Europeana Space – Spaces of possibility for the creative reuse of Europeana's content

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Included (indicate as appropriate)	Executive Summary	☒	Abstract	☐	Table of Contents	☒

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This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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EXECUTIVE SUMMARY

The EuropeanaTV pilot has developed new interactive television experiences using archival content found in repositories such as Europeana and found new business models for the cultural and media sectors in order to reach the public with cultural content. Pilot partners share the vision of Europeana's Strategy 2015-2020[1] that states that online cultural heritage will increase value for the general public, tourism industry, the creative industries and the educational sector. The activities within this pilot have centred on developing prototypes that support this notion. In the Description of Work, Task 4.1 of WP4 the EuropeanaTV pilot is described as follows:

The technical objective of Europeana TV is to enable a novel delivery method of Europeana content to SmartTV environments. The technical framework will connect with the Europeana API and offer an editing environment to analyse, personalise and enrich the Europeana content into a publishing format that supports a new TV experience. This Pilot does not carry out R&D, but rather builds upon developments from projects like HBB-NEXT (FP7, RBB), LinkedTV (FP7, Noterik) and Europeana Creative (NTUA). The Pilot will support and evaluate two distinct scenarios: one focussed on social communities and one on in the context of elderly users. Both are described in more detail below. Content will be made available by RBB, NISV and LUCE. The technology will be built by NOTERIK and PROTON and NTUA. NTUA will ensure the results are contributed to Europeana Labs, built in the context of Europeana Creative.

As described in D4.2[2], the TV pilot will focus on developing applications within the following two scenarios:

1. the **local scenario** aimed at the elderly for the smaller scale media outreach;
2. the **broadcast scenario** aimed at a specific social community for the larger scale media outreach.

In order to prepare the prototypes for use in the EuropeanaTV pilot hackathon (May 2015), a focus has been applied for developing and testing the Multiscreen Toolkit (see 3.1) to make quick prototyping possible and applicable for participants to encourage re-use of cultural heritage content.

Within the local scenario the ReWind application for smartphones and Smart TV's has been conceptualised and defined into two applications: the 'Pusher app' for smartphones and the 'Receiver app' for SmartTVscreens. The prototype has undergone some preliminary user testing, and will be tested on a larger scale once features requiring integration of the WITH platform have been implemented.

[1] "Europeana Strategy 2020 – Impact." *Europeana Foundation,* 28 may 2014: http://strategy202.europeana.eu.

[2] D4.2 Pilots coordination – information on technical planning, 31 July 2014 http://www.europeana-space.eu/wp-content/uploads/2014/04/EuropeanaSpace-D4.2-Pilots-coordination-information-on-technical-planning-v1.pdf.

Within the broadcast scenario the 'Fall of the Berlin Wall' HbbTV app has been integrated into the Multiscreen Toolkit, and has also been user tested with a positive user evaluation. The application has also been used by Noterik, together with the Multiscreen Toolkit, to build a demo app that combines tablet viewing and the SmartTVinto one television experience.

The pilot prototypes, content and IP documents have been used to support creative developers during the EuropeanaTV hackathon called 'Hacking Culture Bootcamp' that took place in Amsterdam in May 2015, and the Multiscreen Toolkit has been successfully applied in several teams' concepts.

INTRODUCTION

2.1 BACKGROUND

The EuropeanaTV pilot has explored the possibilities of re-using cultural heritage content in a SmartTVsetting. SmartTVs are television sets that can display broadcast programmes and services from traditional broadcast channels as well as content from the Internet.

Innovations in the media and Internet sectors such as SmartTV have led to new forms of delivery for television content. Additionally, new possibilities of using content on different devices in a home environment as well as in a mobile context lead to new expectations for viewers and consumers of media.

An increasing number of TV broadcasters offer hybrid TV services, primarily in the form of catch-up video-on-demand services such as BBC iPlayer, ARD Mediathek. For these services the HbbTV standard is increasingly gaining significance. In addition, an increasing number of third party companies offer over-the-top (OTT) video delivery services such as Netflix or Hulu for SmartTVdevices. In fact, interactive TV has become one of the dominating trends in consumer electronics. The idea of long tail product delivery invokes the idea that bigger audiences may be reached with specialty or niche content. For cultural heritage institutions this means that archival footage can be re-used in new contexts, thus increasing media experience value to users and increasing impact numbers for these (usually public) institutions.

The popularity and market for television hardware remains vibrant. According to a study from Eurodata TV Worldwide, the average daily viewing time per individual increased slightly from 2003 to 2013. Over the last five years TV consumption has remained more or less stable. In addition, the Internet has increasingly looked towards improving the audio-visual (AV) experience online. Social media such as Facebook and Instagram that have previously catered for photography and text message sharing, have improved sharing of videos by making ‘moving thumbnails’ available and sound options are added in user-friendly ways.

It is also interesting to note is that P2P file-sharing has much improved for video and television viewing by offering previews whilst downloading, which is the basis for the popular Popcorn Time application and its derivatives. The Internet and digital world are becoming increasingly suited for quick and innovative ways of sharing audio-visual material, and user expectations and demands adjust accordingly. The TV pilot has therefore aimed to operate and develop new ideas for cultural heritage audio-visual content within this context.

2.2 ROLE OF THIS DELIVERABLE IN THE PROJECT

As outlined in the original Description of Work (DoW) document for the overall 'Spaces of possibility for the creative re-use of Europeana’s content' E-Space project, the EuropeanaTV pilot is one of the six experimental pilots in the domains of Education, Research, Leisure and Tourism that explore different scenarios of content re-use in the six thematic areas defined by E-Space. The EuropeanaTV pilot has aimed to facilitate re-use of cultural heritage by creating the pilot prototypes, as well as a sector specific development toolkit that will aid the quick prototyping of applications working with cultural data.

This deliverable explains the work undertaken in the pilot as further background to the available prototypes, toolkit and re-usable content provided by the pilot partners.

2.3 APPROACH

To achieve the aims defined in the DoW, the TV pilot has supported the development and evaluation of two distinct scenarios as described in D4.2:

1. the local scenario for the smaller scale media outreach;
2. the broadcast scenario for the larger scale media outreach.

These scenarios have been integrated into multiple co-creation workshops where general challenges and subsequently user needs and requirements were assessed. Two prototypes have been delivered as well as a development toolkit to support creative developers during maker events such as hackathons. The TV pilot and its partners have then supported the TV pilot hackathon organised by WAAG in May 2015, to encourage creative developers and entrepreneurs to innovate in the SmartTVsector.

2.4 STRUCTURE OF THE DOCUMENT

1. The Executive Summary – this section is intended as a stand-alone synopsis of the pilot's work and outcomes.
2. The Introduction – describes the social and technical background to the pilot while also situating the pilot in the context of the E-Space project.
3. Pilot Execution – gives an overview of the pilot's activities and progress during the first 24 months of the pilot's run.
4. Pilot Outcomes – discusses the pilot's outcomes in terms of prototypes, the Multiscreen Toolkit and hackathon concepts.
5. Content Sources – provides a final list of all sources used by the pilot and its IP indications.
6. Project Integration – discusses links with some other activities in the project as well as collaborations with the other pilots.
7. Evaluation – explains the evaluation procedure of the prototypes so far and offers an analysis of the results.
8. Lessons Learned – highlights the challenges faced and motivations for certain amendments and suggestions for future work to be done in the pilot's development area.
9. Educational Use – discusses educational activities that have been developed as part of the pilot.
10. Impact and Sustainability – discusses potential future uses for TV pilot platforms and applications
11. Future Work – outlines pilot work planned for months 25-30 of the project.
12. Conclusions – offers some summative thoughts on this deliverable.
13. Appendix – user testing survey example from the broadcast scenario.

3. PILOT EXECUTION

This chapter describes the progression, pitfalls and milestones in the execution of the pilot. The TV pilot consists of pilot prototypes as well as technologies, which are further described in Chapter 4: Outcomes.

3.1 THE LOCAL SCENARIO

The work on the local scenario has resulted in the ReWind TV prototype, combining smartphone curation with main screen (Smart TV) viewing. The first workshop took place in August 2014, based on use cases brainstormed by all pilot partners. In November the second workshop took place based on the elderly scenario where further detail on elderly needs and user requirements were considered eg children supporting grandparents to find archive footage. All pilot members worked out the details of the scenario, the needed features, the wireframes for the interface, and a design document detailing all user requirements. This workshop greatly benefitted from having one of the developers working on three core features of the envisioned app already. By the end of the workshop, the outcomes of the wireframes and design document were available, together with a very early functional SmartTV application. An elevator pitch was also created,[3] which urged the description of the app with target audience and market applications in mind.

The ReWind apps – Pusher and Receiver apps – were developed based on the first workshop, but alterations were quickly made during the iterative development process spanning design, usability and technology. One important innovation requirement was to integrate existing cultural heritage enrichment APIs (such as the Europeana API at the time) into the application; however feedback times from the API were too slow for the prototype to work. To circumvent the issue, Proton Labs uploaded a sub-set of TV pilot content providers videos to have the prototype concept working both locally and in live mode via Android device. This prototype was made available in time for the TV hackathon in May 2015.

The selected subset of videos has been uploaded to the VBOT platform and served via the VBOT API. The platform allows for video annotation and tagging which made it possible to mimic the query results from the Europeana API, which had originally been intended for enrichment purposes.

Since then, Proton Labs has expanded on the prototype by refactoring the code and improving the applications. The Pusher app is now a native, stand-alone Android app that connects to the VBOT API to allow the users to create and share the video playlists. Between May-October, the VBOT API has been developed very dynamically, with a lot of changes especially regarding user authentication and the way the API queries are handled. By October however, two of Proton Labs' developers, who were working on the ReWind project, left the company and were subsequently replaced by new developers, causing short term gaps in the development lifecycle.

[3] http://www.slideshare.net/nisv_rd/europeana-space-tv-pilot-elevator-pitch accessed 10 December 2015.

This, and the fact that the VBOT API had changed, caused a need to refactor both applications, which took some time. The refactoring and new developments have been done successfully and re-deployed to staging environment in December 2015.

The ReWind application demos can be found online here:

1. The Receiver app (primarily intended for TV screen but can be tested on any widescreen computer): https://vbot-receiver.herokuapp.com
2. The Android Pusher app (installation of applications from unknown sources needs to be enabled on the mobile device): http://vbot.tv/download/rewind/pusher.apk

(Please note: there need to be two separate Facebook accounts used for both apps for testing in order to connect the two users groups.)

3.2 THE BROADCAST SCENARIO

Work on the broadcast scenario has progressed and resulted in the 'Fall of the Berlin Wall' SmartTVapp and a small spin-off demo which combined tablet use and SmartTVviewing, aimed at creating a tourist experience around footage of the fall of the Berlin Wall and the associated Berlin locations. At the first workshop in August 2014 the "Chance discovery of rich cultural content" use case was discussed with the partners. A version of the SmartTVapp "The Berlin Wall" as described in the use case was created and has been publically available since 3 October 2014, on RBB Fernsehen, the RBB TV channel. The application was designed and created by external agencies. The idea was to create and test a model app, to provide certain requirements and to serve as the basis for further work on the broadcast scenario, and use this input for workshops. The next workshop was held in February 2015. The plan was to re-create an app similar to the 'Fall of the Berlin Wall' app using tools provided by the partners, to curate content from Europeana using the LinkedTV Editor Tool and create a broadcast standard application for SmartTV(HbbTV).

3.3 THE TV PILOT PRE-EVENT AND HACKATHON

Figure 1: Pitching the World Photo Press multiscreen experience during the hackathon

On 14-15 May 2015 the TV pilot hackathon, which was called 'Hacking Culture Bootcamp,'[4] was held in the building of the WAAG society in Amsterdam. The three content partners were present for support (LUCE, NISV and RBB), as well as two of the technical partners (NOTERIK and PROTON LABS). In multiple teams, Noterik has supported participants in evolving their concepts with use of the Multiscreen Toolkit and was also part of the winning concept team. NISV participated by presenting the concept of Culture Derby,[5] a crowd-sourced tagging game to help describe key frames and present the eventual footage on the main screen.

To give a quick impression of the types of innovations that were created during the hackathon, below are some of the developed concepts:[6]

1. **World Press Photo:** The team from World Press Photo developed an application with the Multiscreen Toolkit that allows the visitor to select a theme for their exhibition and then play/control with several projection installations that are part of it. Phone interactions include swiping through a story prompting three large screens to simultaneously change their picture, zooming and moving a high-resolution picture projected on a large screen and use the smartphone to play an audio track that contains the story behind the picture.
2. **Bosch:** One of the prize-winners, Team Bosch used the Multiscreen Toolkit to build an application that enables viewers of a painting to move a spotlight over the picture in order to identify different characters in the painting.

[4] http://www.europeana-space.eu/hackathons/hacking-culture-bootcamp/ accessed 10 December 2015.
[5] http://labs.beeldengeluid.nl/example/7bda91a0-a315-11e5-93ae-005056a71e3a accessed 21 December 2015.
[6] Previously described in Noterik's news section: http://www.noterik.nl/building-multiscreen-apps/ accessed 21 December 2015.

Once identified, the user can either listen to sounds that previous people recorded for that character or add a voice recording themselves. The effect of the application is both enriching and engaging. It helps visitors to see different characters in a painting and imagining their position in the story of the painting. The audio samples that are added to the painting also bring the painting to life, not only for the single occasion but over time as well, creating new narratives and layers of meaning, and, to use the phrase coined by the team, 'give the artwork a voice.'

3. **Carrot:** Team Carrot built a collaborative multi-screen learning platform with the main focus on educational settings. Students are able to interact with the learning material using their own mobile device. They can annotate video and build their own collage of fragments that are of interest and share them with each other and the teachers.

The concepts that have resulted from the 'Hacking Culture Bootcamp' demonstrate innovations that analyse, personalise and enrich cultural data, which is a very desirable outcome for the E-Space project. However, as partners of the TV pilot, one notable outcome of this hackathon is that none of the winning concepts specifically made use of audio-visual material in their prototype applications. There are two reasons for this, which might cause problems with the use of video content in prototypes:

1. Video content on most platforms (Europeana, WITH) is handled similarly to photo content: one thumbnail, one description. It needs more metadata: resolution of video (HD or not), timeframes and what content is seen per timeframe, what type of audio, colour or black/white, etc. As video content is now handled as photographic content, most (envisioned) applications play with these options.
2. Playing and handling video content requires higher end image processing hardware, more RAM, quality video graphics card, and more processing power. Not all common laptops, smartphones and PCs are equipped for this.

Figure 2: Team 'Carrot' participants during the hackathon

NISV coordinated the production of a video to capture the hackathon event, which can be viewed here: https://vimeo.com/129602052 and which was shared broadly with the network and beyond via blog, newsletters and social media.

Following the hackathon, the prototype of ReWind has been further developed into a stand-alone app and has been made available for initial user testing by the pilot partners. The 'Fall of the Berlin Wall' app has been user tested and positively evaluated. The Multiscreen Toolkit has been extensively evaluated and lessons learned have been formulated, which has led to an alteration to the original development model that the toolkit was based on. More on these evaluations and lessons learned can be found in Chapters 6 and 7.

OUTCOMES

4.1 THE MULTISCREEN TOOLKIT

The Multiscreen Toolkit, which has been described as part of the TV pilot in D4.3[7], has been developed and iterated based on several co-creation workshops. The toolkit is based on HTML5 and Java, and provides a foundation for building and prototyping of a wide range of video applications. Among other things, the toolkit enables advanced remote control options, co-viewing and collaboration around videos. In addition to offering re-usable software components, the toolkit aims to facilitate easy and quick prototyping of multiscreen application ideas and proof of concepts. Examples of applications built using the toolkit include a second screen application for watching enriched TV programmes and a spatial spotting application for pinpointing objects in a co-viewer setup. Physically, the toolkit exists on Noterik's Github page[8] and support is offered through e-mail, the Github platform and in person by Noterik staff during co-creational events.

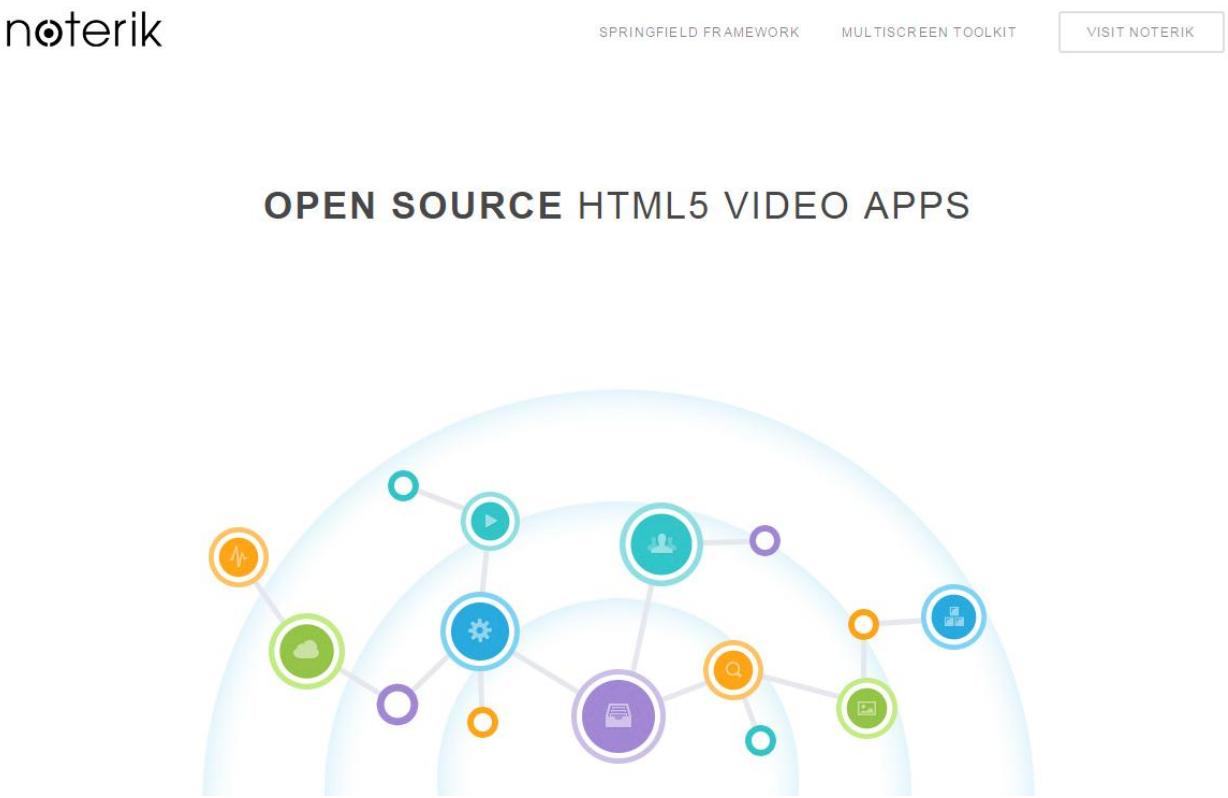


Figure 3: The Multiscreen Toolkit on Github

[7] D4.3: Pilot Prototypes, 3 February 2015 http://www.europeana-space.eu/wp-content/uploads/2014/04/EuropeanaSpace-D4.3-Pilot-prototypes.pdf.
[8] http://noterik.github.io/, Noterik's Github page.

4.1.1 'FALL OF THE BERLIN WALL' DEMO APP

The Europeana TV pilot (Noterik, Sound and Vision, RBB) organised a workshop on 25-26 February 2015, at Rundfunk Berlin-Brandenburg (RBB) in Potsdam to work on a SmartTVapp. The aim was to use RBB's Berlin Wall content together with related materials from Europeana. The idea was to design the app using the LinkedTV Editor Tool,[9] developed by Sound and Vision R&D, and Noterik's Multiscreen Toolkit. The workshop was hosted by RBB and attended by Noterik and Sound and Vision EuropeanaTV Pilot teams.

The outcome of the workshop and some additional days' implementation by Noterik was a TV and second screen service: on the 2nd screen the user can select one of the Berlin Wall tours and the relevant videos of that tour will be played on the TV. The location of the tour is visualised in a map on the 2nd screen and related Europeana content enriches the videos on the TV.

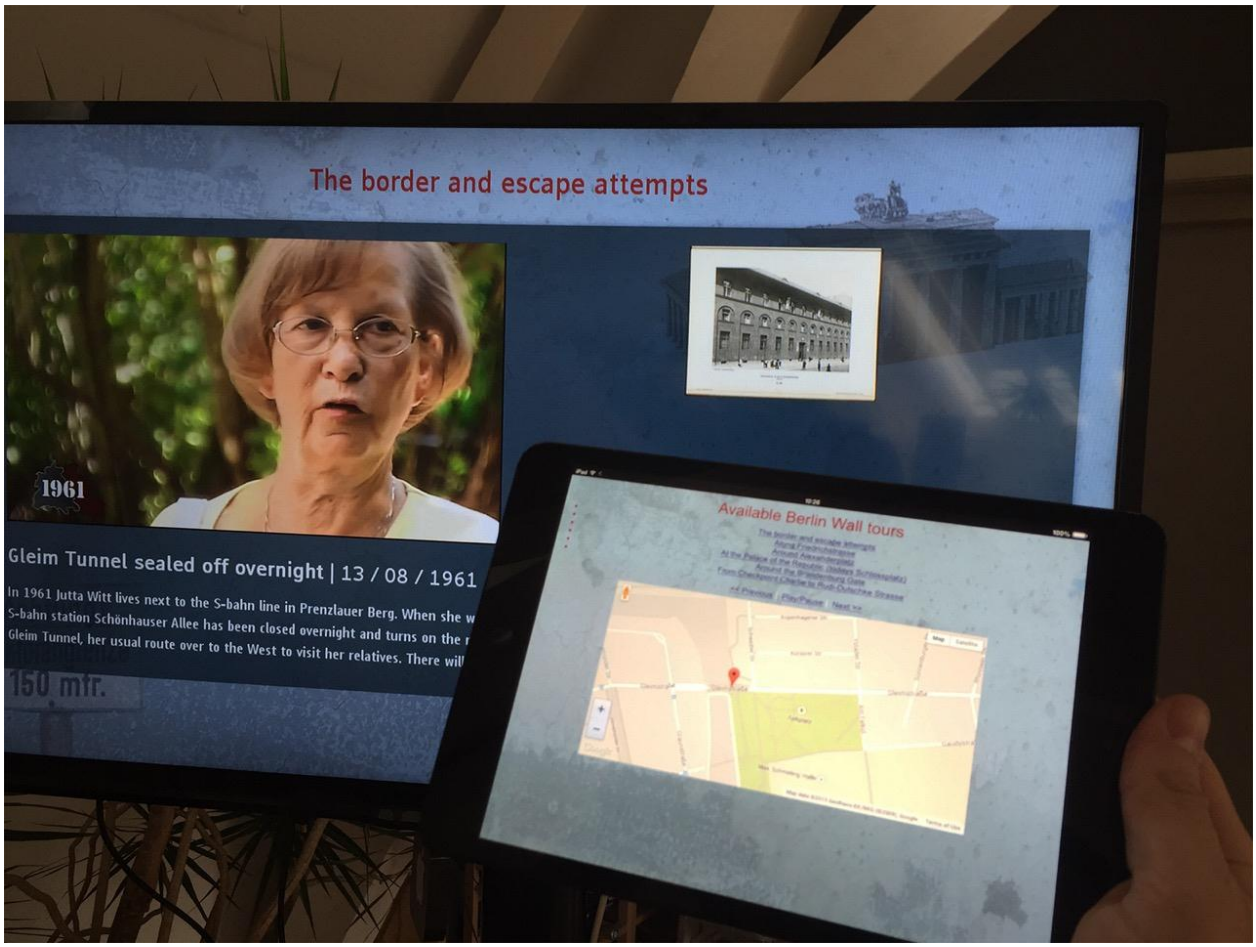


Figure 4: 'Fall of the Berlin Wall' demo companion application

[9] http://editortool.linkedtv.eu/, page of the Editor Tool within the LinkedTV project, accessed 10 December 2015.

4.2 'FALL OF THE BERLIN WALL' HBBTV APPLICATION

The 'Fall of the Wall' HbbTV app was developed using HTML, CSS and JS, following the HbbTV 1.0 specifications (ETSI TS 102 796 V1.1.1.). These specifications allow traditional broadcast TV signal to be mixed with media content delivered through the Internet protocol. To allow access to the same content sources as the Berlin Wall website, an API was developed to deliver all necessary data (list of videos and associated video details) in JSON format. The HbbTV application, the website and all videos are hosted by an external service provider.

The Digital Video Broadcasting signalling of the application, which allows for digital pages to be integrated to the TV view, was added to RBB's DVB-signals (DVB-T, DVB-C, DVB-S/S2) and is available as a regular service linked from RBB's HbbTV launcher bar. This allows for the red button on the remote control to activate the app, which comes through via the DVB signal. The HbbTV application is also accessible via regular web browsers using specific HbbTV-Plugins. FireHbbTV for example is a plugin that uses a browser profile that is, to some extent, similar to HbbTV devices. That browser profile enables Firefox to interpret the CE-HTML language and display the application. After installing the plugin, Firefox will be able to recognise HbbTV-Applications and interprets them in a similar way as for SmartTVs.

Figure 5: 'Fall of the Berlin Wall' HbbTV application

4.3 REWIND APPLICATION

ReWind is a prototype application, based on the VBOT CMS back-end structure developed by Proton Labs that allows one person to build a playlist of videos out of a pre-defined video library, using a mobile app (webview) and then send the videos to a receiver application. The ReWind prototype consists of two apps: Pusher (a mobile app that allows easy creation of video playlists based on selected search criteria) and Receiver (a primarily TV screen app used for video playback). See figure 6 for details:

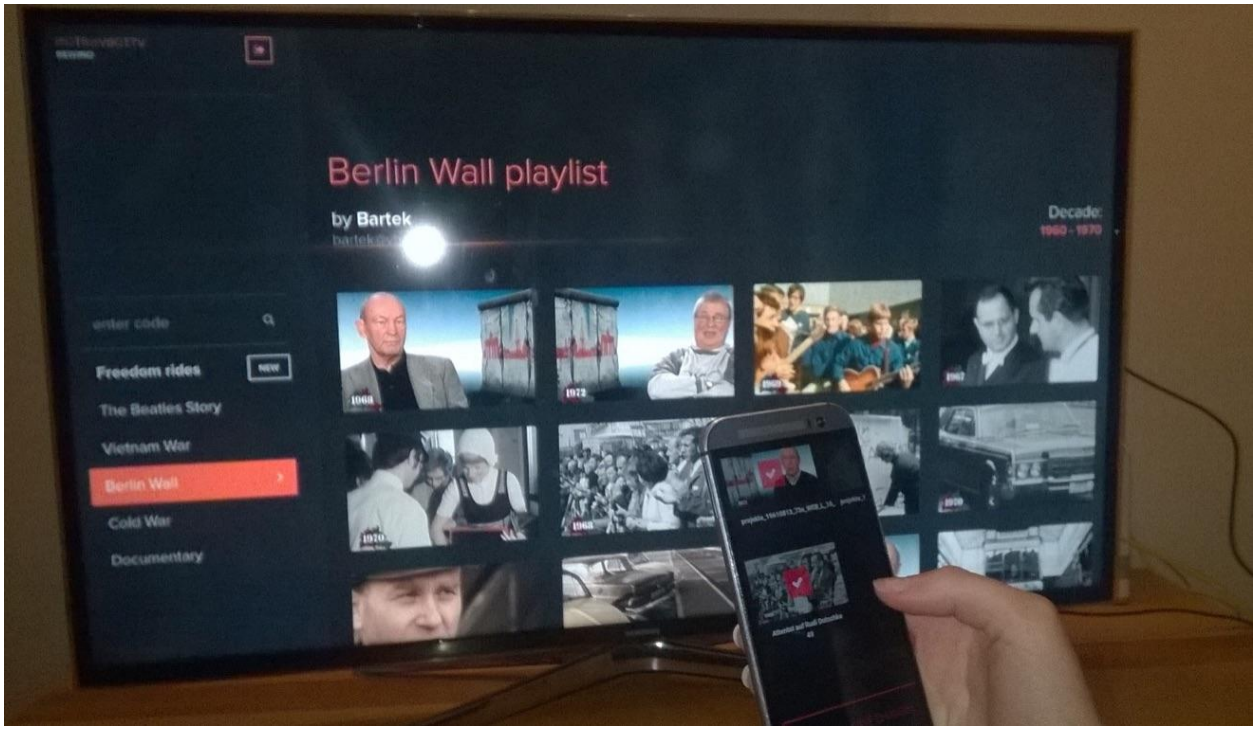


Figure 6: ReWind Pusher and Receiver app

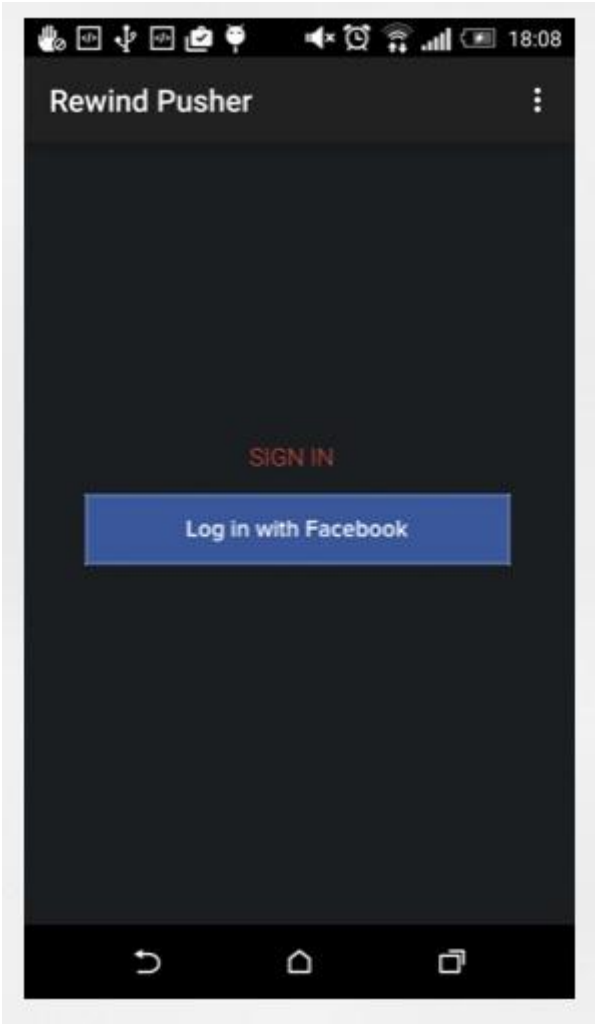
1. The Pusher app is being used by a representative of the younger generation – it is a mobile app that allows the user to easily search for specific video content, collate playlists and share them with the members of the older generation (the users of application).
2. The Receiver app, primarily a SmartTVapp that is intended to be used by a member of the elderly generation and as such needs to be very simple and intuitive to use.

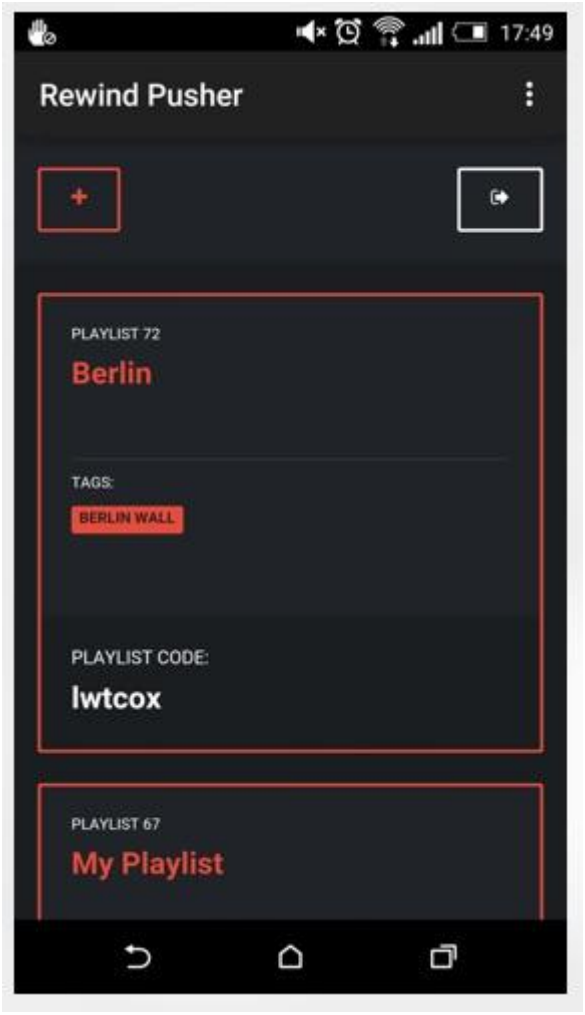
Given the two completely different types of users, Proton Labs focused strongly on usability research and user centred design. Both mobile and SmartTVapp went through a series of design iterations. The main goal is to make the sharing of video content easy and make sure that the Receiver app navigation is very easy for the elderly people.

Positive user experience is a key factor to make online software technologies accessible to elderly users. To make sure that the ReWind application will receive positive feedback from the target user group Proton Labs carried out intensive research around the usability for elderly people, their expectations, their preferred tools and how they consume online content.

The user journeys of the different applications can be described as follows:
PUSHER APP USER JOURNEY

FIGURE 6A – 6G

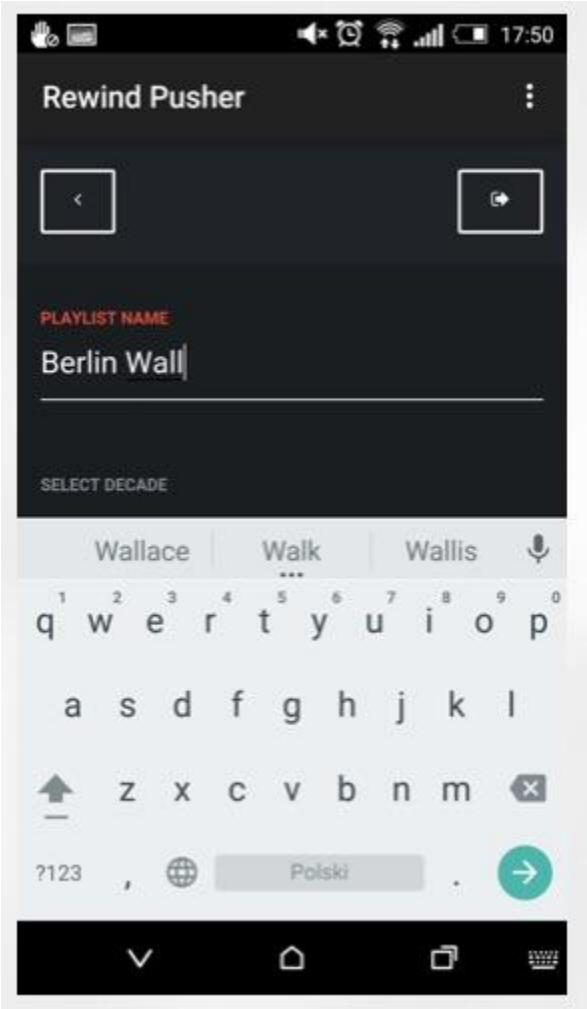




A- Users (young generation) sign in to the mobile application with their Facebook account – this creates a user account on the VBOT Platform allowing them to create playlists and browse their own playlists.

B- After signing in, the users can browse their previously created playlists, and modify their settings.

Any modification will then affect connected Receiver playlists. Users can also create new playlists.

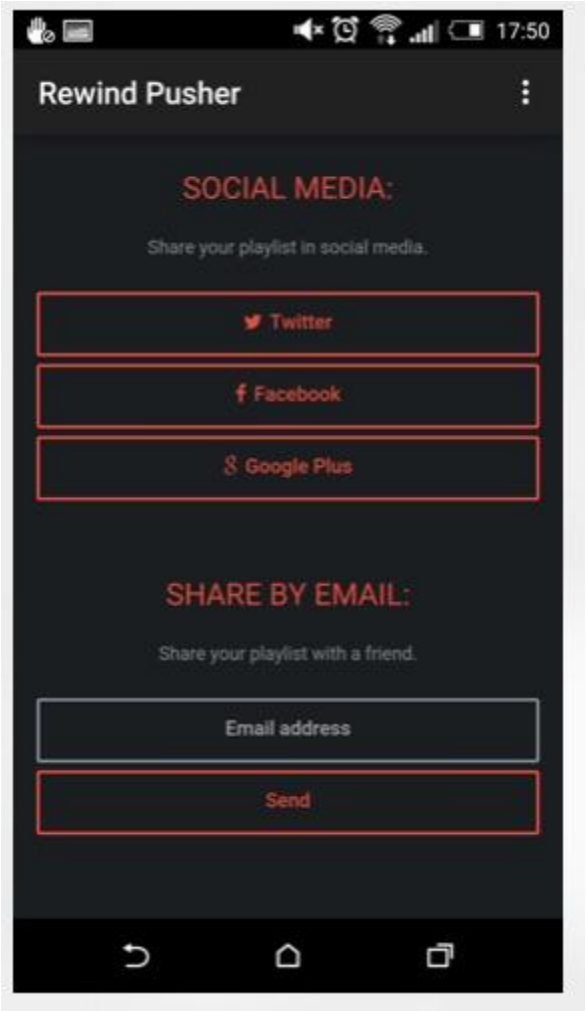


C- To create a new playlist, user gives it a title, then selects a relevant decade …

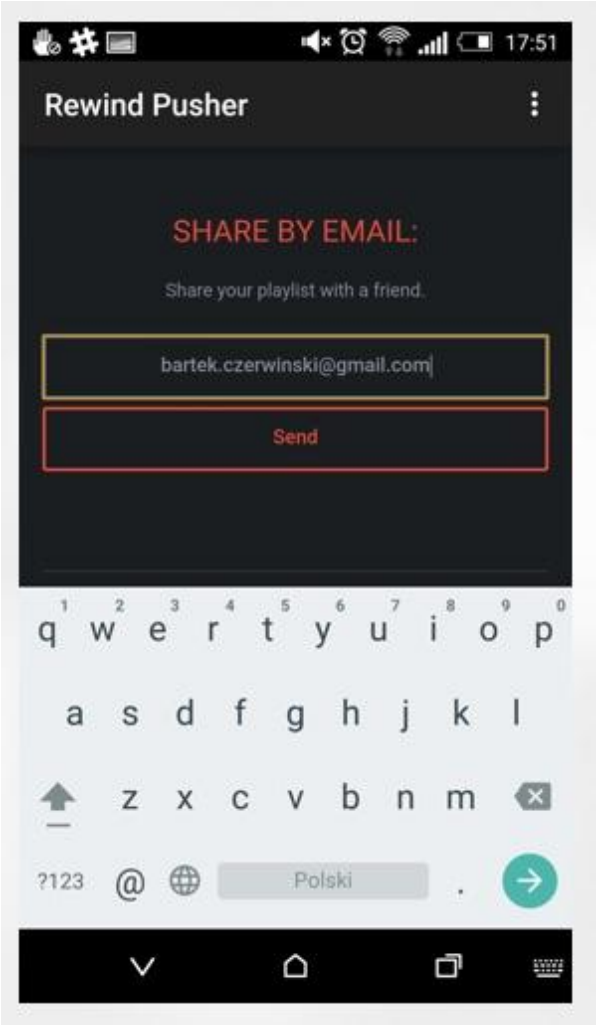
D- User then selects themes that they want to be included in the search.

Pressing GET THE VIDEOS will pull a list of videos that match the selected criteria.

E- User receives a list of videos, and can de-select the videos that they want excluded from the playlist. SAVE CHANGES will then create a new playlist and return a 6-letter playlist identifier code - e.g. “abcdef”.



F- The playlist then can be shared by social media but more importantly via email.



G- Sharing playlists via email has a double effect:

1/ new users can open the Receiver URL and enter the code to retrieve the video playlist.

2/ the Receiver user also signs in with Facebook, which returns the usual graph – it allows the back-end system to automatically connect the Pusher and the Receiver apps and “push” the playlists automatically to the right Receiver interface.

Sharing playlists via social media provides a viral effect as the Receiver app will also be available on the web browsers.

A RECEIVER APP USER JOURNEY – PLAYLIST VIEW

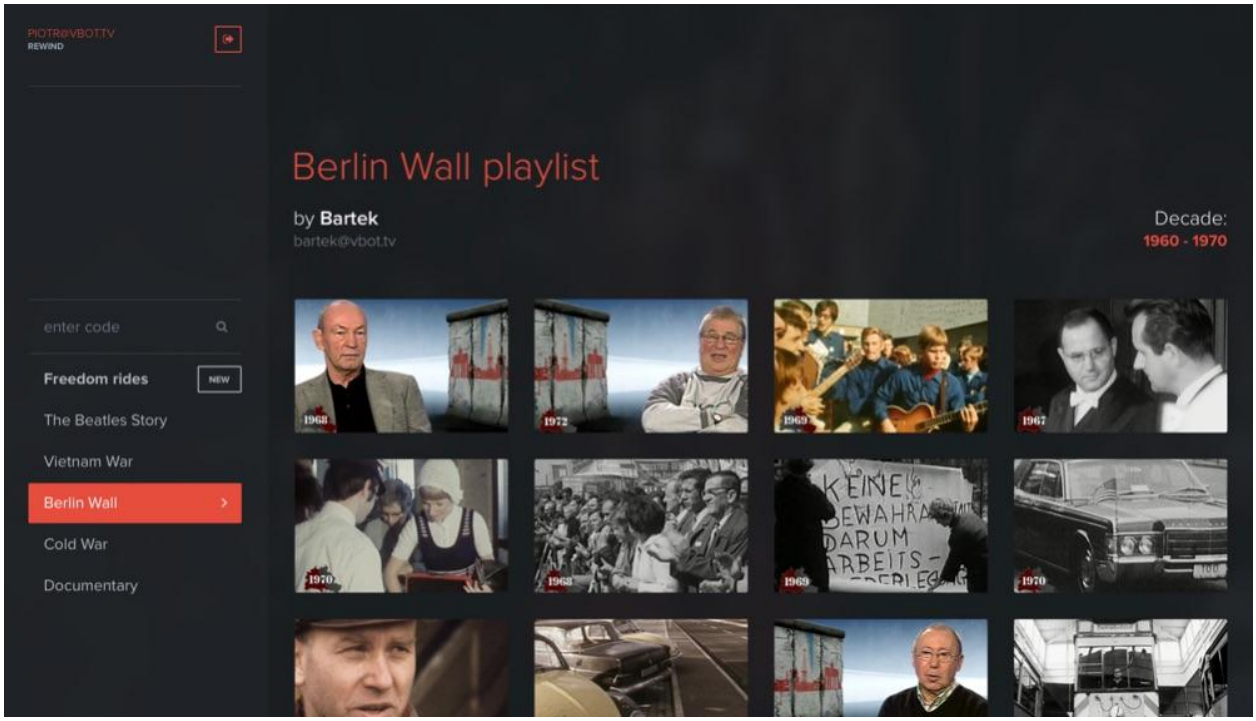


Figure 7: ReWind playlist view

To use the ReWind Receiver app, the users are required to sign in using their Facebook account or enter without sign-in, which would limit available application features e.g. personal playlist collection. The use of the app without login would be a one-off as the app would not store the user details. The app has been designed with emphasis on simplicity and ease of use.

Primarily designed as a SmartTVapplication, the ReWind Receiver app serves as the main display interface for the solution. Centred around the playlists shared from the Pusher users, it allows its users to browse, explore and watch videos from the Europeana archives.

The left panel holds all playlists provided from the Pusher app, but also allows the users to manually enter a code provided to them to retrieve new apps. The right hand panel holds a list of videos available in the selected playlist.

B RECEIVER APP USER JOURNEY – SINGLE VIDEO VIEW

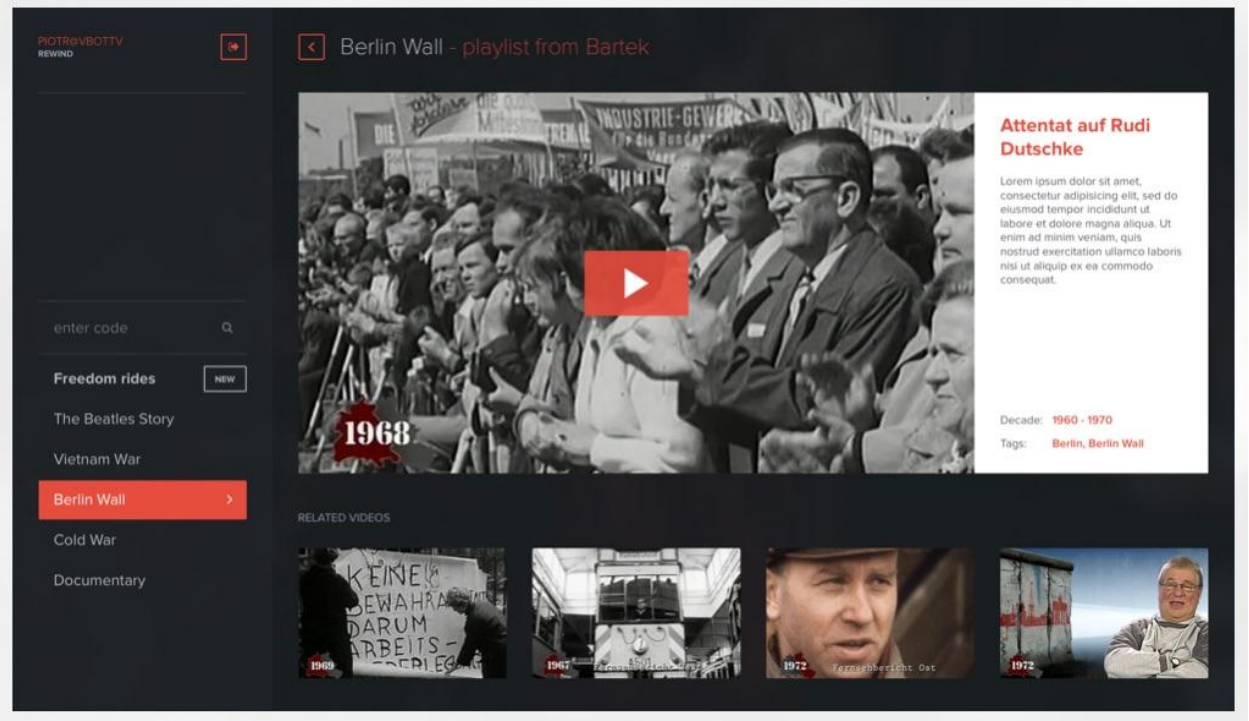


Figure 8. ReWind video playout view

The users can see a list of related content below the video. Currently these are the videos with matching taxonomy. In the future this will be based on related content from the project's Technical Space WITH API, depending on the technical feasibility of this solution. Overall the Single video screen will display the selected video, metadata panel and related videos.

The left hand sidebar panel is always visible for the ease of access. Users can maximise the video to full screen.

Users can go back to the playlist using the back button or alternatively can navigate via the side menu. One of the other planned future developments based on the availability of the enrichment API will be added media enrichments coming from all available sources that have been integrated into the WITH platform developed by NTUA in the WP2 of E-Space.

CONTENT SOURCES

The content sources have not changed since the description of the pilot content in D4.3:

Name of the content provider	Name of the selected collections	Type of content	Approximate amount of the sourced content	Copyright status	Status of the copyright agreement
NISV	Open Beelden (Open Images)	Video	3500	Public Domain, CC-BY, CC-BY-SA, CC0	N/A
NISV	Geluid van Nederland (Sound of the Netherlands)	Audio	2500	CC-BY, CC-BY-SA	N/A
RBB	Berlin Mauer	Video	500	Free access/rights reserved	RBB copyright
LUCE	EUscreen	Video	2400	Free access/rights reserved	Copyright LUCE
LUCE	LUCE YouTube channel	Video	1000	Free access/rights reserved	Copyright LUCE

Table 1. Content sourcing of the TV pilot. Items in grey are also available in Europeana

Of the sourced content, only the Open Beelden footage and Sound of the Netherlands audio is currently available in Europeana. The content of LUCE and RBB is available through EUscreen (www.euscreen.eu) and will be made available through Europeana.

5.1 NETHERLANDS INSTITUTE FOR SOUND AND VISION

The Netherlands Institute for Sound and Vision made two open content collections available for the pilot and hackathon.

Open Images (http://www.openbeelden.nl) gives access to over 3500 videos under a Public Domain or Creative Commons BY-SA license. The collection from Sound and Vision contains newsreels from the Polygoon collection and several other films on the Netherlands in the twentieth century. It contains historical news events, with topics such as art, culture, transportation, health and healthcare, nature, politics, sports, pets and fashion. Other providers to Open Images are VPRO, EYE film institute, University of Amsterdam, etc. The media items published on Open Images are also offered through a range of Atom feeds. Media items and their descriptions (metadata) are also accessible via an Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) API (http://www.openbeelden.nl/api/).

The dataset is also available via the Europeana API: http://labs.europeana.eu/data/newsreels-from-sound-and-vision-on-the-netherlands-in-the-20th-century/.

Sound of the Netherlands (www.geluidvannederland.nl) gives access to a collection of about 2.500 historical sound recordings. Sounds include horse driven trams, street vendors, recordings from the 'Eleven Cities' ('Elfstedentocht') ice skating match, bird sounds and many other interesting soundscapes. The sounds are enriched with a geo-location. All sounds are available under either a Creative Commons – Attribution-ShareAlike (CC BY-SA) or a Creative Commons – Attribution license (CC BY). The dataset is available via the Europeana API: http://labs.europeana.eu/data/sounds-of-daily-life-and-birds-from-netherlands-institute-of-sound-and-vision/.

5.2 RBB

The 'Fall of the Berlin Wall' app uses 486 videos which illustrate the stories of everyday life in the divided city of Berlin between 1961 and 1989, and of its subsequent re-unification in 1991. The material comes from the RBB archives, from "Deutschen Rundfunkarchiv" (the German broadcast archives) and from the former East German state TV channel. The material depicts living history in the form of daily life in the walled city of Berlin both in the East and West sectors. The documentation includes accounts of escape and separation, stories of those who assisted escapes and tales of life on the border. It includes historical speeches from Ulbricht, Kennedy, Gorbachev and Brandt, as well as the voices of prominent dissidents, writers and actors heard in Alexanderplatz in the autumn of 1989, as the process that led to the fall of the Wall neared its conclusion.

The videos have a significant cultural and historic value and as such are highly suitable for Europeana. All the videos used in the application will therefore be added to Europeana.

5.3 ISTITUTO LUCE CINECITTÀ

Istituto Luce Cinecittà is providing to the pilot content from the collections available on its YouTube channel (http://www.youtube.com/cinecittaluce), and from the newsreel collection "La Settimana Incom". The content again ranges between the 1950s and the 1970s and could be quantified in about 30.000 clips. This collection is available with Italian metadata in YouTube format. Videos are in SD and mainly in black and white.

Luce is also making content available to the pilot from its EUscreen collection (http://www.euscreen.eu/search.html?query=*&activeFields=%7B%22provider%22:%5B%22LUCE%22%5D%7D), which is made of about 3.500 video items, coming from the more recent newsreels and documentaries collections (ranging from the 1950s to the 1980s). This collection is also available through Europeana, but the EUscreen source is richer in terms of metadata. This collection, in fact, comes with a uniform set of metadata represented in XML and including information like: title, short description, extended description (scenes description), subject keywords, geographical keywords, topic, date of production and technical information. All the metadata are in Italian, but titles, descriptions and keywords are translated also in English. Videos coming from this collection are in SD and mainly in black and white, the format of the videos is H.264 with a bitrate of 500 Kbit/s

6. PROJECT INTEGRATION

6.1 COLLABORATION WITH OTHER PILOTS

During monthly work package calls across all pilots, the TV pilot has participated and given feedback on the progress of all the pilots within the project.

6.1.1 MUSEUMS PILOT AND TV PILOT (SPK, MEK, MUSEUMSMEDIEN AND RBB)

In March 2015, RBB and the German museums pilot partners (SPK, MEK and Museumsmedien) had a meeting to evaluate possible mutual benefit from cooperation. It was identified that RBB could potentially provide content for the two pilots 'Toolbox' and the 'Blinkster App'. Additionally, a list of events was prepared to cross-disseminate the results of the two pilots.

List of activities:

1. an initial delivery of requested RBB content for the Toolbox was made;
2. RBB participated in the Evaluation Workshop of the Toolbox on November 29, 2015;
3. RBB supported SPK in the translation of the E-Space Booklet into German (not yet available).

6.1.2 THE MULTISCREEN TOOLKIT SUPPORTING OTHER PILOTS

The Multiscreen Toolkit has been tested extensively during the TV hackathon and been evaluated and iterated since (see Chapters 6 and 7 for further information on the evaluation of the toolkit). The toolkit will be used by Noterik for support during two other hackathons within the E-Space project: the Photography hackathon 'Hack your photo heritage!' on 25-27 February 2016, and the Museums hackathon 'Hacking the museums experience' on 17-18 March 2016.

6.2 COLLABORATION WITH OTHER PROJECT TASKS

Furthermore, the TV pilot partners have supported the following activities within the E-Space project:

- background information on the use of audio-visual content and copyright challenges has been provided to support Deliverable 3.6 – Labelling report;
- the VBOT platform has been used to produce the E-Space TV channel to disseminate hackathon video reports;[10]
- video content made available by the content partners in the TV pilot has been used in the Games and Open Hybrid Publishing pilot prototypes;
- the ReWind application will provide interaction features that communicate with the WITH platform developed in WP2, the Technical Space;
- the TV pilot has provided support into the IP Case Study document created in WP3.[11]

[10] http://www.europeana-space.eu/project/europeana-space-tv-channel/, overview page of video clips of the Europeana TV hackathon, accessed 10 December 2015.
[11] http://www.europeana-space.eu/wp-content/uploads/2015/12/spa_content_tv.pdf, The E-Space TV Case Study, accessed 22 January 2016.

7. EVALUATION

7.1 'FALL OF THE BERLIN WALL' APP EVALUATION

Description of the on-air pilot

The 'Fall of the Berlin Wall' HbbTV app has been on-air since 3 October 2014, as an open-beta test. It was one part of the RBB online project 'The Berlin Wall – History in Pictures'. It is based on the existing RBB web/mobile video website www.berlin-mauer.de, which was designed and developed externally.

RBB TV viewers with a HbbTV enabled TV connected to the Internet could access the application via the red button on their remote control. The red button starts the HbbTV 'Launcher Bar' which includes a widget to access the 'Fall of the Berlin Wall' app.

Figure 9: HbbTV Launcher Bar

Figure 10: Start of the application via the widget

Figure 11: Start screen of the application

Target audience

Within RBB's broadcasting area of Berlin and Brandenburg there are 3.104 million potential TV households[12] that could view the RBB TV programme. Not considered is the reception via satellite outside of this area. Based on the recently published digitalisation report of 'Die Medienanstalten - ALM gbR' around 624,000 households have HbbTV enabled TVs connected with the Internet in RBB's broadcasting area and thus constitute the potential user group for the HbbTV Berlin Wall application (11.8% of all TVs nationwide are SmartTVs connected with the Internet).

The target audience for the 'Fall of the Berlin Wall' app included both the general public and those with special interest in the geo-political and economic area, i.e. scholars, historians, tourists, social science researchers/students, journalists and artists.

7.2 'FALL OF THE BERLIN WALL' LAB TEST

Approach

The methodology was based on the evaluation criteria from D4.3. The lab test was designed to investigate the usability of the Berlin Wall application, which is representative of an interactive TV application using valuable cultural heritage content. The test was conducted with the on-air application. Test participants were sat in front of the TV set and interacted with the application by using the TV remote control. Task-based testing was used, with testers requested to express their thoughts during the process.

The test was consisted of four parts:

1. *Information on general media use and interactive TV use in particular* – This section is used to more accurately identify the target group.
2. *Task-based validation of usability* – Feedback about specific tasks like starting a selected video or change to the full-screen view.
3. *General feedback about the application* – Feedback about the concept of the application as a whole and the likelihood of a user recommending the application.
4. *User experience questionnaire for the application* – A mini Attract Diff was used to gain knowledge about the subjective perception of the usage and presentation of an interactive product.

Tester group

The test was conducted with a group of eight people. The group was aged between 20 and 74. For the test evaluation, it was decided not to separate the results by age or gender groups to avoid the risk of a biased evaluation of issues. The test group answered a pre-test questionnaire to assess media consumption habits, technical skills and possible role as multipliers.

[12] Digitalisation Report 2014 of "die Medienanstalten – ALM GbR" http://www.die-medienanstalten.de/fileadmin/Download/Publikationen/Digitalisierungsbericht/2014/Digitalisierungsbericht_2014_Daten_und_Fakten.pdf, accessed 10 December 2015.

The basic insights were:

- all users owned a TV and watched TV daily;
- five users owned a SmartTVwhich is connected to the Internet and one user owned a SmartTVin combination with a set-top-box;
- six users owned a computer, smartphone and tablet and two users did not own a tablet but a smartphone and a computer;
- seven users used the Internet on a daily basis and some hourly, while one stated he/she used it several times a week;
- the Internet was mainly used for communication and information. Three people used video and/or music and four used web 2.0 applications.

Technical skills

Two scales to identify technical lead users were in place (Hippel, 1986).[13] They were identified as follows:

- Scale 1: How often do others ask you about technical matters (TV and Internet)? – (frequently, often, rarely, never).
- Scale 2: How often do you ask others for help about technical matters (TV and Internet)? – (frequently, often, rarely, never).

Lead users were defined as those who, at a minimum, answered 'frequently' in scale 1 and stated the same or a lesser frequency in scale 2. In other words, lead users are users who give advice 'often' or 'frequently' and who ask for advice themselves in an equal or reduced frequency.

With this definition in place, seven out of eight users are technical lead users.

The lab-tests were conducted on 19-20 February 2015. Originally 10 participants were recruited, but two unfortunately cancelled at short notice. Each session lasted around one hour per tester. A moderator conducted the test and another person took notes.

Analysis of the task-based questionnaire

- *Usability of the HbbTV Launcher Bar*

The task-based usability test began with the validation of the access of the application via the HbbTV 'Launcher Bar' by pressing the red button on the remote control and selecting the widget of the application. Six of eight testers could activate the app without any problems. The remaining two testers had never used HbbTV applications before and learned the activation of the 'Launcher bar' and the selection of the respective widget after some initial difficulties.

- *Usability of the 'Fall of the Berlin Wall' app*

The application is navigable with the arrow keys on the remote control and every selection of a functional button or video element needs to be confirmed with the OK button. The following buttons are additionally overlaid with functions based on the ARD HbbTV guidelines:

Red Button: hide app

0= launcher bar

Back Button: back to the start screen (year 1990)

Play, stop, pause, rewind and forward buttons: control of the video play

[13] Hippel, Eric von (1986). Lead Users: A Source of Novel Product Concepts. In: Management Sciences, Vol 32, No 7 (1986).

- *User feedback on controls*

FEATURE	EVALUATION
Focus and selection of elements	While focussed elements were recognised and perceived by all testers, the control concept of confirming the choice with [OK] was not consistently used. This concept is mandatory for HbbTV applications in contrast to an interactive application for mobile devices or the navigation on websites. The recognition and internalisation requires a short learning process from the user.
Forward function on video page	The forward function of the video player confused some testers as they expected not to wind forward by chapter but rather an immediate film preview.
Back button on video page	Some testers did not recognise the back button on the video player site as an active button. They alternatively used the back button on the remote control. The expectations as to target of the back button were very different. The navigation concept defined it as 'back to the start' screen that is fixed in the year 1990. 
Arrow buttons on the video page	The function of the arrow buttons to scroll the text was recognised by all testers. Some testers were irritated that the arrow button for scrolling down was still visible at the end of the text. It was proposed that the arrow buttons faded out at the end of the text. 

General feedback on the application

Two testers did not have any previous knowledge of HbbTV applications and had initial difficulties with the tasks. It was possible for one of them to learn the navigation and the concept while doing the testing.

Therefore, the assessment of the application based on the general questions was still positive.

SCALE 1-6 (1 COMPLETELY INCORRECT – 6 COMPLETELY CORRECT)	ARITHMETIC AVERAGE	EXPLANATION
The use of the app was immediately clear to me. (Perceived learning curve)	4.25	As explained above only two testers had no previous knowledge of HbbTV applications.
The app was easy to use. (Perceived ease of use)	4.38	Seven of the eight testers rated themselves as having used the app without difficulties. Only one tester gave the application negative rating for ease of use.
It was always clear to me what I had to do in order to use the app. (Familiarity)	4.13	The usage of the application was mostly clear for six testers. Only two testers had no previous knowledge of such an application.
The graphics were appropriate.	5.25	Seven of eight testers assessed the application as attractive.
I understood the labels immediately.	5.38	In contrast to the expressions of the testers during the tests, seven of eight testers scored the comprehension of the wording very high.
I achieved what I wanted to achieve. (Perceived achievement of goal)	5.25	Seven of eight testers assessed the perceived achievement of their goal as very high.
I wanted additional explanations and advice on the use of the app.	2.13	Only one tester required more explanations and advice. Two more testers rated it scale 3, which is marginally positive.

How likely is that you would recommend this app to friends? Please circle a number. (0 unlikely – 10 very likely)	7.38	Six of eight testers would recommend the application to their friends.

Analysis of the MiniAttrakDiff

MiniAttrakDiff is a user experience questionnaire derived from the well-known AttrakDiff2.[14] It is meant as a compact alternative when user experience has to be measured as part of a more extensive survey where there is not much space for additional items. It measures four different qualities of user experience:

- Pragmatic Quality (PQ), which indicates usefulness and usability of the application.
- Hedonic Quality – Identity (HQ-I) indicates how much a user identifies himself with the product.
- Hedonic Quality – Stimulation (HQ-S), indicates the potential that the user sees in the product to improve his life or open new possibilities in any way.
- Attractivity (ATT) covers the aesthetic quality of the product.

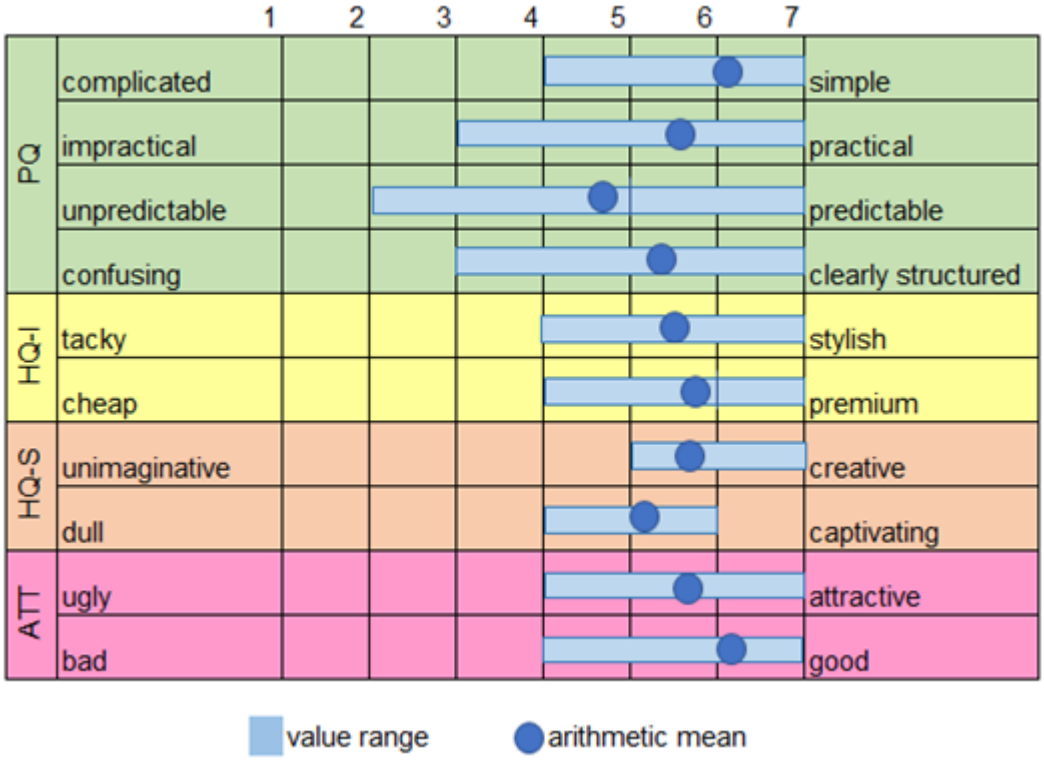


Figure 12: Summary of MiniAttrakDiff questionnaire

[14] Hassenzahl, M., Burmester, M. & Koller, F. (2003). AttrakDiff: Ein Fragebogen zur Messung wahrgenommener hedonischer und pragmatischer Qualität. In: J. Ziegler & G. Szwillus (Hrsg.), Mensch & Computer 2003. Interaktion in Bewegung, 187-196, Stuttgart, Leipzig: B.G. Teubner.

Pragmatic Quality

The pragmatic quality shows good results with an arithmetic mean of 5.5 and indicates that the usability of the application was valued positive especially in the category simplicity, practicability and a clear structure.

Hedonic Quality

The hedonic quality refers to the users themselves and their needs related to the interaction with the application. It is segmented in two sub-components: identity and stimulation. With values around 5.3 the hedonic quality and especially the sub-component identity valued with 5.7, implies that the testers could identify with the application. This shows that such thematic video dossiers correspond to the tester needs.

Attractivity

The attractively shows very good results with a value of 5.9. With a mean of 6.1 good is the dominant attribute, which is as well reflected in the analysis of the general question about the probability that the testers will recommend the application to their friends. The scale ranged from 1 (unlikely) to 10 (likely) and the value was 7.3.

Improvements after evaluation

As stated above, the application has been broadcast in an open-beta version since October 2014. In order to publish the application in time for the 25th anniversary of the fall of the Wall, it was decided to accept minor bugs and continue the debugging process afterwards.

In general, the user feedback on the usability of the application was positive and only minor issues were raised during the trials. Most of them are HbbTV specific and only require a short learning process from the user but do not necessarily demand changes in the application itself. Consequently, RBB focused on the functional bugs on the identified target devices. In several testing and debugging iterations a number of technical issues could be solved and the stability of the application could be improved. A final version was deployed early September 2015, which has successfully been tested on all major HbbTV devices and platforms.

6.3 'FALL OF THE BERLIN WALL' OPEN BETA TEST

Analysis of the user figures

The use of the application has been tracked since 1 November 2014. The user figures were evaluated as they provide a realistic indication of the acceptance of the application. Piwik has been used to track the visits to the English (http://www.the-berlin-wall.com) and the German website (http://www.berlin-mauer.de), which is considered as a benchmark for the user figures of the HbbTV application as they use the same video content and have a similar look.
The visits of both website were regarded in proportion to the user figures of the 'Fall of the Berlin Wall' app. It shows that the application was accepted by the TV viewers as an alternative to the website.

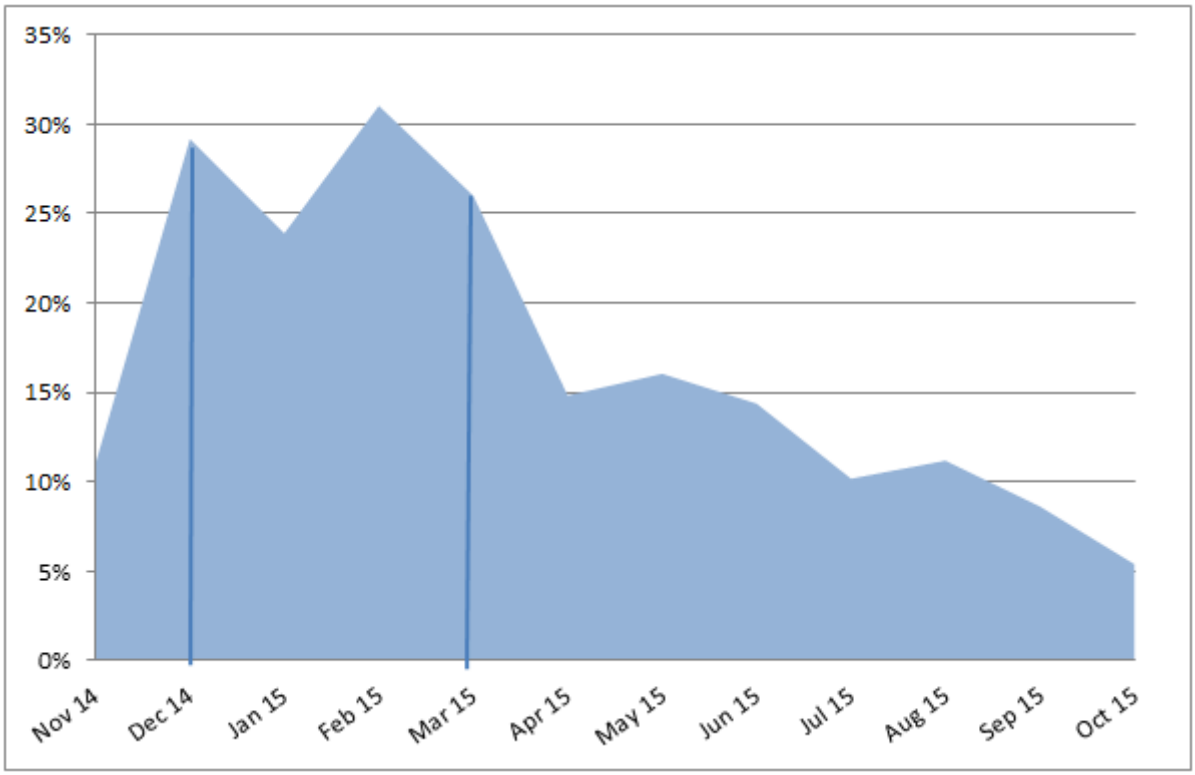


Figure 13: Percentage of use of the application in proportion to use of the website

The usage of the application from November 2014-October 2015 was divided into three main phases.

In the first phase from November-December 2014 the visits to the website (both language versions) were proportionally higher than the user figures of the HbbTV application.

The Berlin Wall websites (both language version) were promoted intensively in a marketing campaign around the 25th anniversary.

The application had the highest user figures between January-March 2015. From April onwards the user figures fell as demand reduced.

8. LESSONS LEARNED

8.1 THE MULTISCREEN TOOLKIT

Within the projects partners have applied several technologies used by the technical providers. Among them it was decided that the Multiscreen Toolkit created by Noterik would be used within the workshops and hackathon that is part of the project. As described earlier in D4.3, one of the goals of the toolkit was to allow developers to quickly create multiscreen applications. Within the project this was 'user' tested with developers in several workshops leading up to the hackathon where it formed the base layer for teams to use. During this process, the focus was on the following issues:

- providing a hostable (amazon) installation of the toolkit, so no setup is needed;
- provide a way to package and install applications on top of the toolkit;
- include examples on how multiscreen development works versus normal development;
- allow them access to all the underlying code on github if they needed it;
- support each team during the hackathon by adding a Noterik developer to each team.

Given the length of the hackathon, some great results were achieved. Several interesting experiments made it from concept to working application within the space of 72 hours. However, this needed much more help from Noterik's developers then had been hoped and as a result, work has taken place to improve several aspects of the toolkit. The following conclusions and solutions were drawn form the experience.

8.1.1 HOSTING THE PLATFORM

Months before the hackathon took place, as part of the testing process, the pilot had began to move each new project and/or test to a new instance of the platform, running on a new amazon cloud instance (as in the case for RBB). By the time of the hackathon, this process was so familiar that within minutes, a new dataset could be set up and shared with the different teams. To make this even faster, six totally different instances were set up on Amazon that could be shared immediately. Normally about 50% of the time is lost on people setting up a machine, install and load databases, install access and methods. The pilot team feel that further improvements can be made in the area of installing new datasets, but in general partners are content with how this works and will be replicating it for upcoming hackathons in this and other projects.

8.1.2 PACKAGING AND INSTALLING

The toolkit is strongly based on the idea of running applications on top of a platform (similar to installing and updating apps on a mobile phone). That allows teams to quickly develop something, and install a new version that can be tested within seconds. During workshops and hackathons, mistakes are quickly made as people work under time pressure, often with limited sleep. Therefore, it was ideal to have a system in place that allowed for version control that made it easy to switch back to older versions within seconds. Also, keeping both the Amazon images (the platform) and the packaging system created a backup of each version which, even after the events over, is still available.

Several upgrades are being made for wider deployment (for example being able to install clusters over multiple Amazon data centres for failover), but these are additional adjustments and do not reflect specific problems found during the testing.

8.1.3 APP MODEL AND EXAMPLES

The toolkit followed an API model created by Sun Microsystems in the mid 1990s; which it was expected that developers would be able quite easily. However, the reality has shown to be more complex. First of all, even though Sun Microsystems is very popular, there are many other API models. Using them needs strict adherence, which proved difficult for developers who were not familiar with the model. Secondly, the way in which the toolkit is designed and how it should be used, was unknown to most developers. It demanded that users adapt their thinking, which required a willingness that was difficult to achieve within the time constraints. Realising this, the more commonly known MVC model was adopted and a multiscreen version was created on this basis. This gave developers more guidance on how to structure their applications, as well as making other applications more accessible to them. This decision fits in with the templating concepts and demands, as an MVC concept is part of most developer courses in education and hence more widely known.

A standard MVC model looks like this:

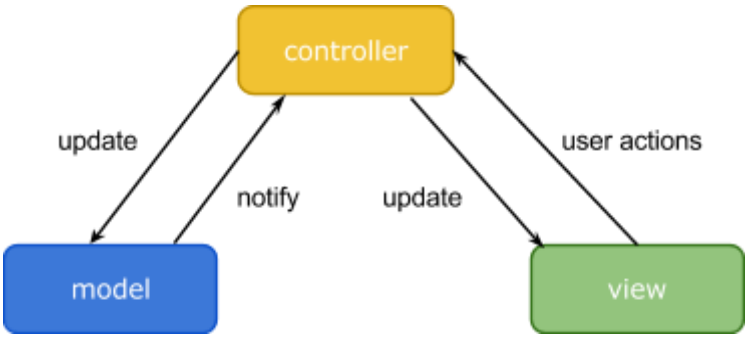


Figure 14: Model-view-controller model

An application model will be presented on a view. In this case, the content and metadata from the TV pilot content partners, as found on WITH or Europeana, is viewed in a browser window of a laptop. The controller acts as a middleman between the model and the view and decides how to translate events from coming from the model and view and issue updates to them accordingly. This is called the programming logic.

However, the MVC model was never designed for multiple visual outputs. Therefore, the model had to be adjusted slightly to accommodate the unique demands in a multiscreen, multi-device and multi-user application. The following structure was designed, based on the MVC model:

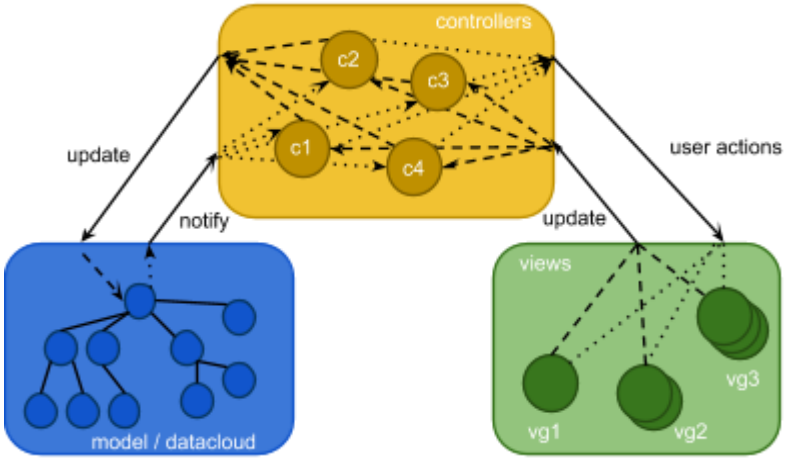


Figure 15: Multiscreen model-view-controller model

We still only have one model (a single state of a data model), which is an object-oriented cloud. This is maintained and accessible on all the machines in a cluster, using its own synchronisation methods for continuous availability. This allows users to group views based on attributes that can be controlled by one or multiple controllers. If someone adds a new time-annotation to the data cloud, several controllers might receive a notification signal. One controller (c1) could for example update a main screen (vg1). The second one who also receives this same notification signal (c2) and controllers (vg3) that are views grouped and turn out to be 3 second screens. The trick is that from a developer's example the network layer abstract was extended and also abstracted this grouping so the again the developers can concentrate on the program logic instead of the tracking of which views are where and updating all the views one by one.

Internally, this new model is now being used and is starting to be adopted in the Horizon 2020 project (MECANEX). Since the TV hackathon has taken place, a team will attend some of the other E-Space hackathons to see how this new MVC model works under workshops and hackathons pressure.

8.1.4 ACCESS TO UNDERLYING CODE

Giving participants access to all the code used in the platform, encourages them to be involved, and allows them to continue the development of their work elsewhere, without restrictions by the platform provider. In addition, a great deal of time was spent publishing all code on github. Although this was not accessed often, the investment of time was appropriate, to provide a non-threatening environment that allows sharing of ideas and code.

8.1.5 SUPPORT DEVELOPERS

Finally, the workshop format was experimented with. Within the TV hackathon, support was offered to one developer in each of the teams. This was partially successful, as it created the risk that the assigned developer became the main coder within the team.

The aim is to improve this by adding the revised MVC model, and experimentation will continue by running full teams in hackathons, supporting larger hackathons with the method of embedding a developer in each team. For this reason, the TV pilot will send a development team to the Photography hackathon. The last model turns out to be very useful for the Multiscreen Toolkit as platform developers learn and see how other companies develop and try to match and improve that in future releases.

8.2 DEVELOPMENT OF AN HBBTV VIDEO DOSSIER

The 'Fall of the Berlin Wall' app was a first attempt to create a thematic cultural heritage video dossier application for HbbTV. The basis for the application was the existing RBB web/mobile video website www.berlin-mauer.de. The concept of web-optimised navigation was completely revised to adapt it to presentation on a TV screen and navigation with a remote control. The continuous usage of the application, which extended beyond the thematic context of the 25th anniversary of the fall of the Wall on 9 November 2014, illustrates the attractiveness of such an application for TV viewers.

The application was uniquely developed for this use case. A system needs to be established to easily curate cultural heritage content from Europeana and other sources and to replicate the application for other content contexts. An initial step in this direction was made at the TV pilot workshop with Sound and Vision, Noterik and RBB (24-26 February 2015), extending the 'Fall of the Berlin Wall' app with related content by using existing tools.

In general, compatibility of such an application with a wide range of HbbTV enabled TVs is difficult as application manufacturers partly disregard full compatibility with the HbbTV standard. Lessons learned include that a definition of a range of end devices is essential for the development of such an application and that it needs several evaluation rounds. These aspects should be considered in the planning and development phase of such an application, especially in respect to timing.

8.3 REWIND

8.3.1. LESSONS LEARNED USING VBOT

Lessons learned were common for the ReWind prototype development. They include minimum viable development given technology constraints, personas and use cases. As the ReWind prototype leans heavily on the VBOT platform, an initial overview is provided of the evaluation method for VBOT.

The iterative process of user centred design is part of Proton Labs' own Prototype as a Service model, which focuses on three areas: software design, user experience and business value. The user centred design methodology focused on delivering a pleasurable user centred experience, making it easy to use the application and delivering social value, exploring video content together with others.

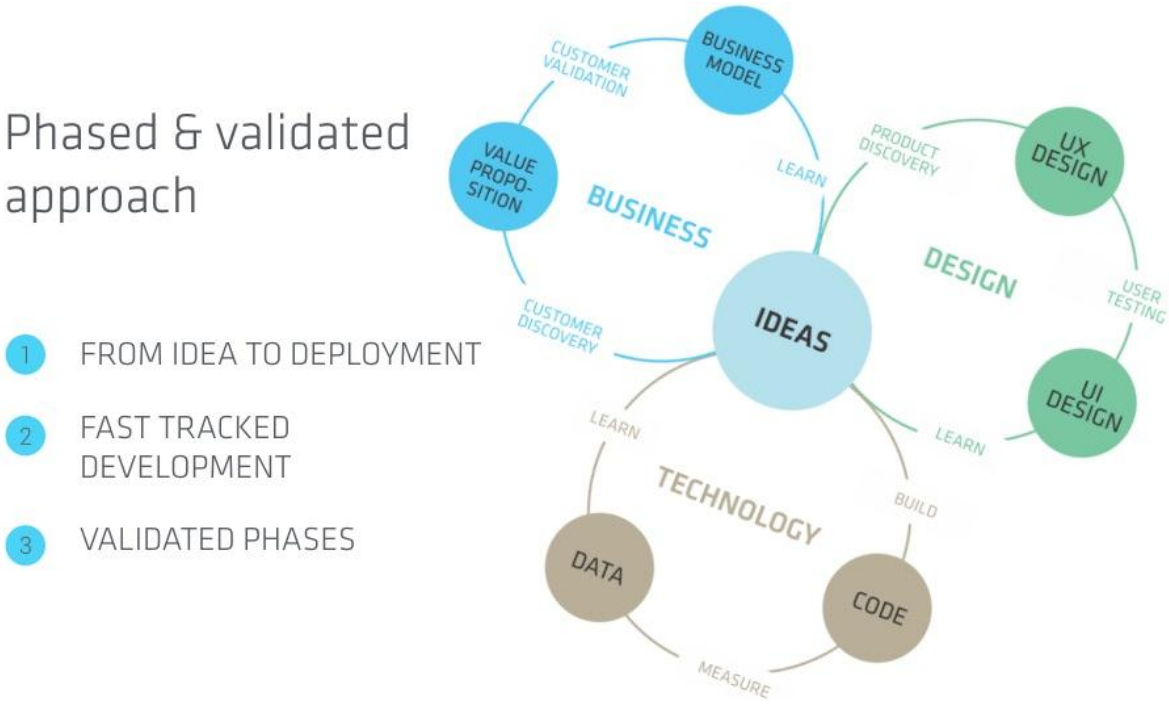


Figure 16: VBOT phased & validated approach

The proposed methodology begins with establishing specific user interface and functional requirements, which lead to contextual inquiry, task analysis and task scenarios for two types of users, those working separately and together as a team. This phase was concluded with the delivery of low-fidelity wireframes (published in deliverable 4.3).

After the initial user experience and requirement analysis phase, a first interactive version of a prototype was developed. This version had a very basic interface, demonstrating the possibility of creating playlists out of VBOT CMS system and privately sharing them in a web-based video player system. The stages of designing and building this interactive version were interrelated, and included extensive low-fidelity (paper prototype) and high-fidelity (software prototype) prototyping along with screen mock-up designs made in Photoshop.

Each stage of the prototype was evaluated by conducting internal user testing for every version. As basis for further development, Proton Labs applies agile SCRUM methodologies for software development that have user testing tasks embedded. This has proven to be a highly effective method allowing for many iterations and flexibility to adapt to end user requirements.

8.3.2 REWIND INITIAL USER TESTING

Initially, the ReWind prototype attempted video ingestion using the Europeana API. However, user tests using this ingestion method have resulted in alterations to the prototype. The reasons for these deviations were due to the slow nature of Europeana API to present video content when retrieved from a third-party interface such as the Pusher app for the subsequent creation of personal playlist to be sent to the Receiver app. Slow searches, retrieval and presentation of Europeana videos and thumbnails as part of the Pusher app interface led to poor usability and did not provide suitable baseline technology upon which an application such as ReWind could be scaled.

Proton Labs decided to upload a sub-set of TV pilot content providers' videos to provide an end-to-end technology concept, working both locally and live via an Android device. That concept was made available in time for the TV hackathon in May 2015. Now that the E-Space WITH platform is available, connection will be made with the WITH API to see if video retrievability is fast enough to achieve high standard usability as a feature within the ReWind prototype. As WITH sits within the project, it has the ability to be more responsive to partner needs than the Europeana API that failed to optimise ReWind.

9. EDUCATIONAL USE

9.1 'FALL OF THE BERLIN WALL' HBBTV APPLICATION

The 'Fall of the Berlin Wall' app is suitable for use in an educational context, especially for history lessons. The videos are short, generally lasting a couple of minutes. Their content provides an overall picture of everyday life, culture and politics in Berlin shortly before, during and immediately after the fall of the Wall. The app is available in both a German and English version and is available without geo-blocking. It is accessible via the RBB broadcast channel that is signalled without any encryption. Consequently, educational institutions with an HbbTV enabled TV connected to the Internet or a TV with a respective set-top box can access the application and use the content. RBB's TV channel is available via DVB-T in the eastern parts of Germany, via cable (DVB-C) in most parts of Germany and via satellite in most parts of Europe.

RBB TV channel in HD satellite digital	ASTRA 19,2° east; transponder 61; frequency: 10,891 GHz; polarisation: horizontal; symbol rate: 22 MS/s; modulation: 8PSK
satellite digital	ASTRA 2C; transponder 85; 12,110 GHz; horizontal; symbol rate 27500 Symb/s; FEC ¾

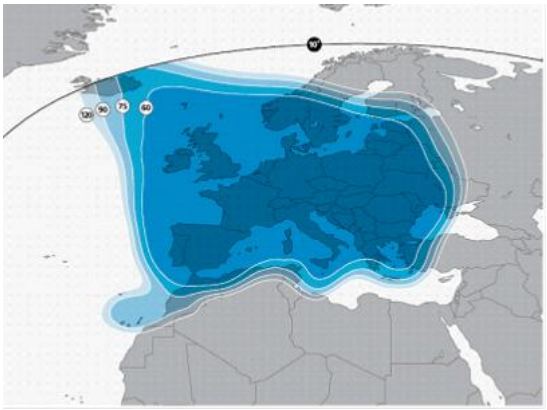


Figure 17: Europa-beam of ASTRA 19,2°

9.2 REWIND

The ReWind app can be directly applied to an educational context without any structural changes to the software prototype.

The ideal scenario would be for teachers and lecturers to use the Pusher app to create and curate archive themes for groups of students. The students can then use the Receiver app to view 'pushed' videos for research and discussion purposes. The same scenario can be applied to class situations where the teacher can create impromptu playlists by simply searching and curating the videos via the Pusher app, and then displaying the videos on a TV in the classroom for immediate screening. Teachers can also prepare separate homework assignments based on audio-visual content and share them with their students.

A possible extension to the ReWind app with an educational aim would be to develop two more features:

1. A commenting system through which students can annotate and comment on the video as they watch, including timeline based comments. Teachers and lecturers can curate the comments from students.
2. A feature for reporting and analytics for teachers to obtain real-time reports on videos watched by students, as well as on video access data, comments and video shares etc.

Key advantages of ReWind as a learning platform:

1. Easy content management and secure delivery for blended and embedded learning.
2. Just-in-time access to archive video available to groups of learners with push notifications.
3. Learners can interact, ask questions and provide feedback.
4. Accurate training reports.

This could be a stand-alone video solution for education, or could be embedded into a MOOC.

9.3 FOCUSSING ON EDUCATION USE IN THE TWO EXTRA HACKATHONS

Further iterations of the Multiscreen Toolkit are planned during several co-creation events, including the Photography and Museums hackathons. Education will receive specific attention by creating extensions to existing products, designed for classroom settings. Currently, user scenarios are being drafted for these iterations. Although due to the nature of hackathons giving a clear outline of what these extensions might look like is not easy, objectives are:

Photography hackathon

A prototype of a fully interactive app will be created for use during a photography class, using the presenters' screen and students' phones. The unique feature will be that elements of selection, composition, and subject identification will be completed in 'real time', increasing discussion and learning opportunities compared to the assignment/review model. The TV and Photography pilots have collaborated on this concept and TV will send a team to their hackathon in February 2016. Noterik and Luce will be involved as project partners, to make sure that both content and technical sides are covered.

Museums hackathon

During preliminary discussions with the Museums pilot, agreement was reached for two distinct elements for further exploration. The first element concerns interactions with classes who visit a museum and use on-screen content in a manner that extends the teaching both before and/or after the physical visit. The second element involves improving the match between the enormous availability of content sets that could be shown, through video archives on the one hand, and the teacher's goals for the visit on the other. This can be achieved through time-based video tagging and synchronised interactive elements within and output to mobile devices.

10. IMPACT AND SUSTAINABILITY

10.1 PLATFORMS

The project was not aimed at developing new products, but rather to use and adapt existing platforms. The three technical partners all introduced platforms that were used in other commercial and European projects, also prior to the start of this project. The reason for this is that the task of developing a platform from scratch would be too large for this project, which would increase the risk of failure, while this choice guarantees sustainability as long as the platforms themselves are valued, a fact of which all three partners involved feel confident.

10.2 APPLICATIONS

The applications created within the pilot will, by design, be less sustainable than the platforms. These types of applications are fast moving targets, allowing content providers to update their website, second screen app, or mobile apps on a regular basis (sometimes yearly). The idea of prototypes and demonstrators is to allow an easy flow of elements into future versions of an application. For example, some of the ideas developed during the project in the area of group-based education, are now being implemented into additional products. For instance, the 'Fall of the Berlin Wall' HbbTV app is a starting point for a 'white label' application which could be used for other content in a new thematic context.

The ReWind prototype impact beyond the TV pilot is that content provision can securely extend via flexible application frameworks, such as stand-alone, native, mirrored apps or TV apps, via a unified Content Management System. Content access and viewing can be maximised given the fact that content providers can make a relevant subset of their archives or content themes to Pusher app users and subsequently make content viewing via the Receiver app highly personal and relevant. The impact of ReWind beyond the TV pilot is that it is an end-to-end video application compliant with most playback devices and omni-channel distribution reaching significant number of Europeana users and smartphone/tablet users. In terms of sustainability, Proton Labs can host and maintain current apps and technology sustainability is credible given compliance (databases, ingestion, storage, security, playback) sought when developing both CMS and app technologies.

10.3 METHODS

The final area of lessons is in the area of how to run technical workshops and hackathons. The lessons learned in the application area are well known and user testing is a known science that will have effects on next projects and products. The effect of this type of project on platforms is much harder to predict since this method has not been used that much. Several changes have been made to workshop planning to support these changes to the three platforms, but testing of this will take more time. Part of it will still be undertaken within this project, but the real effects will take several years to fully understand.

11. FUTURE WORK

11.1 'FALL OF THE BERLIN WALL' APP 2ND PROTOTYPE

RBB and Noterik will work on the implementation of a multiscreen extension for the Berlin-Wall showcase. The HbbTV showcase will be extended using Noterik's Multiscreen Toolkit to connect several mobile devices to the HbbTV enabled TV-Set and have different audio-layers running synchronised with a video in the HbbTV app. This will enable the delivery of different audio versions of the same media item to personal devices, thereby extending the scope and reach of the current application. Offering multiple language versions of the videos, for example, would increase the attractiveness and likelihood that the application could be used in a non-living room context and applied to displays in museums or other public spaces. A meeting to develop the prototypical HbbTV extension is planned for February/March 2016.

11.2 REWIND

ReWind apps will be available for iterative tests and customisation until the pilot ends in Month 30, during this time, the WITH API integration will be assessed, with further development of it from WP2, as required. They will also be populated with additional video content from Europeana, EU Screen and other third party databases to make it relevant, interesting and beneficial for elderly testing groups. Proton Labs can also publish a range of stand-alone Android ReWind apps to conduct A/B tests across usability, visual design, front-end features, and video experiences. Live ReWind Pusher & Receiver apps would ideally link to content provider databases hosting xml video information, as well as lists of emails and/or mobile phone numbers of registered ReWind app users and/or web video users. This setup would allow content providers to have control in packaging, presenting, and publishing copyrighted playlists and related videos based on devices, age groups, content themes, viewers interests, locations, and copyrights. Publishing ReWind apps in Apple TV app format is also feasible if content providers want to experiment it before Month 30.

Following these developments of the ReWind prototype, the application will be subject to extensive user testing. Opportunities for local user testing have been identified in Utrecht (as a side activity to the EU Screen final review) and in Pisa, were a home for the elderly has been approached for user testing.

12. CONCLUSIONS

The TV pilot covers several angles of the TV playing field. Firstly, there is a horizontal consideration of a 'one to many' broadcast model followed and exploited within the broadcast scenario. This has led to the development of the HbbTV application for the 'Fall of the Berlin Wall' app. The user testing for this application has been positive, with only a few minor usability issues raised. As the features for HbbTV 2.0 offer more interactive entryways to (broadcasted) content, further concepts and user scenarios will be explored by RBB and Noterik and will result in a second HbbTV prototype.

Furthermore, an emerging 'on demand' home setting scenario is to be further explored, which has formed the base of the ReWind app concept. The application has been built on the successful VBOT TV platform that has been through several stages of user testing and iterations, following the SCRUM agile model.

Thirdly, this pilot has served several iterations of the Multiscreen Toolkit, to encourage creative re-use and quick prototyping by creative thinkers in the cultural heritage sector. This toolkit has been tested during the TV pilot hackathon in May 2015 with positive results, as the toolkit has been involved in three concepts that have been produced during the hackathon. However, the toolkit still required strong support from the main Noterik developers, which is a main concern for future iterations of the toolkit. In order to be more accessible and understandable by new developers, the commonly used CMV model will be used and adapted slightly to fit a multiscreen application structure.

The TV pilot set itself the challenge of addressing two scenarios; one local with small scale media reach, with a target group including the elderly, and the other a broadcast scenario, with a larger scale community objective. The effective blend of three content and three technical partners held creative meetings within the early months of the project and forged strong ideas. Through user testing and the feedback that came from the successful hackathon in May 2015, lessons were learned and the apps strengthened to further meet the needs of target groups. In fact, the versatility of the TV pilots outputs enables adaptation to different situations, including in a classroom. Pilot partners will continue to test and utilise their apps in different ways, linking with other project pilots to share results and discover further opportunities. In summary, the TV pilot has achieved its objectives and has the potential to make a positive impact with different client groups, both within the remaining year of the project and in the future.

APPENDIX: USABILITY TEST OF THE BERLIN WALL HBBTV APPLICATION

QUESTIONS CONCERNING MEDIA USE

1. Do you own a TV set?

Comments:

2. If you do own a TV, how often do you use it?
    a. daily
    b. a few times per week
    c. once a week
    d. seldom
    e. never

Comments:

3. Do you use a set-top box or a TV with a connection to the Internet?

Comments:

4. Do you own
    a. a smart phone?
    b. a tablet?
    c. a PC or laptop?

Comments:

5. How do you access the Internet:
    a. with a smart phone?
    b. with a tablet?
    c. with a PC or laptop?

Comments:

6. How often do you use the Internet?
    a. every hour?
    b. every day?
    c. a few times per week?
    d. once a week?
    e. seldom?
    f. never?

Comments:

7. What do you use the Internet for?
    a. communication (email, chat, communities, chat forums, social networks, Skype), videos and music (YouTube, catch-up TV)
    b. to gather information
    c. web 2.0/interactivity (blogs, uploading videos and photos, Wikipedia editing)
    d. other: _____

Comments:

8. How often do others ask your advice about technology (i.e. TV/Internet)?
    a. Very often
    b. occasionally
    c. seldom
    d. never

Comments:

How often do you ask others for advice about technology (i.e. TV/Internet)?

    a. very often
    b. occasionally
    c. seldom
    d. never

Comments:

THE BERLIN WALL APP ON SMART TV

On-air RBB task-bar

I. Intro

You are in your living room in front of the TV, watching an **RBB** programme.

Switch to **RBB** on **channel 30** and start the Berlin Wall app in the task-bar.

(Initial settings: RBB is the selected channel)

II. Task-based usability test

1. First impressions

What do you see? Tell us what you expect to be able do with the app. You can control it with the remote controller.

Comments:

2. Start a selected video

Start a video from within the HbbTV app.

(Initial settings: start screen)

Comments:

3. Select and de-select full-screen

You can watch the video full-screen. Select the full-screen option, and then go back to the minimised screen again.

(Initial settings: video page)

Comments:

4. Next video

Go to the next video in the selected year.

(Initial settings: video page)

Comments:

5. Select a particular video, play and pause

Select the “Mass Breakout from Bernauer Strasse” video from 1964; play a few seconds, pause it, and then resume play.

(Initial settings: video page)

Comments:

6. Accompanying text (inc. navigation instructions)

Read the last sentence in the accompanying text for this video.

(Initial settings: video page)

Comments:

7. Change from detail page to start page

Go to the start page using the time-line.

(Initial settings: video page)

Comments:

8. Change to the English version

Play the English-language “Kreuzberg Nights are Long” video from 1978.

(Initial settings: start screen)

Comments:

9. Switch back to German

Switch the app back to German. **(Initial settings: video page)**

Comments:

III. General questions about the Berlin Wall app

1. The use of the app was immediately clear to me. (Perceived learning curve)

Completely incorrect	1	2	3	4	5	6	**Completely correct**

2. The app was easy to use. (Perceived ease of use)

Completely incorrect	1	2	3	4	5	6	**Completely correct**

3. It was always clear to me what I had to do in order to use the app. (Familiarity)

Completely incorrect	1	2	3	4	5	6	**Completely correct**

4. The graphics were appropriate

Completely incorrect	1	2	3	4	5	6	**Completely correct**

5. I understood the labels immediately.

Completely incorrect	1	2	3	4	5	6	**Completely correct**

6. I achieved what I wanted to achieve. (Perceived achievement of goal)

Completely incorrect	1	2	3	4	5	6	**Completely correct**

7. I wanted additional explanations and advice on the use of the app.

Completely incorrect	1	2	3	4	5	6	**Completely correct**

8. What did you like best about this app?

Comments:

9. What did you like least about this app?

Comments:

10. How likely is that you would recommend this app to friends? Please circle a number. (0 unlikely – 10 very likely)

0 – 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

Comments:

Here are pairs of words which you can use to describe the Berlin Wall app. They represent the extremes – place a cross in an appropriate box.

Example	1	2	3	4	5	6	7	
simple					X			**Complicated**

Example: this value shows that you found the app somewhat complicated.

Don't think too long about it, enter the value which spontaneously occurs to you. Even if you don't find either term very relevant to the app, please indicate a value anyway. Remember that there are no right or wrong answers, it is your personal opinion that we need.

	1	2	3	4	5	6	7	
simple								**Complicated**
ugly								**Attractive**
practical								**Impractical**
stylish								**Tacky**
predictable								**Unpredictable**
cheap								**Premium**
unimaginative								**Creative**
good								**Bad**
confusing								**clearly structured**
dull								**Captivating**