of the main program represented in the chapter. However, at least some of the labels failed to create this kind of association. For example the label “Straffes Programm” makes only sense if the content of the main program was consumed already and the user knows that the program is about Obama’s visit in Berlin and that his/her family had a dense program in Berlin.

Only at **S&V** users specifically even suggested to only display chapters on the second screen after the show is over. Some participants at S&V even suggested to get rid of them entirely.

Interpretation: See section 3.2.2.4

Implication: See section 3.2.2.4.

3.2.3.6 Skipping chapters on the main screen

All users were not able to figure out how to display the chapter on the main screen. Even after being shown how to select a chapter - long tap and slide it to the top of the second screen - they often failed to replicate this. For some users this activity was even more difficult as during certain trials there were some synchronisation problems at all three locations.

At USG several users were not sure if they succeeded with skipping to a chapter of their choice on the main screen, even though they completed the activity successfully. This was in particular the case, when subsequent chapters had similar setting in the background – the speaker of the news. They had to listen carefully, if they would hear the keyword used for labelling the chapter thumbnail. If this keyword isn’t mentioned at the beginning of the chapter, it was difficult for them to recognize if they were listening to the right chapter to which they wanted to skip on the main screen. As the program continues on the main screen and there is no indication neither on the main nor on the second screen that the user has skipped successfully to another chapter on the main screen, it is difficult to distinguish if a new chapter has started. This happens in particular when the user skips to a chapter on the main screen that was not already shown in the program of the main screen. As the topic and content is not known to him and there is no sign at the main screen if something new started he cannot tell for sure if he was successful. After experiencing the possibility to control the program, most of the users in USG were impressed by the possibility to be able to do this.

Interpretation: The current implementation of the functionality “Skipping to chapters on the main screen in a non-linear way” is too complicated and requires a high concentration of users and enforces the loss of attention to the main screen.

Implication: jumping among chapters in a non-linear form on the main screen needs to be implemented in an easier and more intuitive way. Additional coordination support that might help users to quickly asses if they have succeeded with skipping to a new chapter on the main screen would be very helpful. For example, having a subtitle on the main screen or a short notification on the second screen “Chapter XY has just started” would be very helpful.

3.2.4 Content

3.2.4.1 Evaluation of Concepts

One major innovation and technical feature of the LinkedTV Application is the ability to automatically detect topics in the main TV program for which additional information might be relevant. Based on previous user research [RHH13], the LinkedTV Application subject to the trial offered three categories of concepts that were covered with additional information. These are: “WHO”, “WHAT” and “WHERE”. In the “WHO” category, all the detected persons have been listed. In the “WHAT” category, specific topics, objects and events are listed, while the category “WHERE” involved detected places. The trial provided the opportunity to evaluate the following aspects with respect to concepts:

- If the proposed structuring of the topics in three categories was considered useful by the users.
- If the automatically detected and presented topics meet the user requirements and interests.
- If the users like the provided topics and if they find them informative and providing added value.
- If the user would choose the same topic as the ones presented in the application.

The results related to chapters were different at the three locations and are summarized below:

RBB – Participants understood the general structure of the second screen. Participants were mostly interested in concepts of the category 'WHAT' and ‘WHO' and two of them mentioned they would like to have one more category for sports. One of the participants suggested that it would be valuable to have the option to choose which of the three categories should be displayed for each show (personalisation).

USG – Participants were mostly interested in the categories “WHAT” and “WHO”, but didn’t mind to also have information about “WHERE”. Several participants mentioned that they would also like to have the categories “WHEN” and “WHY”, in particular with respect to why something is of relevance. Participants noticed several problems related to the concepts:

- To hear and see concepts in the main program, but not see a related concept offered on the main screen
- Wrong categorization of concepts (for example persons in “WHAT” and “WHERE” categories)
- To see concepts on the second screen that they have missed on the main screen

One user mentioned that the application is choosing a strange focus on topics and concepts. For example in the main program it was mentioned that the dinner with Obama took place in the Orangerie of the Castle Bellevue. The chapter presented by the application in this context was “Orangerie” in general. However, the user expected to be able to read more about the specific Orangerie at the Castle Bellevue and not only about “Orangeries” in general. Also, when the Institute “John F. Kennedy” was mentioned as the company where an expert interviewed in the show works, the application considers the person Kennedy as concept, and not the institute as concept in the “What” category. At the same time there was no concept pointing to the expert talking in the main program.

S&V – Participants understood the general structure of the second screen, but it was mentioned several times that not all categories were needed. Participants were mostly interested in topics of the category 'WHAT' and ‘WHO', not 'WHERE', therefore three of them suggested to remove the 'WHERE' category entirely. Regarding the concepts related to the show’s experts and the recording location, participants suggested showing these in a separate, general tab.

Furthermore, they suggested only showing one or two of the most relevant concepts per chapter in one layer during the show, and then showing more concepts afterwards.

Interpretation: Overall users evaluated the topics differently. Users at RBB and University of St. Gallen like the provided categories, “WHO”, “WHAT” and “WHERE”, but they would also find interesting to have more information about “WHEN” and “WHY” in particular why certain topics are of relevance. At RBB one user specifically mentions sports as one additional relevant category.

At S&V, users considered the category “WHERE” as not relevant. These differences in the evaluation are again resulting from the different characteristics of the two genres, which were already explained in previous sections of the document.

Implication: The differences in the evaluation regarding the relevance of the offered concepts and categories clearly show that probably there is no standard selection for all the different genres. Given this, the relevant categories have to be chosen and discussed for each specific genre separately.

The users would like to have more flexibility and choice, which concepts might be of relevance to them. They also would like to have more control and indication on the main screen for which chapter additional information is provided to be able to switch the attention to the second screen only if the interest of the user and the offered information matches.

More importantly is to describe the relevance criteria according to which concepts have been chosen. For example, this was not clear in the context of the concepts in the category “Who”. One strategic approach of the LinkedTV Application might be to aim for 100% of completeness in detection of persons. In this case it would be a good solution to detect any person mentioned or shown in the main TV show. This approach would mean that also additional information is provided for “Nowitzki”, who is one of the guests at the Obama

dinner, even though this fact is irrelevant with respect to the political goal related to Obama's visit to Berlin. An approach striving for more quality than quantity might focus only on the relevant persons for the given topic and skip "Nowitzki" as concept.

With respect to topics that are mentioned and discussed, to achieve completeness is more difficult. The same holds for objects that are discussed and shown in the main program. Which of them are mostly relevant? What are the criteria to choose the specific offered concepts at the end? Are their differences in the relevance and also in the importance of the provided concepts within one category? These are important questions that cannot be answered with the available version of the LinkedTV Application. LinkedTV would probably provide more value to the users, if selected concepts are classified according to relevance criteria that are understandable by the users.

3.2.4.2 Evaluation of extra information

The core functionality of the LinkedTV technology is the provision of additional information related to TV content. In the LinkedTV Application subject of the trial, the additional information was presented in two steps (see explanation and illustration in section 2.2.1, Figure 2 and 3).

The specific feedback at the three locations can be summarized as follows:

RBB – All participants stated that the additional information shown in the first level was interesting enough and apart from the absence of related videos were satisfied with the amount of information. They didn't want more text or more pictures at this level. In the second level all but one user said that the Wikipedia page displayed was fine for them and in some cases would also be their first choice when searching for more information on a subject for themselves. Wikipedia is for all users a trusted and reliable source of information. One user would in addition like to see more RBB content on the topic like the dossiers on special topics or news, e.g. Berlin Flughafen, Elections, etc. One user said the Wikipedia page was superfluous for him. He had enough information with the one in the first level. Participants also missed more visual information in the form of videos. They all pointed that the additional information offered by the application was valuable for them.

Furthermore, they suggested:

- more related videos on the topic (6x)
- in the second level of additional information not only the Wikipedia page but also other RBB contents e.g. dossiers on the chosen topic (1x)
- second level superfluous (1x)

USG – The main feedback of users in St. Gallen regarding the offered additional information was:

- Wikipedia can be found easily by the users themselves
- What is the up-to date information about Obama and his activities and opinions?

- Can I get access to Twitter and what is discussed about a concept under the specific #hashtag?
- What else up-to date information is available about the concepts mentioned in the main show? The users would rather have more up-to date and timely information than basic information from Wikipedia. One user gave the following example: “For example if they speak about occupation of Crimea and compare the current situation with the situation before the 1st World War, than it would be very valuable to read more about the situation before the 1st World War and to understand.”. Also the additional information should not repeat what is already said in the main program.

In general most of the users at the USG considered the provided additional information as superficial.

Most of the users liked the structuring of the additional information in two steps – first a summary and then the details on a separate screen. It enables the user to choose if he wants only the summary or more information.

S&V – Almost all participants asked for editorial written information about the specific objects on the show, or the type of object in general. The latter could also e.g. entail recommendations of more gold watch chapters from the show’s history, or a timeline of the development of gold watches.

Participants also liked to receive more visual information instead of textual. They indicated that they could have looked for the additional information on a Wiki page themselves and were therefore disappointed when only a Wiki page was shown as additional information. They did not think that had an added value.

In the case of the chapter shown to the participants about a Jacquemart-type gold watch by Parisian watch maker Breguet, they indicated to be interested in:

- more information about the type of object in general (5x)
- information about the specific watch itself (4x)
- the maker, Breguet (3x)
- the Jacquemart technique (3x)
- the mythological figures (Hebe and Charitas) depicted in the watch (2x)
- the World Fair (where the watch was bought) (2x)
- the expert, Fred Kats (1x)
- opinions on the art object or art in general (1x).

Summary and interpretation: At all locations users considered the Wikipedia page as superficial and some of them were disappointed to get quite often Wikipedia as additional information. The main comment regarding that was that they would probably find Wikipedia easier alone then going through the LinkedTV Application. Related to this, the main message of the users is that the LinkedTV Application should provide better results than if they have to google the additional information themselves. Furthermore, the users

mentioned very specific additional requirements, what kind of additional information they want. It can be summarized that users would rather like to have more pictures and video information as they can be consumed faster and easier as well as editorial content related to the detected topics.

Implication: The main message from the users can be summarized in the following sentence: The LinkedTV Application should provide better results then searching over Google by the users themselves. The additional information should not be superficial and basic as Wikipedia articles. This in particular means that the LinkedTV Application needs to be improved regarding the following aspects:

- Many users at all three locations explicitly mentioned that they would like to have an overview of the discussions in Twitter related to the TV shows on the main program. For example, instead of having only basic information about Obama, which is presented in the Wikipedia article about Obama, it would be more interesting to have current information and information about Obama related to the topic discussed, for example what is his opinion about Berlin, or what is his opinion about the visit in Germany.
- As the two trials took in connection with two public broadcasters and show producers, users expect to have as additional information more editorial choice from the archives of the TV broadcasters and content producers.
- Furthermore users would like to have more pictures and videos as they can be consumed easier and faster than textual information. This can also be achieved by prioritizing and putting pictures and videos on the first place.

In particular more editorial content and in case of news, up to date content needs to be provided.

Maybe, an improvement might be achieved if the additional information as it is currently collected and presented can be rated automatically. For example, the information about persons can be classified in:

- basic information about the person, which might link to Wikipedia or a personal homepage, and
- Up to date information that is currently available on the Web about the person, published within the last week, or the last month.

The same structure could be provided also for the different concepts. Given that the users had a lot of associations with currently available apps and applications for example, in direction of social TV, the LinkedTV Application needs to be up to the current standards of second screen applications in particular Social TV second screen applications. This in particular means connection to social media in particular Twitter where the specific hashtags provide concrete thematic links to the TV program.

3.3 Final interview results

After the assignments were finished, a short semi-structured interview was held with the user. The questions of the interview were:

- “Did you miss anything in the application which could be valuable for you?”
- “Did you find something specially valuable/attractive/innovative for you in the application?”
- “Would you recommend this application to someone else?”
- “Would you pay for this application in its final version?”

3.3.1 Summary of Results from Final Interview

3.3.1.1 Missing Functionality

The users mentioned a variety of functionalities they would like to see in a productive version of the LinkedTV Application. The missing functionality referred to different aspects of the LinkedTV Application. Most of the users missed social features and functionality related to social media. The specific user statements can be summarizes as follows:

Missing social features:

- Two participants indicated that social media icons are missing and that they for instance use Twitter hashtags of shows to follow the conversation around episodes (S&V).
- Social and comments of social connections
- To chat with social connection about TV program
- See who else is watching and which of my friends are watching
- Integrate with Facebook and in particular through hashtags with Twitter

Further missing functionalities that were mentioned by users can be summarized as follows:

Concepts and Categories:

- Users of the news application repeated that the categories “WHO”, “WHAT” and “WHERE” were not sufficient and would like to see more categories such as “WHEN”, “WHY” and “HOW”.
- Possibility to define own search for information independently from time and location

Personalisation:

- Users asked for better customizing of the information to the individual user (one user at USG) as well as personal and anonymous recommendation arguing it was not clear how the application determines which user is interested in what (one user at each three locations),

*Navigation***:**

- Easier orientation
- More control over the main screen, in particular the possibility to pause the main program when consuming additional information in depth on the second screen
- To use the second screen as main screen
- More help with navigation as handbook, manual, contextual help, language switcher and similar

Additional Information:

- More program data
- Not only text but also video, podcast, pictures
- In particular more editorial info than just search results

Other extensions:

The users provided also ideas how the LinkedTV Application might be extended with useful or advertising information. For example several users mentioned that they would like to add own comments to the provided information. One user mentioned that he would expect more TV channels to be available in a non-linear way and with additional information not only one.

Finally, users asked for selling/advertising functionalities, such as a possibility to buy the sports shoes of the athlete currently depicted in the sports program on the main screen, or hotel booking functionalities and travelling information for the same travel route or place currently depicted on the main screen.

3.3.1.2 Valuable or interesting

The functionalities considered most valuable by the largest number of users at all three locations together were the fragmentation of the main TV show in *chapters* together with the functionalities related to chapter. These were in total 11 users out of 24 at all three locations. The 11 users that explicitly mentioned chapters as the most valuable feature were distributed among the three locations as follows: at RBB 3 out of 9 users, at USG 6 out of 10 users, and 2 out of 5 users at S&V. Most of these 11 users like the possibility to watch TV programs in a non-linear way by skipping chapters and choosing chapters they want to watch on the main screen. Several users suggested that chapters could be used as learning units, e.g. in case of how-to programs such as cooking shows. The bookmarking feature is considered most valuable by two of the 11 users.

On the second place of mostly valuable features is the *additional information*: 4 out of 9 users at RBB find the additional information valuable, at USG 4 of the 10 users considered the additional information valuable for entertaining. Furthermore, users mentioned the possibility to get additional information quickly, automatically selected and sorted by importance. At S&V participants indicated that they thought it was valuable that the different items were presented to them. Also, knowing how to spell concepts is a jumping-off point that helps them to find more. All participants at S&V indicated that in its current state, the second screen app is better fit as a catch-up/informative app to use after viewing the programme, since there's too much information shown.

On the 3rd place is the synchronisation among main and second screen and the quick and dynamic presentation of the additional information on the second screen along the program. In total 3 of the users in USG and one user at S&V mentioned this feature as valuable.

Some of the users were also sceptical. One of the users at USG was sceptical that the LinkedTV Application would be able to really provide relevant information to users according

their personal needs and was also sceptical with reference to the potential business models. Also one of the users at S&V explicitly mentioned that there is no added value of the LinkedTV Application except of chapters, as the provided information is superficial and the user can find information faster himself.

3.3.1.3 Recommend the App

Table 7 summarizes the answers of the users as well as their comments at all three locations regarding the question if they would recommend the LinkedTV Application

Yes	No	Maybe	Comments	RBB	UNISG	S&V
Yes			(without further comment)	8	4	
Yes			If the app is not limiting and if there is a clear advantage compared to searching for information manually.		1	
Yes			Recommend to teachers and for watching together with friends.		1	
Yes			For people interested in technology		1	
Yes			Yes, once the app is finished. The UI usability needs to be ensured, bugs need to be fixed		1	1
Yes			The audience might miss the news when dealing with additional information. Some people may be able to deal with two information sources simultaneously.		1	
Yes			If all watched TV channels and programs are supported		1	
Yes			Would recommend to TKK viewers			1
		Maybe	Depends on costs		1	
	No		Doesn't work properly			2
	No		No. Too many steps and actions need to be taken to get information. Yes if simplified.			1
	No		(without further comment)	1		

Table 7: Overview of results related to recommendation

The clear majority of the users indicated that they would recommend the LinkedTV Application.

Comments on the decision to recommend include the following: The app shall not be limiting and needs to provide a clear advantage over manual information search, recommended to teachers and for watching together with friends, recommended to people interested in technology, and recommended if all watched TV channels and programs are supported.

However, users also indicated that the audience may miss the TV program itself when dealing with additional information, and that only some people were able to deal with two information sources simultaneously. Also, the app needs to be finished before a recommendation will be given, i.e. the usability of the UI needs to be ensured and bugs need to be fixed. Such open issues are also the reason why some users chose not to recommend the app (yet). Also, one user criticized that too many steps and actions need to be taken to get the information, resulting in a similarly high effort as with manual information search. One user chose not to recommend the app without further comment, and another user did not

want to tie him-/herself down to a yes/no answer, mentioning that the decision to recommend depended on the cost of the app.

3.3.1.4 Payment

Generally, the user trial of LinkedTV Application revealed a moderate to low willingness to pay for the application, given that it is a prototype and many details of the LinkedTV Application's innovative functionality still need to be elaborated and reworked. However, the three user trial locations (RBB, S&V, St. Gallen) did deliver very mixed results:

RBB: the clear majority of users are ready to pay for the application given it is not too expensive. The price explicitly mentioned by two users is 1.99 Euro for the application. One user expected the application to be free when it is offered from a public broadcaster.

USG: Half of the users indicated they would be ready to pay for the LinkedTV Application, however imposing various conditions such as a low price, well-known brand, high reliability and a community of users. Two users mention that the readiness to pay for the application is increased since TV content needs to be paid for anyway and since paid services yielded a better quality. Users that expressed willingness to pay compared possible prices with their previous payment behaviour for apps. All of them would pay in the range from 3 Swiss Francs (2.5 Euro) over 5 Swiss Francs to 20 Swiss Francs for a special channel. Reasons for not being ready to pay include a lack of utility of the application and that the functionality is not yet properly working. Some of the users who are not willing to pay believe that others might be, and that the application's commercial success could be improved by combining it with advertising/sponsoring and by choosing a freemium price model, similar to Spotify[9].

S&V: No participant wanted to pay for the app as it is now. The reason they gave is that people in the Netherlands are not likely to pay for apps made by public broadcasters, since these are made with public money. However, some would in fact consider paying if changes are made: one participant indicates they might pay if you can actually win something by using it; another might pay if that ensures their personal information is protected and not shared or mis-used and a third one might pay only if the app is improved and they can use it for free at first to see if it's worth paying for.

In summary, 12 (52%) of 23 users were not willing to pay for the app. Three users explicitly mentioned that they would not pay because the app is offered by a public broadcaster and expect it to be free. One user at S&V and several users in St. Gallen were not willing to pay as there is no clear added value of the application and because they would rather not use the application. All of the users that tested the TKK application were not willing to pay. The lower or missing willingness to pay for the TKK application might also depend on the genre of the program to which the LinkedTV app is offered. It remains an open question, if different

[9] For more information see https://www.spotify.com/ch-de/

genres would result in different willingness to pay or with other words if additional information might be more valuable for audiences of different genres and also depending on the way the information is presented in the main program. In the TKK application and program topics might get a more extensive and detailed coverage, while topics and persons are presented in a very condensed form in a news program.

11 of the 23 users indicated they would be ready to pay for the application. All of the users were either from the RBB or St. Gallen trial that tested the news application. Even though, the mentioned minimum price of 2.5 Euro by the Swiss participants is slightly higher compared to the lowest price mentioned by RBB users, it might be expected that a price of 1 to 1.99 Euro might be appropriate and acceptable for the LinkedTV Application on the German speaking markets and for the news application.

3.4 Results online survey

After the users tried the application they could provide a final assessment with a short online survey. The online survey involved the following 8 variables (see also Appendix 3):

- Graphical Design
- Icons & Symbols
- Colours & Contrast
- Main Page: Structure
- Names of Categories
- Additional Info Page: Structure
- Additional Info Page: Content
- Ease of Use

The users could either value the variables with a Likert scale with 5 items (from 1 “like it very much” to 5 “don’t like it at all”), or chose the options 6 which denotes “Didn’t see it/realise it was there” or 7, which denotes “Didn’t understand it”.

The individual results of the online survey per location and in total for all three locations together are summarized in the subsequent subchapters.

3.4.1 Results of the online survey at RBB

The user trials of the LinkedTV Application received very mixed responses at RBB (see also Table 8). The variables *Graphical Design* and *Icons & Symbols* are considered to deserve substantial improvement and the variables *Names of Categories* and *Ease of Use* are graded fairly. In contrast, the remaining variables received responses far better than at the other locations, USG and S&V. The responses *“did not see it / did not realize it was there”* and *“did not understand the feature”* was received for none of the variables from any user.

User	Graphical Design	Icons & Symbols	Colors & Contrast	Main Page: Structure	Names of Categories	Additional Info Page: Structure	Additional Info Page: Content	Ease of Use
RBB1	3	3	2	1	2	1	1	3
RBB2	4	4	1	2	2	2	2	3
RBB3	3	4	1	1	4	2	1	3
RBB4	3	3	2	1	2	1	1	2
RBB5	3	3	1	2	2	2	2	2
RBB6	3	3	3	1	2	2	2	2
RBB7	3	3	3	1	1	2	2	3
RBB8	3	3	2	1	4	2	2	3
RBB9	3	6	2	1	1	2	2	2
Average	**3.1**	**3.6**	**1.9**	**1.2**	**2.2**	**1.8**	**1.7**	**2.6**

Table 8: Overview of RBB online questionnaire results (individual values and means)

3.4.2 University of St. Gallen

Generally, the user trials of the LinkedTV Application received a positive response from the users at St. Gallen (for details see Table 9). The worst responses were 2.5 and 2.4 on a scale 1 (best) to 5 (worst), for the variables *Additional Info Page: Content* and *Ease of Use*. Two variables received mean responses better than 2.0: *Names of Categories* (1.6) and *Additional Info Page: Structure* (1.9). Only within the variable *Icons & Symbols*, one user indicated to not have seen the feature / not having realized it was there. The response *"did not understand the feature"* was received for none of the variables from any user.

User	Graphical Design	Icons & Symbols	Colors & Contrast	Main Page: Structure	Names of Categories	Additional Info Page: Structure	Additional Info Page: Content	Ease of Use
USG1	3	4	2	4	2	2	2	3
USG2	1	1	4	2	1	1	3	2
USG3	2	2	2	2	1	3	3	1
USG4	4	6	4	2	2	2	3	3
USG5	2	2	2	1	1	1	1	3
USG6	2	3	3	2	2	2	3	3
USG7	1	2	1	1	1	1	2	2
USG8	2	2	1	2	2	2	2	3
USG9	2	3	2	2	3	2	3	2
USG10	2	2	2	3	1	3	3	2
Average	**2.1**	**2.3**	**2.3**	**2.1**	**1.6**	**1.9**	**2.5**	**2.4**

Table 9: Overview of USG online questionnaire results (individual values and means)

3.4.3 Sound and Vision

At S&V, the user gave the worst grades for the LinkedTV Application, compared to the other locations (see Table 10 and also Figure 7 and 8). The variables *Ease of Use* and *Icons &*

Symbols are thought to need great improvement. The remaining variables received fair grades, ranging from 2.2 to 2.6.

The responses *"did not see it / did not realize it was there"* was received twice for the variable *Icons & Symbols* and once for *Additional Info Page: Content*. The response *"did not understand the feature"* was given by one user for the variable *Ease of Use*.

Those shortcomings may provide explanations why none of the users at S&V indicated they would be ready to pay for the application.

User	Graphical Design	Icons & Symbols	Colors & Contrast	Main Page: Structure	Names of Categories	Additional Info Page: Structure	Additional Info Page: Content	Ease of Use
S&V 1	3	6	2	2	2	3	6	4
S&V 2	4	4	3	4	4	3	2	4
S&V 3	1	6	1	1	2	2	3	4
S&V 4	4	4	4	5	3	3	3	7
S&V 5	1	2	1	1	2	1	2	4
Average	**2.6**	**3.3**	**2.2**	**2.6**	**2.6**	**2.4**	**2.5**	**4.0**

Table 10: Overview of S&V online questionnaire results (individual values and means)

3.4.4 Summary quantitative data

Figure 7 summarizes and illustrates the results of the quantitative survey at all three locations together. The vertical axis denotes the 5 values of the Likert scale. By grouping the variables into groups, we extract an aggregate overview which aspects of the functionalities of the Main Screen / Second Screen functionality of the LinkedTV Application deserve improvement:

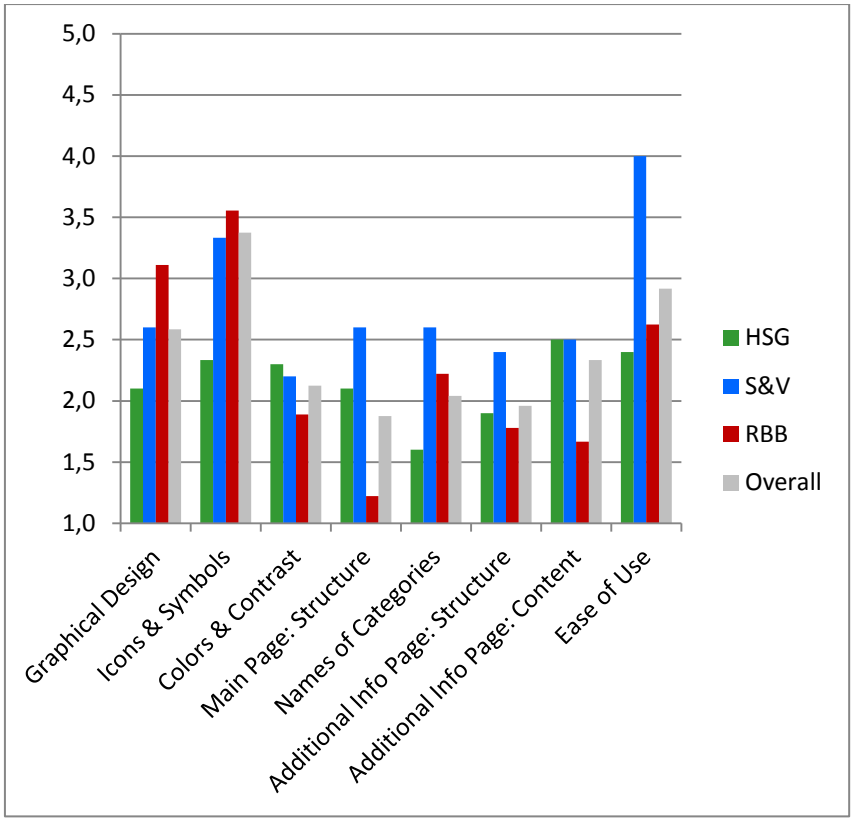

Figure 7: Overview of means resulting from answers to the closed questions in the online survey

1. The variables *Graphical Design*, *Icons & Symbols* and *Colours & Contrast* pertain to the design of the screens and displayed pages. These variables are thought to deserve some improvement (2.6, 2.9, 2.1), with the exception of *Colours & Contrast*, which received a good response.
2. The variables *Main Page: Structure*, *Names of Categories* and *Additional Info Page: Structure* pertains to the visual structuring of the screens and pages, as well as naming of page elements and the navigation by the user. These variables received a good response, including the best grades among all variables tested within the LinkedTV Application user trials (1.9, 2.1, 2.0).
3. The standalone variable *Additional Info Page: Content* received a good response, with a considerable difference between RBB and USG/S&V (like most other variables).
4. The standalone variable *Ease of Use* received one of the worst grades among the variables tested (2.8).

As a result, we conclude that the users generally consider the functionalities of the LinkedTV Application useful and innovative, yet with remaining potential for improvement in implementation.

The grades given by users greatly differ among the three user trial locations (see Figure 8). Beyond, comparing the differences in grades between any two locations for each variable

reveals no trend that some location may generally give better grades than another. Further investigations, particularly with a greater number of users, may reveal explanations.

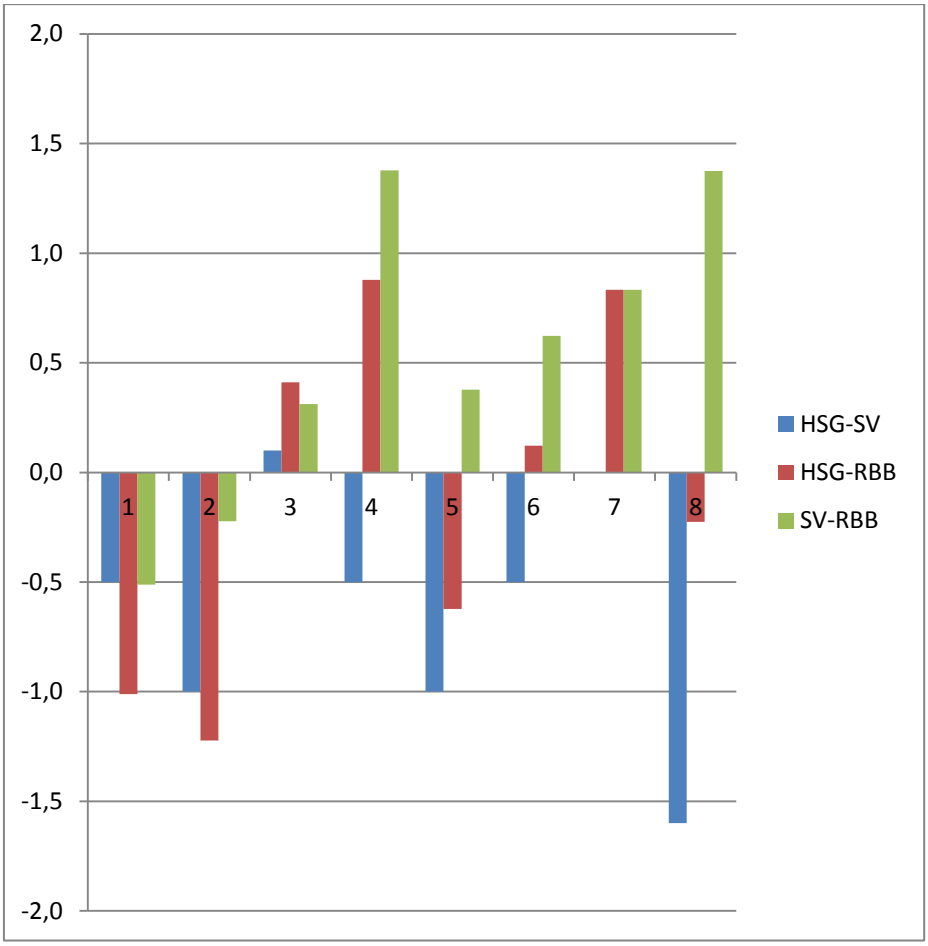

Figure 8: Overview of differences in means for closed questions in the online survey at the three locations

3.5 Summary of Qualitative input

In general the few comments entered by the users directly in the open questions of the online survey confirmed the results from the observation and the final semi-structured interview with the users (for details see Table 11).

Question	Partner	Answers
Graphical Design	USG	A better overview w.r.t. different pages, more variety
		A clear stress of the hierarchical level helps orient
	S&V	Clear
		Very cluttered
Icons/Symbols	USG	Did not notice any, yet would consider them intuitive and good to work with
		A bit too unclear
		Double click needs to be indicated
	S&V	What is meant here?
Colours/Contrast	USG	The links could be considered to be depicted richer in contrast
		Are beautiful
		White as background preferred
	S&V	Good, this way you can immediately see to which category it belongs and which information is selected.
Structure of the Main Page	USG	Clear. In case of certain topics (rather in background), a temporal dimension / chronology might be helpful.
		Good
		I would depict or delimit "Chapter" differently graphically, since it is different from "where", "who", "what"
	S&V	Good, I understood why it was organised that way
		Some parts can come before: where and chapter.
Names of the categories/entities	USG	A better overview would be worthwhile
	S&V	Where not as interesting and should be translated to Dutch.
		Good, only I didn't understand why the bottom category was called 'Chapter'.
Structure of the page with additional information	USG	Good
		A real structure is not obvious to me
	S&V	Sometimes good, but sometimes it didn't fully work yet.
Content of the page with additional information	USG	Possibly distinguish different content types, including videos and podcasts which might be embedded
		I consider it excellent that I only have to tilt the screen
	S&V	Did not really see it.
		Interesting, but incomplete in some cases.
Handling and ease of use of the application	USG	Intuitive
		Could be more intuitive
		Help pop-ups, transparency e.g. chapter name
		turning of the tablet should remain user dependent
	S&V	System stalled sometimes
		Could be better. It was e.g. unclear how I could return to the main page.

Table 11: Overview of answers received fort the open questions in the online survey

4 Overall summary and input to other Work Packages

The trial provided interesting insights into the users' perception of the LinkiedTV Application. This chapter summarizes the most important findings related to main functionality of the LinkedTV Application.

4.1 Fragmentation of TV and video content into chapters

The fragmentation of TV or video content in chapters is a very important feature that is not reflected in the communication of LinkedTV yet. The main problems experienced by users during using and dealing with the chapters can be summarized as follows:

1. Understanding of the meaning and the purpose of the chapters and their relation to the main program and to concepts and categories presented on the second screen. These aspects were discussed more in the following chapters:
2. Labeling of the fragments or chapters depending on the content. In particular, in the current news version the labeling was not always meaningful and if the chapter is for example bookmarked it might be very difficult for the users to understand what the bookmarked chapter was dealing about.
3. Visualization of the chapters within the 1st overview screens of the second screen application.
4. Visibility and accessibility of functionality related to the chapters. In general except of the presentation of the chapters in the 4th horizontal bar (see Figure 1), and by that providing the possibility to slide through the chapters, all the other functionalities related to the chapters were more or less not visible and by that not accessible to the users.

In general functionality around chapters, in particular the possibility to skip chapters and watch them in a non-linera way on the main screen was liked and very much appreciated and considered as innovative by the users. However, the current implementation just did not show that it is possible to bookmark and share chapters. The chapters as a main component need to be better integrated in the user interface and the LinkedTV product.

For example, potential improvements might be:

- To define more control elements in relation to the main program and also in relation to the included concepts and categories.
- To clearly design the features of the "bookmarked chapter". How can a bookmarked chapter be meaningful to the user, if he comes back to it after one week or even one month after he has bookmarked the chapter and the main program is not available anymore? How much of the main program needs to be bookmarked together with the chapter?

- Better design the functionality to share chapters.

4.2 Detection and selection of concepts

The detection and selection of concepts is a crucial first step towards getting relevant additional information related to given TV and video content. The concepts have to reflect the user needs for additional information. This is not easy to achieve because as the trials show, users have different associations, different existing knowledge and they have different needs for additional information. When in the next version of the LinkedTV product, personalization is included; this might solve one of the problems experienced with the selected concepts. But it might not solve the whole problem. The major problems reported by users in relation to detection and selection of concepts were summarized in section 3.2.4.1:

- To hear and see concepts in the main program, but not see a related concept offered on the second screen
- Wrong categorization of concepts (for example persons in “WHAT” and “WHERE” categories)
- To see concepts on the second screen that they have missed on the main screen

These findings and problems were even forced by the automatic version that was presented to users in St.Gallen. Furthermore, users of the news application rather missed information compared to users of S&V who experienced an information overload. As already explained in section 3.2.4.1 these different experiences by the users result probably from the different characteristics of the genres. Thus, we can actually classify the implication related to detection and selection of concepts, in three parts: specific overall implication for the overall LinkedTV Application and specific implication for the news and TKK application.

Implication for the overall LinkedTV concept related to concepts:

Only an edited and curated version seems to have the chance to meet the user needs. Any automatic version will probably lead to information overload and will not be able to provide information about the different relevance of detected concepts. Furthermore, it is necessary to clearly communicate the relation among main program and concepts. For example in particular for persons it was not clear if only persons that are also shown in the picture of the news program are considered or also persons that are just mentioned in the program. Also in this context the relevance of the concept is of importance.

Implication for the News LinkedTV Application:

To find the relevant and interesting concepts within the news show seems to be more difficult than for more knowledge oriented TV shows. This was already explained in section 3.2.4.1. The main finding is that more quality than quantity is needed. It is not necessary to

be complete, but to focus on relevant concepts. As a consequence, the implication for news shows might be summarized as follows:

- To focus on the main concepts that are part of the news show and avoid concepts (for example Nowitzki and similar) that are not in the focus of the news.
- Personalization for individual choice of relevant concepts for users
- To add “WHEN” information, where appropriate and relevant for the news
- Clear and intuitive categorization of concepts in categories

Specific implication for the TKK LinkedTV Application:

The TKK application has a different character than the news. First of all, as already explained in section 3.2.4.1 this type of show is knowledge-based. This means that also the additional information has a more long-lasting relevance and might not change as fast as information related to current news and events. Furthermore, the time dedicated to concepts is longer compared to news, where the information is dense. Given all this, it is possible to concentrate on some of the most important concepts, for which there is relevant additional knowledge. The main suggestions for improvement of the TKK application can be summarized as follows:

- To prevent information overload by focusing on the main and important concepts
- To separate concepts that are repeating in shows as moderators and places
- To focus on concepts in the category “WHO” and “WHAT”

4.3 Enrichment with external additional information

The main user criticism related to enrichment with additional information can be summarized as follows:

- Wikipedia is too superficial and doesn’t add much value. Users can easily find it themselves.
- Too much textual information
- Too much basic information
- Relevance of additional information not really seen by users
- What is being discussed about the concepts in social media?

Potential improvements can be summarized as follows

- Provide indication about the meaning and relevance of additional information by structuring it into basic and up-to date information
- Clear explanation according to which relevance criteria the information was chosen
- More visual enrichments as pictures and videos
- More curated information. Something like “The Editor’s choice”
- Inclusion of social media information as enrichment, in particular Twitter.
- Inclusion of more information from the archives of the broadcasters and producers of the show.

One potential approach that might allow for an efficient implementation of the above improvements can be to develop specific templates for the search and structuring of additional information for specific concepts that are repeatedly present in the different types of shows. For the news and TKK show that were subject to the trials described in this deliverable this approach might be summarized as follows:

Improvement of the additional information for the news LinkedTV Application

One major difference regarding the additional information in the news show compared to the TKK show was the time dimension of the relevant information. News is based on timely and up-to-dated information. The relevance of the information can change dynamically, depending how events and topics are developing. Thus, the time dimension and the actuality of the information are of high relevance. Potential templates for the news application might be:

- Templates for "WHO" concepts (persons): The information about persons might be classified in: 1) basic information about a person linking to the person's personal page or the Wikipedia page; and 2) up-to date information about the person regarding his/her statements or current development. The up-to date information can be collected from white-listed news sources as news portals, newspaper sites and similar. A third 3) type of information might be the relation of the person to the topic he is mentioned with. For example Obama and his goals with the visit in Berlin.
- Templates for "WHAT" concepts: The main components of the "WHAT" concept might be: 1) A description and definition of the concept; 2) Up-to date information about the concept (what has been published the same day or week, depending of the dynamic of the topic) and 3) historical aspects that refer to the past of the topic or related past events.
- Templates for "WHERE" concepts: 1) Basic reference about the place; 2) Why is it relevant in the specific context of the news; 3) If applicable and the history of the concept.

Improvements of the enrichment for the TKK LinkedTV Application

In the TKK show repeating and new concepts can be distinguished. For example, shows like TKK that have well-known moderators, which are present in each weekly show. The additional information to these kinds of concepts (i.e. moderators) should not be treated in the same way as information about other persons that appear in the program. So the information about the moderators can be provided separately and only on request of the users. This approach can help to limit the information overload and can prevent that information about the moderators is presented many times without actual need to the users. This can be actually a basic rule also for any kind of TV show or video, which has a similar structure - moderators that are well known.

For the changing concepts a typology of potential objects might be created. For example typical objects discussed in TKK shows are paintings, watches, and similar.

For each type of object a specific template might be created. For example the template for paintings might include the following elements: 1) description and categorization of the painting, i.e. basic information about the paintings; 2) information about the painting technique; 3) information about the painter

Similar templates might be developed for other typical objects (concepts).

4.4 Navigation

A complicated navigation can enforce the loss of attention to the main screen. Thus it needs to be designed according to typical usage patterns for tablets and to be as smooth as possible.

More notification on the main screen about what is going on and which additional information is offered would be very helpful.

In particular chapters should be better labeled and the time stamps should be more meaningful.

4.5 Business aspects

The users provided also interesting insights related to potential LinkedTV products and commercialization. These insights can be summarized as follows:

End user products: The LinkedTV technology can be the basis for interesting end-user products, but the applications have to be genre specific (for example news or sports), provide clear added value and sophisticated genre specific information.

Target audience: The audience for knowledge-based shows as TKK is more specialized. The potential users/buyers are most probably the tablet owners/users among the typical audience of knowledge based shows.

For the news application a broader audience can be expected. The typical user might also be a tablet owner/user and rather not defined by age but by interest in additional information.

Pricing: The users of the TKK application explicitly don't want to pay for a LinkedTV application as long as it is provided by a public broadcaster. Some of the users at RBB and at USG mentioned the same. Thus, it can be expected that LinkedTV Applications provided by public broadcasters will have to be provided for free.

Furthermore, it might be expected that a price of 1 to 1.99 Euro might be appropriate and acceptable for the LinkedTV Application on the German speaking markets and for the news application.

This information shows that the LinkedTV Application has to provide clear added value and to be attractive enough for users to pay for the application. Furthermore, it has to be at least up to the standard or even be better than competitive TV apps.

5 Bibliography

[KM05] Bonnie Kaplan and Joseph A. Maxwell. Qualitative Research Methods for Evaluating Computer Information Systems. In: Anderson, J.G. and Aydin, C. (Eds.): Evaluating the Organisational Impact og Health Care Information Systems, pages 30-55. Springer: Heidelberg, 2005.

[MH94] M.B. Miles and A.M.Hubermann. Qualitative Data Analysis: An Expended Sourcebook. Sage publication, Beverly Hills, Ca, 1994.

[OL13] Daniel Okeloen and Pieter van Leeuwen. Work Package 3: LinkedTV interface and presentation engine. Deliverable 3.6 of the LinkedTV project. Available online: http://www.linkedtv.eu/wordpress/wp-content/uploads/2013/12/LinkedTV_D3.6.pdf.

[PS96] Ellen Taylor-Powell and Sara Steele. Collecting Evaluation Data: Direct Observation. Available online: http://learningstore.uwex.edu/assets/pdfs/g3658-5.pdf.

[RHH13] Lilia Perez Romero, Linda Hardmann, Michiel Hildebrand. Deliverable 3.5**:** Requirements Document LinkedTV User Interfaces (Version 2). Available online: http://de.slideshare.net/linkedtv/requirements-document-for-linkedtv-user-interfaces

[SBS94] Marten W. van Someren, Yvonne F. Barnard and Jacobijn A.C. Sandberg. The Think Aloud Method – A practical guide to modelling cognitive processes. Academic Press, London, 1994. Available online: http://staff.science.uva.nl/~maarten/Think-aloud-method.pdf.

[WA08] Without Author. Data Collection Method for Program Evaluation: Observation. Available online: http://learningstore.uwex.edu/assets/pdfs/g3658-5.pdf.

Appendix A: Protocol

LinkedTV Trial Observation Protocol

Date: _____

Participant's Number/Code: _____

Participant's Number/Code: *By giving each participant a number, we can anonymise personal data from the beginning. This number can be used also in the online questionnaire, so that we can always link both parts of the user feedback*

S&V: Our participant's code is in this form ***M-NS-00*** *(M for male, F for female, N for the name's initial and S for surname's initial, 00 for the age). We did it so cause it's easier for us to quickly identify all the documents we have for a given person.*

Technical issues to keep in mind before the participant starts with the test

The LinkedTV Interactive Documentary application has to be *prepared* to start the test. On the first screen (desktop/laptop) is a “frozen” first picture of the TKK video. On the second screen (tablet) is the splash screen with horizontal bars to navigate through the video chapters and the categories.

Introduction of the people involved in the test, the LinkedTVproject and the application (5 min.).

TO BE PRESENT AT THE TEST:

- Water and other beverages
- Protocol
- User assignment
- PC/Laptop
- USB keyboard
- VGA cable
- Consent form
- Travel cost claim form
- Return envelope for travel costs
- Parking lot card

- Present all the persons who are going to be present during the test and explain which roll each one has and what is he/she going to do.
- Explain why we're doing the test.
- Explain what the LinkedTV project is about and what our we aiming for with this test.
- Explain what will happen, in which order and how long it will take.
- Explain that the test is not an exam and that it cannot go 'badly'. We are testing the application, not the participants! If the tester doesn't understand something, this is not his / her fault.
- Explain that the tester will be observed and recorded while he is performing the tasks and test.
- If the participant needs a break, this is always possible. If the participant wants to at any moment to finish the test, he/she can do this.

Filling out the forms (5min.):

- Participant fills out the consent form and the administrative form to get back the costs for the test (in our case we are giving 30 Euros to each participant for the time and the travel costs)

Before starting the test the user gets a short introduction to the scenario: "Imagine that you are at home or wherever you usually watch TKK or other cultural programmes. You have your tablet, because you like to look at extra information during or after the show.

ASSIGNMENT 1 – Watch first and second screen (5 min.)

Start the video on the first screen and tell the user to watch it as though he were watching TKK/cultural programme at home or the place where he normally does. Tell the user he doesn't need to do anything but if he wants he can do whatever he wants. Stop the video when the chapter (Breguet – Gold watch) is over before the next chapter starts.

Observation protocol

1. What does the user do? How does he start dealing with the information on the first and second screen?

2. On which information does the user concentrate? Which screen does the participant seem to pay more attention to? Does the user watch the video on the main screen and forget to check the second screen?

3. Does the user focus on the frames and concepts on the second screen and forget the first screen?

4. Is the user confused about what to do?

5. Does the user seem to immediately understand the connection between the video on the first screen and the information on the second screen?

6. Any other remarks or observations?

Questions for the participant

What do you think is the purpose of the application?

What do you think is the purpose of the first and the second screen?

First screen:

Second screen:

What do you think is the target group of the application?

ASSIGNMENT 2 – Take a look at both screens and discover (10 min.)

Ask the user to look at both screens and comment out loud what he sees there and any other observations that he could have. Tell him to take all the time he needs to discover the information elements presented on both screens.

Questions for the participant

What is your first impression of the way the information on the second screen is presented?

What do you think about the structure of the interface?

What do you think are the horizontal bars and the thumbnails there for? Please explain it

Are the topics covered by the horizontal bars interesting for you?

Did you miss any topic? Which?

Which of the topics presented is the most interesting for you?

What do you think are the different colours used for?

Does the use of the different colours help you to understand and find your way on the interface or did it disturb you in any way?

Is there any element or topic on the screen which you don't understand?

Do you have any further comments or observations?

ASSIGNMENT 3 - Browse through video chapters (10min.)

On the second screen you can find the chapters to the video you are watching. Please tell us where they are and browse through them. Please choose one of them and put it on the first screen in order to watch it there.

Observation protocol

1. What does the user do?

2. Does the user intuitively understand how to activate, open, move the video chapters on the second screen?

3. Any other remarks or observations?

ASSIGNMENT 4 - Select a topic of interest and find additional information for it

Please choose a topic on the second screen which interests you. Try to find and read the additional information about this topic.

Observation protocol

1. Does the user intuitively understand how to get the additional information on the second screen?

2. Has the user understood the difference between the bar with video chapters and the category bars with thumbnails?

3. In order to select and find the additional information, what does the user do? How does the user try to open the item? (tip, double tip, ..?)

4. What is the reaction of the user when the additional information (short version on first page) is displayed ?

5. Does the user see and understand the different elements which are displayed?

Short text:

Image:

Links:

6. How does the user interact with the different elements? Is the user at any time surprised or irritated while interacting with the second screen interface? Is the user satisfied or even happy while interacting with the second screen interface?

7. Does the user see and read the request to turn the tablet 90 degrees in order to get more information?

8. Any other comment or observations?

EVALUATION - Evaluation form + questions (5-15min.)

Explain the participant we prepared a short onkine evaluation for some of the items/elements and functions of the second screen application (in form of a scala) and two questions which. Tell the participant to ask anything he/she doesn't understand and that he/she can also add written comments when the space for an item is not enough.

OPEN LINK TO ONLINE QUESTIONNAIRE

ASK FINAL QUESTIONS

Did you miss anything in the application which could be valuable for you?

Did you find something specially valuable/attractive/innovative for you in the application?

Would you recommend this application to someone else?

[ ] Yes
[ ] No

Would you pay for this application in it's final version?

[ ] Yes
[ ] No

Thank you very much for participating in the test and this valuable feedback. If would you like to be informed about future version tests of this applications please tell us so we can add you to our pool.

Interviewer name and signature:

……

Observer name and signature:

……..

Technical Staff name and signature:

……..

Appendix B: Consent form

Consent form for participation in LinkedTV Interactive Documentary Trial

I hereby confirm my participation in the Trial "Novel TV-applications" held in the context of the project LinkedTV.

I was informed by the LinkedTV researchers about essential research information and understand the scope of the research conducted by LinkedTV and the study "Novel TV-applications" in which I will participate.

I understand and agree that my responses will be documented and stored until the end of the study (latest until 31.12.2014). Specifically, my responses and actions will be written down, anonymised pictures will be taken, and the second screen will be filmed (audio and video) so that my interaction with the application is also documented. The documented information will be used exclusively for research purposes and deleted at the end of the study.

My personal information will not be shared with third parties. My answers as well as all audiovisual documentation will not be shared with third parties as well, and will be anonymised both in external and internal documentations and publications.

This anonymised information and documentation may be used by Sound and Vision and the LinkedTV project without any further consent.

My participation is voluntary and I understand that I can stop the research "Novel TV-applications" at any time of my choosing and that I do not have to answer questions if I do not want to.

Take if you agree:
☐ I have read the consent form and I agree to voluntary participation by signing this consent form.
☐ I allow usage of audio, video recordings and photographs of this test as documentation of it. This documentation will only be used for reference by the researcher(s), and will be fully anonymised for both internal and public presentations and publications.

You may withdraw your consent at any moment. You can contact Lotte Belice Baltussen (lbbaltussen@beeldengeluid.nl, 035-6771755), if you want to withdraw your consent after the trial.

Date and Place: _____

Participant name: _____

Signature: _____

Researcher Names: _____

Appendix C: Questionnaire

Druckversion

Fragebogen

1 Startseite

Vielen Dank das Sie an unserer Umfrage teilnehmen. Bitte wählen Sie die Sprache, in welcher Sie fortfahren möchten.

Dank voor je deelname aan het gebruikersonderzoek van LinkedTV. Kies hieronder de taal waarin je de afsluitende enquête wilt doen.

Thank you for participating in our survey about LinkedTV. Please select the language in which you would like to proceed.

- ○ Deutsch, Duits, German
- ○ Holländisch, Nederlands, Dutch
- ○ Englisch, Engels, English

Bitte geben Sie ihre Teilnehmerzahl ein.

Vul hier je deelnemerscode in.

Please enter your participant's number.

2.1 ankreuzen Englisch

Please rate the following LinkedTV functions:

	Like it very much	Like it	neutral	Didn't like it	Didn't like it at all	Didn't see it/ realise it was there	Didn't understand it
Graphical design	○	○	○	○	○	○	○
Icons/ Symbols	○	○	○	○	○	○	○
Colours/ Contrast (all pages)	○	○	○	○	○	○	○
Structure of the main page	○	○	○	○	○	○	○
Names of the categories/ topics	○	○	○	○	○	○	○
Structure of the page with additional information	○	○	○	○	○	○	○
Content of the page with additional information	○	○	○	○	○	○	○
Handling and ease of use of the application	○	○	○	○	○	○	○

2.2 ergänzen Englisch

Do you have any additional remarks?

Grapghical Design

Icons/ Symbols

Colours/ Contrast

Structure of the main page

Names of the categories/ topics

Structure of the pages with aditional information

Content of the

pages with additional information

Handling and ease of use of the application

2.3 Endseite Englisch

Thank you, for your participation.

3.1 Umfrage German

Bitte bewerten Sie folgende LinkedTV Funktionen:

	Sehr gut	Gut	Neutral	Schlcht	Sehr Schlecht	Habe ich nicht gesehen	Habe ich nicht verstanden
Graphisches Design	○	○	○	○	○	○	○
Icone/ Symbole	○	○	○	○	○	○	○
Farben/ Kontrast (alle Seiten)	○	○	○	○	○	○	○
Struktur der Hauptseite	○	○	○	○	○	○	○
Namen der Kategorien/ Themen	○	○	○	○	○	○	○
Struktur der Seiten mit Zusatzinformationen	○	○	○	○	○	○	○
Inhalt der Seiten mit Zusatzinformationen	○	○	○	○	○	○	○
Bedienung und Einfachheit der Applikation	○	○	○	○	○	○	○

3.2 ergänzen deutsch

Haben Sie noch zusätzliche Bemerkungen?

Graphisches Design

Icone/ Symbole

Farben/ Kontrast (alle Seiten)

Struktur der Hauptseite

Namen der Kategorien/ Themen

Struktur der Seiten mit Zusatzinformationen

Inhalt der Seiten mit Zusatzinformationen

Bedienung und Einfachheit der Applikation

3.3 Endseite Deutsch

Viele Dank, dass Sie an unserer Umfrage teilgenommen haben.

4.1 Umfrage Dutch

Wat vond je van:

	Zeer goed	Goed	Neutraal	Niet zo goed	Helemaal niet goed	Heb ik niet gezien	Begreep ik niet goed
De grafische vormgeving	○	○	○	○	○	○	○
De gebruikte iconen/symbolen	○	○	○	○	○	○	○
De kleuren en het contrast (alle pagina's)	○	○	○	○	○	○	○
De structuur van de hoofdpagina	○	○	○	○	○	○	○
De benaming van de categorieën/onderwerpen	○	○	○	○	○	○	○
De structuur van de pagina's met aanvullende informatie	○	○	○	○	○	○	○
De inhoud van de pagina's met aanvullende informatie	○	○	○	○	○	○	○
Het gebruikersgemak van de applicatie	○	○	○	○	○	○	○

4.2 ergänzen Holländisch

Eventuele aanvullende opmerkingen over

De grafische vormgeving _____

De gebruikte iconen/symbolen _____

De kleuren en het contrast (alle pagina's) _____

De structuur van de hoofdpagina _____

De benaming van de categorieën/onderwerpen _____

De structuur van de pagina's met aanvullende informatie _____

De inhoud van de pagina's met aanvullende informatie _____

Het gebruikersgemak van de applicatie _____

4.3 Endseite Holländisch

Dank voor je deelname aan het gebruikersonderzoek.

5

Appendix D: Sign-up form

Gebruikersonderzoek Tussen Kunst & Kitsch - Beeld en Geluid

Inleiding

Hieronder volgen enkele korte vragen waarmee u zich kunt aanmelden voor een gebruikersonderzoek van het Nederlands Instituut voor Beeld en Geluid naar een tweede scherm-applicatie voor het AVRO programma Tussen Kunst & Kitsch [1]. Deze applicatie is ontwikkeld binnen het Europese project LinkedTV [2], waarbij informatie op het web wordt gekoppeld aan televisieprogramma's. Iedereen vanaf 18 jaar kan meedoen, ongeacht of je een tablet of smartphone hebt, en of je een trouwe kijker van Tussen Kunst & Kitsch bent.

Het onderzoek wordt afgenomen door twee researchers van LinkedTV, en vindt plaats in Hilversum bij Beeld en Geluid. Het onderzoek duurt maximaal 1,5 uur. De opzet van het onderzoek is als volgt: er worden een paar opdrachten voorgelegd waarmee u de ontwikkelde tweede scherm-applicatie test. Na het afronden van de opdrachten houden we een kort nagesprek en vult u een enquête in.

Beeld en Geluid gebruikt de resultaten van het onderzoek om binnen het LinkedTV project de ontwikkelde tweede scherm-applicatie voor Tussen Kunst & Kitsch te evalueren. De uitkomsten van het onderzoek worden volledig anoniem verwerkt.

De onderzoeken vinden plaats tussen 7 en 18 maart. Er is een beperkt aantal plaatsen voor dit onderzoek. We laten u uiterlijk 5 maart weten of u bent geselecteerd voor deelname.

Reiskosten worden vergoed (tot €15) en als dank voor het meedoen krijgt u naar keuze een cadeau uit de Beeld en Geluidwinkel twv €15, een VVV bon van €15 of twee tickets voor de Beeld en Geluid experience.

Mocht u nog vragen of opmerkingen hebben, neem dan contact op met Lotte Belice Baltussen (lbbaltussen [@] beeldengeluid.nl)

[1] http://www.linkedtv.eu/scenarios/hyperlinked-documentary-scenario/
[2] http://www.linkedtv.eu/

***1. Algemene gegevens: wat is uw leeftijd?**

- 18-24 jaar
- 25-39 jaar
- 40-54 jaar
- 55+
- Wil niet zeggen, geen antwoord

***2. Algemene gegevens: wat is uw geslacht?**

- Man
- Vrouw
- Geen antwoord

Page 1