



## Television Linked To The Web



---

# Building the future of television

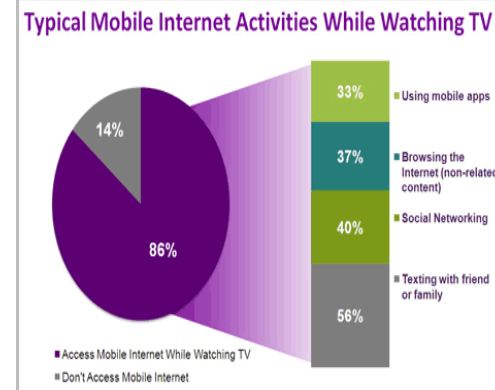
---

**Lynda Hardman, Lilia Pérez Romero**  
Centrum Wiskunde & Informatica

[www.linkedtv.eu](http://www.linkedtv.eu)

# The LinkedTV vision

- Web and TV exist in parallel
  - 86% of TV viewers surf the Web at the same time (Yahoo!, USA)
  - 88% of USA consumers use mobile as second screen (Business Insider, May 2013)
  - Manual efforts to link TV program to additional content (Shazam, IntoNow)
- **LinkedTV: interweaving Web and TV into a single experience**
- Mixing lean back and lean forward
  - Want to maintain immersion while removing fourth wall illusion
  - Works only for certain genres and audiences
  - Does second screen help or hinder?



# Scenarios and content

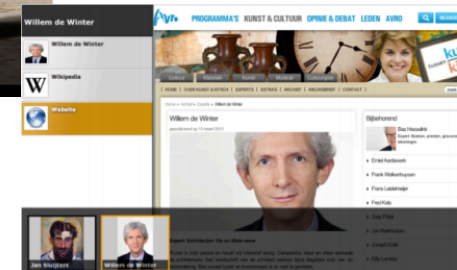
## Enriched News

- Professional news content produced by RBB for general audience
- local news show *rbb Aktuell*
- People, locations and events can be linked to previous events.



## Antiques Edutainment

- Program watched predominantly by 50+ers
- AVRO:  
*Tussen Kunst en Kitsch*
- Presenters, locations and objects provide hooks to related materials.





22:11

45%

29 | July | 2013

Settings

PHILIPS

LinkedTV

SNOWDEN APPLIES FOR RUSSIA ASYLUM

Edward Joseph Snowden

Asylum

POLITICAL Asylum

Russia

CIA

Sheremetyevo Airport

Anatoly Kucherenko

United States Department of State

Vladimir Putin

Edward Joseph Snowden

born: June 21, 1983

On June 14, 2013, U.S. federal prosecutors charged Snowden with espionage and theft of government property.

Wikipedia

BREAKING NEWS: SNOWDEN APPLIES FOR RUSSIA ASYLUM

Now watching

ABC Morning News

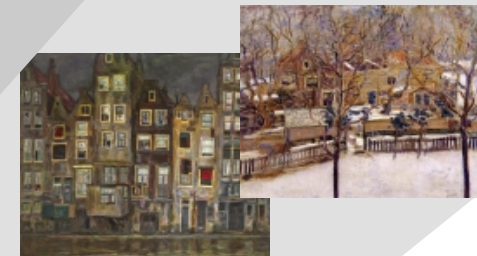


# How does it work?

Video object and word  
detection

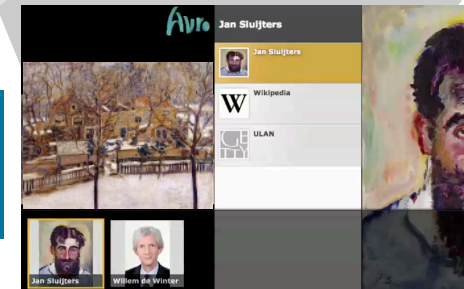
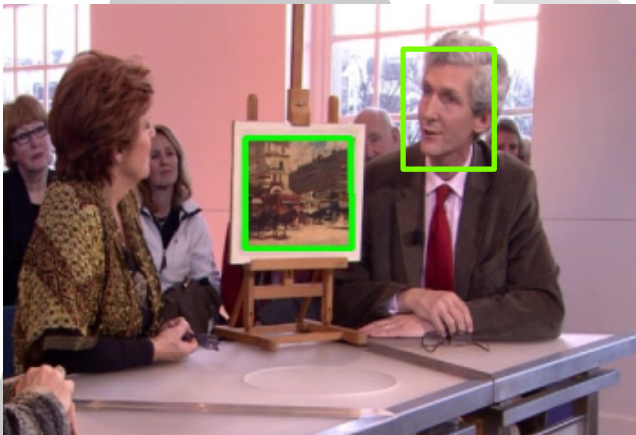
Connection to  
concepts

Paintings by Jan Sluijters



Selection of related  
concepts

Selection of related  
content



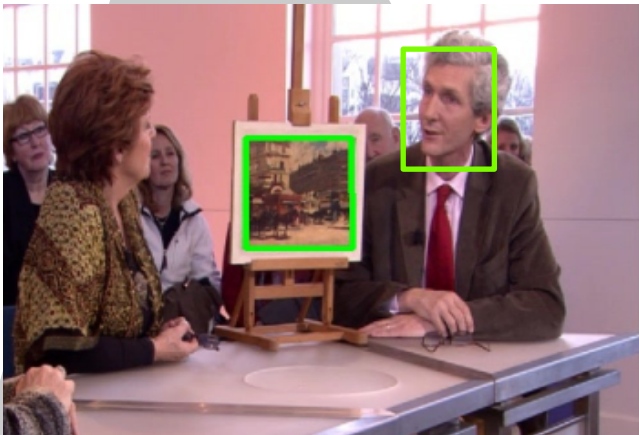
Presentation engine

“...schilderij van **Jan Sluijters**....”

[dbpedia.org/resource/Jan\\_Sluyters](http://dbpedia.org/resource/Jan_Sluyters)

# Concept Detection

Video object and word  
detection



“...schilderij van Jan Sluijters....”

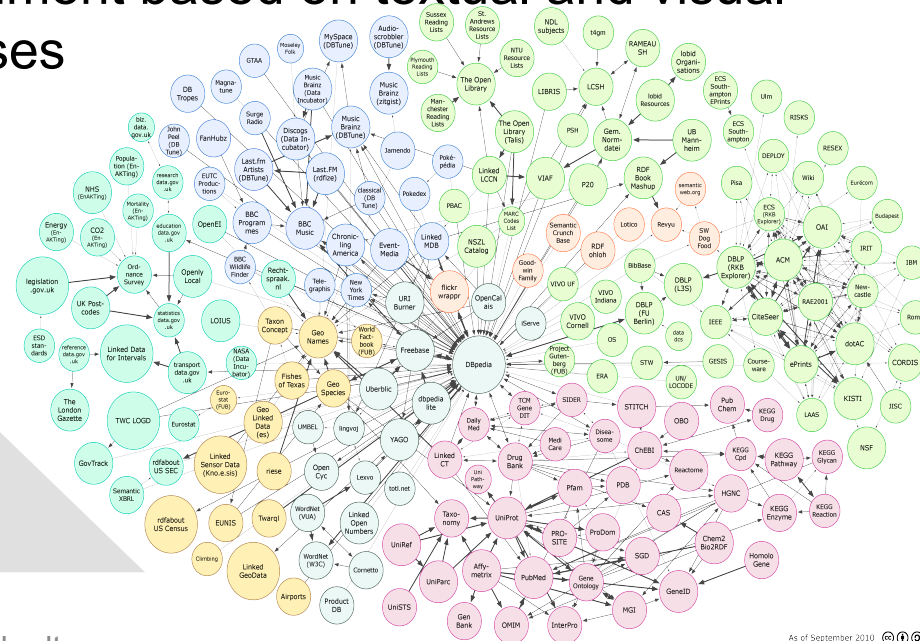
- Object detection in video
  - Face detection
  - Text analysis, keyword extraction
  - Multilingual automatic speech recognition
  - Combining results from different modality analyses
  - Speaker identification
  - Object re-detection
- 
- Output in XML using OpenSource tool: EXMARaLDA  
<http://www.exmaralda.org/>

# Concept connections

- Annotations represented in RDF stored in LinkedTV platform
- Use existing vocabularies e.g. schema.org, NERD, LSCOM, DBpedia
- Named Entity Recognition using statistical & knowledge-based approaches
- Enrichment based on textual and visual analyses

Connection to  
concepts

[dbpedia.org/resource/Jan\\_Sluyters](http://dbpedia.org/resource/Jan_Sluyters)



# LinkedTV metadata conversion


[Home](#) [Get started](#) [About](#) [Contact](#)

LINKEDTV

## TV Metadata Generator

Automatic conversion of television content metadata into RDF.

<http://linkedtv.eurecom.fr/metadata/>



Instructions >

Select Video Resource >

Choose Metadata Files >

RDF Generation >

Upload Results to Triplestore >

Queries over the RDF Data >

## 1. Introduction

Here we present the tool "TV Metadata Generator", developed by [Eurecom](#) under the scope of the European Project [LinkedTV FP7](#). In a nutshell, this application takes a video and its corresponding metadata files, available in different formats, and produces a RDF representation of the whole information. The knowledge graph obtained as result is suitable to be interlinked with other data in the Web, and allow the execution of complex queries that can bring the viewers a new way of enjoy Television.



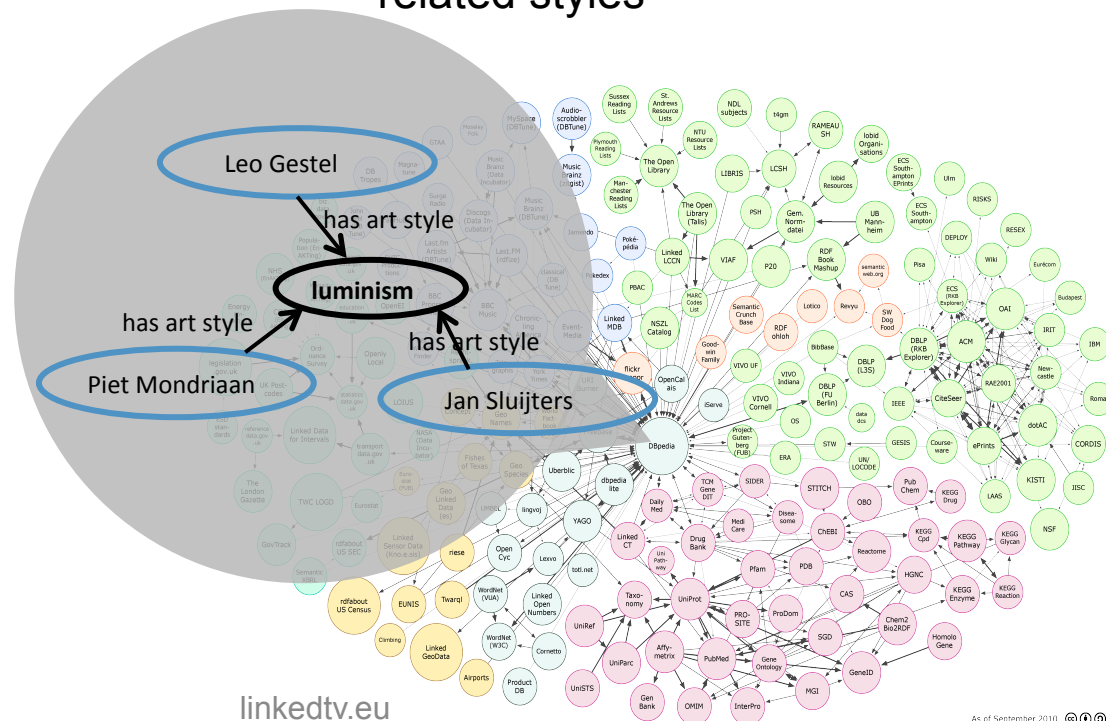
# Concept selection

- Additional information, e.g.
  - biography of artist
  - style of painting
- Related information, e.g.
  - artists from same period
  - paintings in similar style
  - related styles

## Paintings by Jan Sluijters

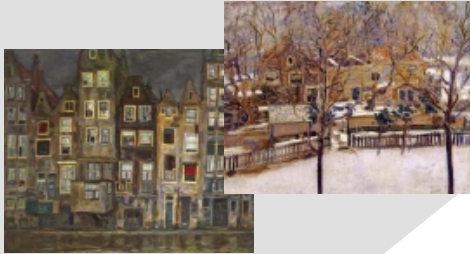


## Selection of related concepts



# Content selection

- Selection based on context of scene, e.g. system knows which topics appear next
- User preferences, e.g. closely related information to uninteresting topic is less useful
- We need to understand user information needs (per genre), e.g. don't miss important news because of personalisation
- Broadcasters don't want users to drift away from program



Selection of related  
content

# Example user information needs for news

- **MORE IN DEPTH SPECIFIC INFORMATION**

*I was wondering just how expensive it is to make all those vaccines, you know? I was just wondering if it is a good idea to even make a lot of it or how hard it is to make.*

- **LOCAL EFFECT OF GLOBAL NEWS – What is the impact in my life?**

*Yes then I would look it up, what is the effect in the Netherlands... (of the bird flu virus)*

- **OVERVIEW OF PAST RELATED EVENTS**

*My search would be something like "South Korea state of war ramp up" (...)  
I would like to know, what happened two years ago and how they solved it...*

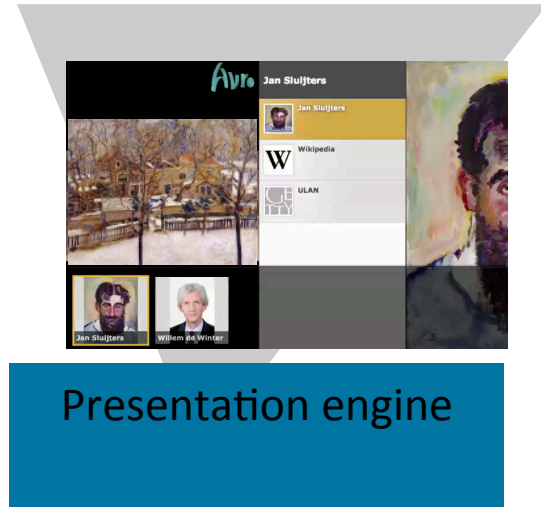
# User information needs for news

- Information about how the story ends
- Updates when important changes occur
- More information about the people involved
- Where is that location?
- Consult related publications and documentaries
- Opinions from different experts
- Access related info selected by experts and suggested by broadcasters



# Content display

- Many users watch TV news during dinner!
- Use second screen to
  - give user more control
  - retain sense of immersion via TV screen
- Need to resolve issues of pausing when in group situation
- There is no single best solution

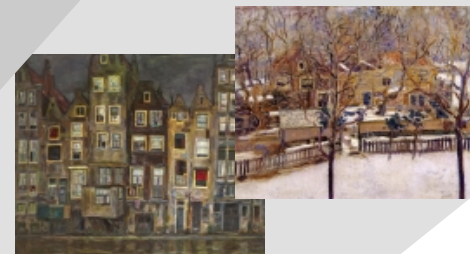


# How does it work?

Video object and word  
detection

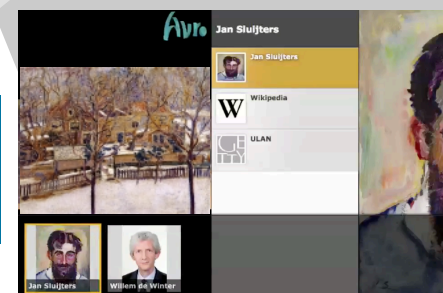
Connection to  
concepts

Paintings by Jan Sluijters



Selection of related  
concepts

Selection of related  
content

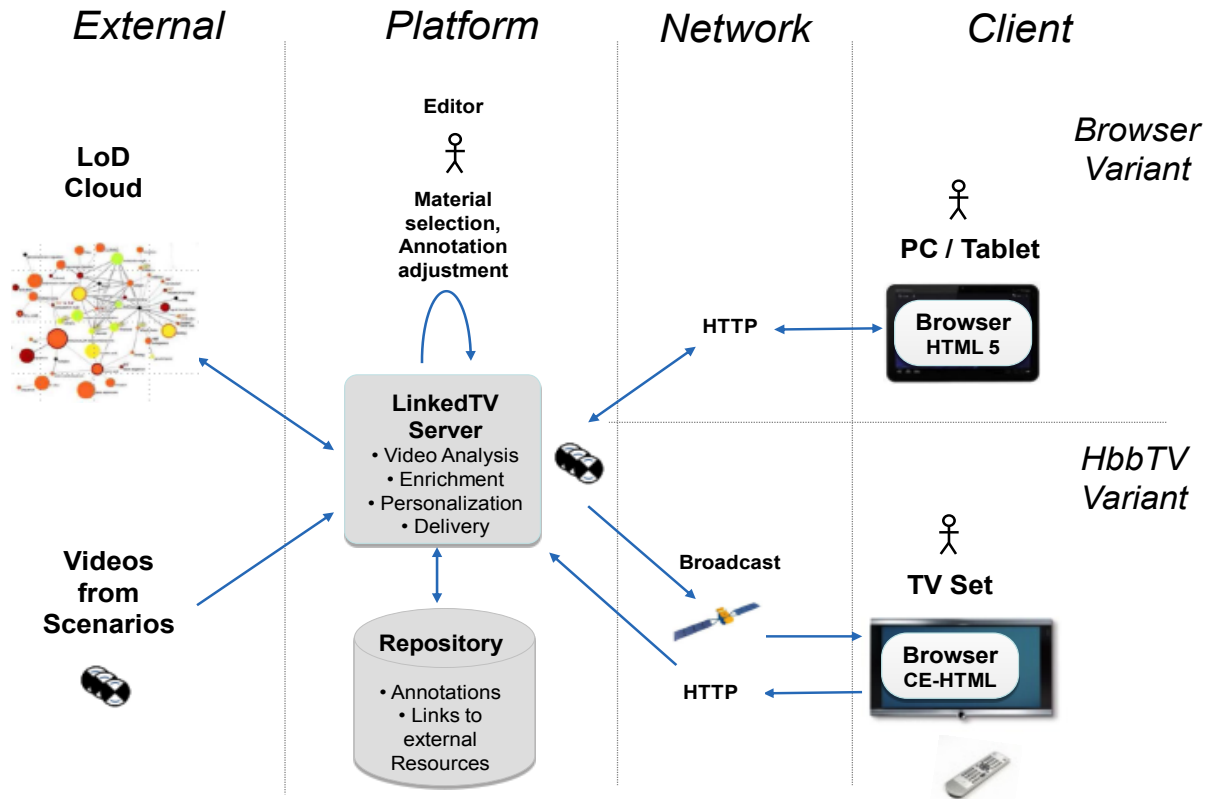


Presentation engine

“...schilderij van **Jan Sluijters**....”

[dbpedia.org/resource/Jan\\_Sluyters](http://dbpedia.org/resource/Jan_Sluyters)

# LinkedTV platform & player



A clearly defined and modularized **platform** architecture, deployment decisions made, initial REST API

An interactive **video player** based on Web specifications (HTML5) realising intuitive interaction & enrichment layers



## Online demos

### Demo categories

- [Scenarios](#)
- [Core Media](#)
- [Annotation Tool](#)
- [Linked Media](#)
- [Personalisation](#)

## Scenarios

### Linked Cultural Heritage TV

#### Description



This scenario developed by the Netherlands Institute for Sound and Vision is focused on cultural heritage. It uses material from the program Tussen Kunst & Kitsch (similar to the BBC's Antiques Roadshow) courtesy of Dutch public broadcaster AVRO. In the show, people take art objects with them to be assessed by an expert. The objects brought in provide the possibility to add relevant information on questions like Who, When, What, Where and Subject, all related to art history and cultural heritage. This

first demo has been showcased at several conferences in 2012.

[Homepage](#)

## LinkedTV



## FOLLOW / FRIEND ME



## Project overview



## Categories



# Designing a 2<sup>nd</sup> screen news companion

- Description of context analysis evaluations
- Results and requirements
- Design proposal
- Demo
- Evaluation of the hi-fi prototype
- Discussion and conclusion
- Future work

A young man with shoulder-length brown hair, wearing a grey suit, white shirt, and a red and black striped tie, sits at a wooden desk. His hands are clasped in front of him on a piece of paper. The background is a grid of blue squares, each containing the word 'INSIGHTS' in white capital letters. A white circle is overlaid on the top left of the image.

## Why the news?

- standard format
- fragmented pace
- no suspension of disbelief
- informative nature
- richness and variety of media formats

# Why a second screen?

**80%**

of 3000 respondents are  
mobile multitasking  
while watching TV

**98 Millions**

mobile TV  
multitaskers

*The adoption of second screen systems is  
facilitated by their resemblance to current behavior  
patterns.*

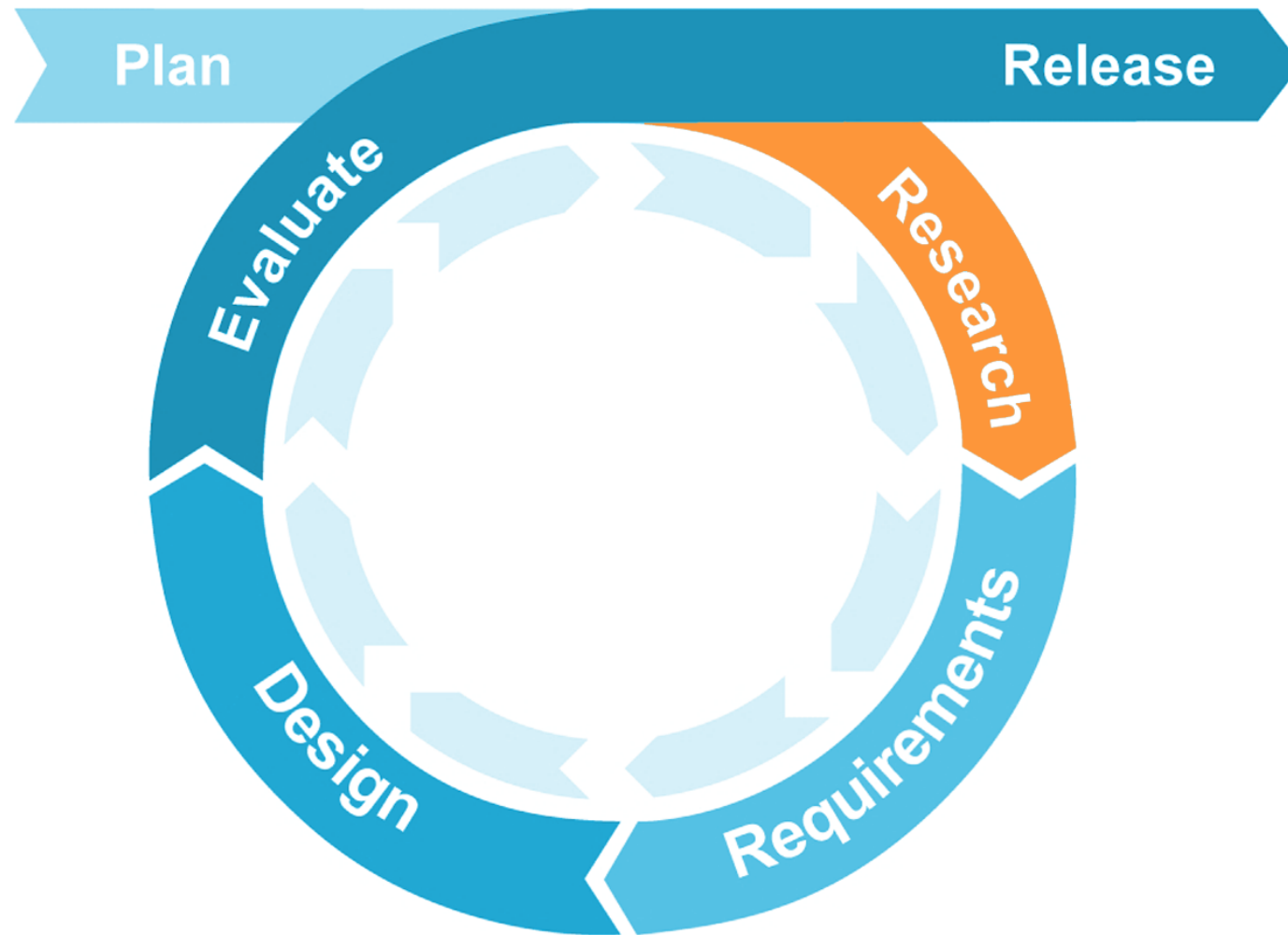


# Goals for news prototype

- to obtain knowledge about users **information needs** and an indication of the **reception** that this technology could have among them;
- to extract initial **design guidelines** for future work within LinkedTV and in the field of **second screen interfaces** for web-enriched television newscasts;
- to create a **high-fidelity prototype** to facilitate **communicating** a future vision of hyperlinked broadcast news.



# User Centred Design Cycle



# Context Research

- Second screen and multitasking user habits
- Habits and social context regarding news broadcasts
- Habits when searching for additional information (frequency, tools, processes)
- Opinions, suggestions and desires regarding the application and functionalities
- Define target user group

# Context Research

## FOCUS GROUP

**Setting** =living room environment  
(experiment room)

### Participants

- 11(6F, 5M)
- mean age: 43, S.D.: 11.5
- 1 undergrad. 4 university grad.  
1 postgrad. 3HBO, 1 VWO, 1 HAVO
- Diverse digital literacy
- Regular newscast viewers

### Method

- Demographics + habits Q.
- View news videos, make questions, choose device
- Brainstorm
- Talk about the future of TV

## INTERVIEWS

**Setting** =office at respondent's workplace

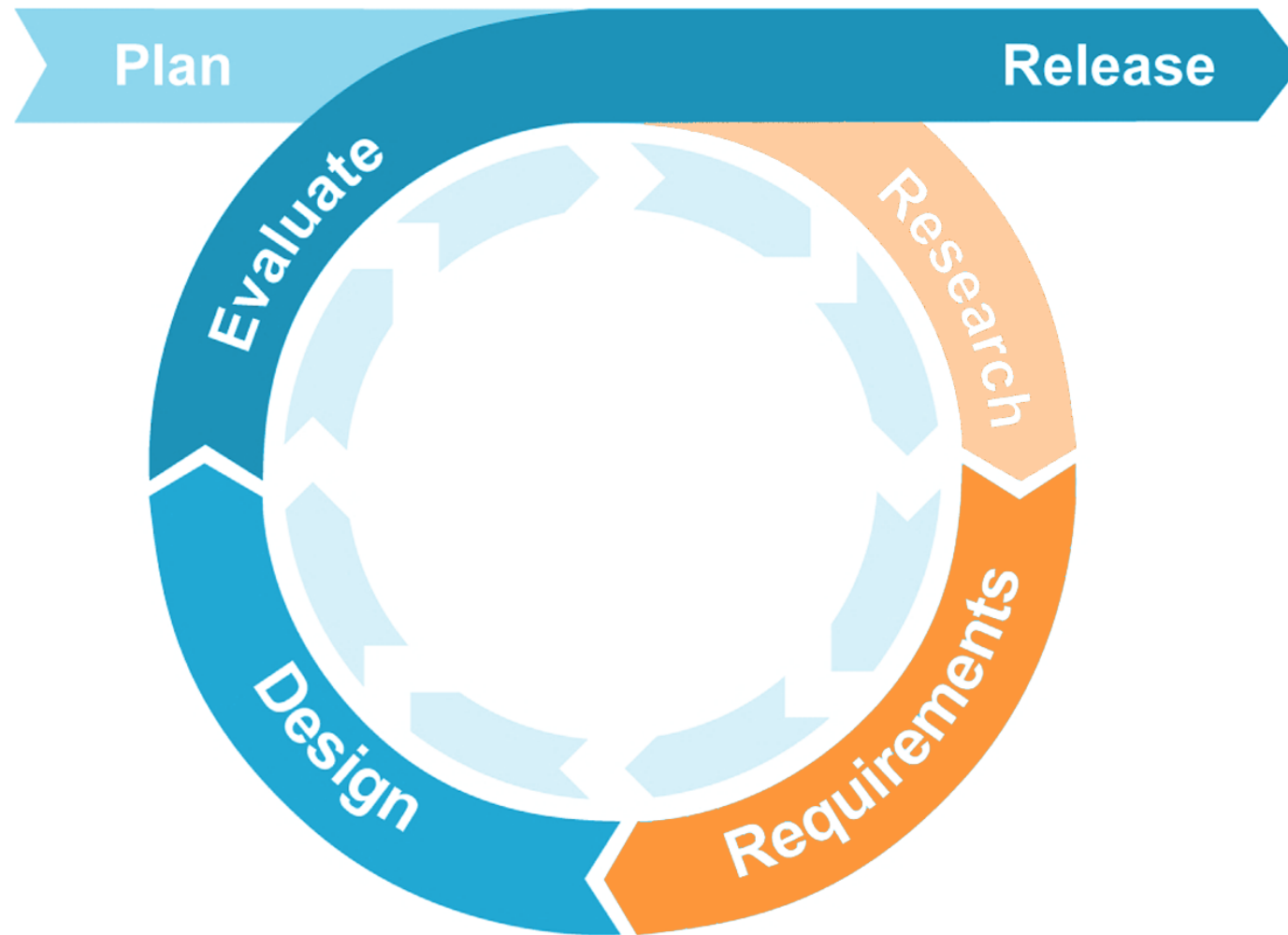
### Participants

- 8 (3F, 5M)
- mean age: 33, S.D.: 5
- Highly educated (University graduates and postgraduates)
- Very digitally skilled
- Regular newscast viewers

### Method

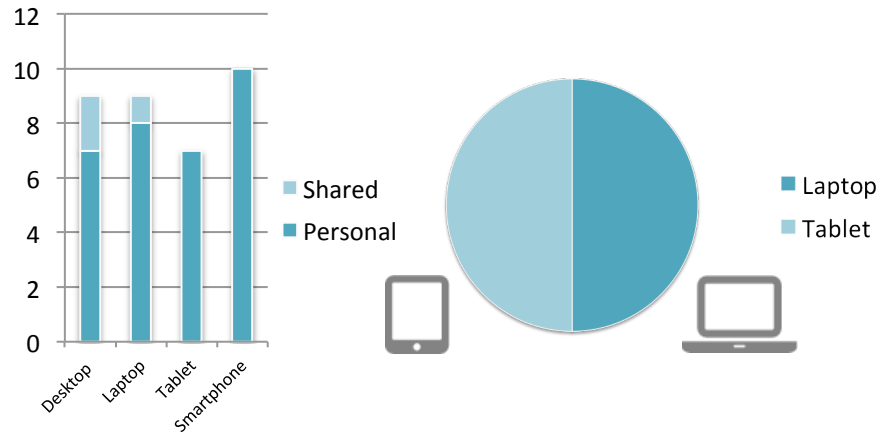
- Demographics Q.
- Open semi structured interviews lasting from 24 to 45min.
- Functionality ranking

# Results and implications for requirements



# Habits and implications for requirements

## 1. Choice of Device

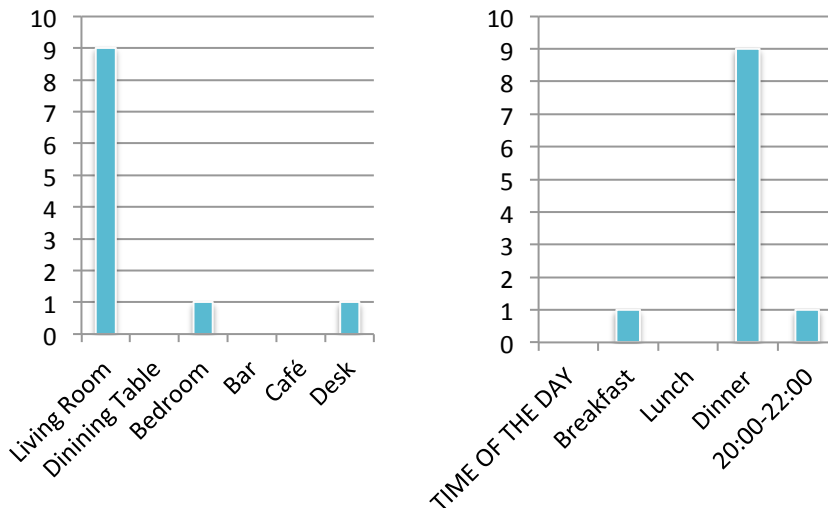


## 3. Social context



6/11 watch the news with others.  
5/6 interact while they watch.

## 2. Location and time



## 4. Multitasking



4/11 participants eat or drink while watching the news.  
6/8 second screen multitask (email reading and Internet browsing)



# User Needs

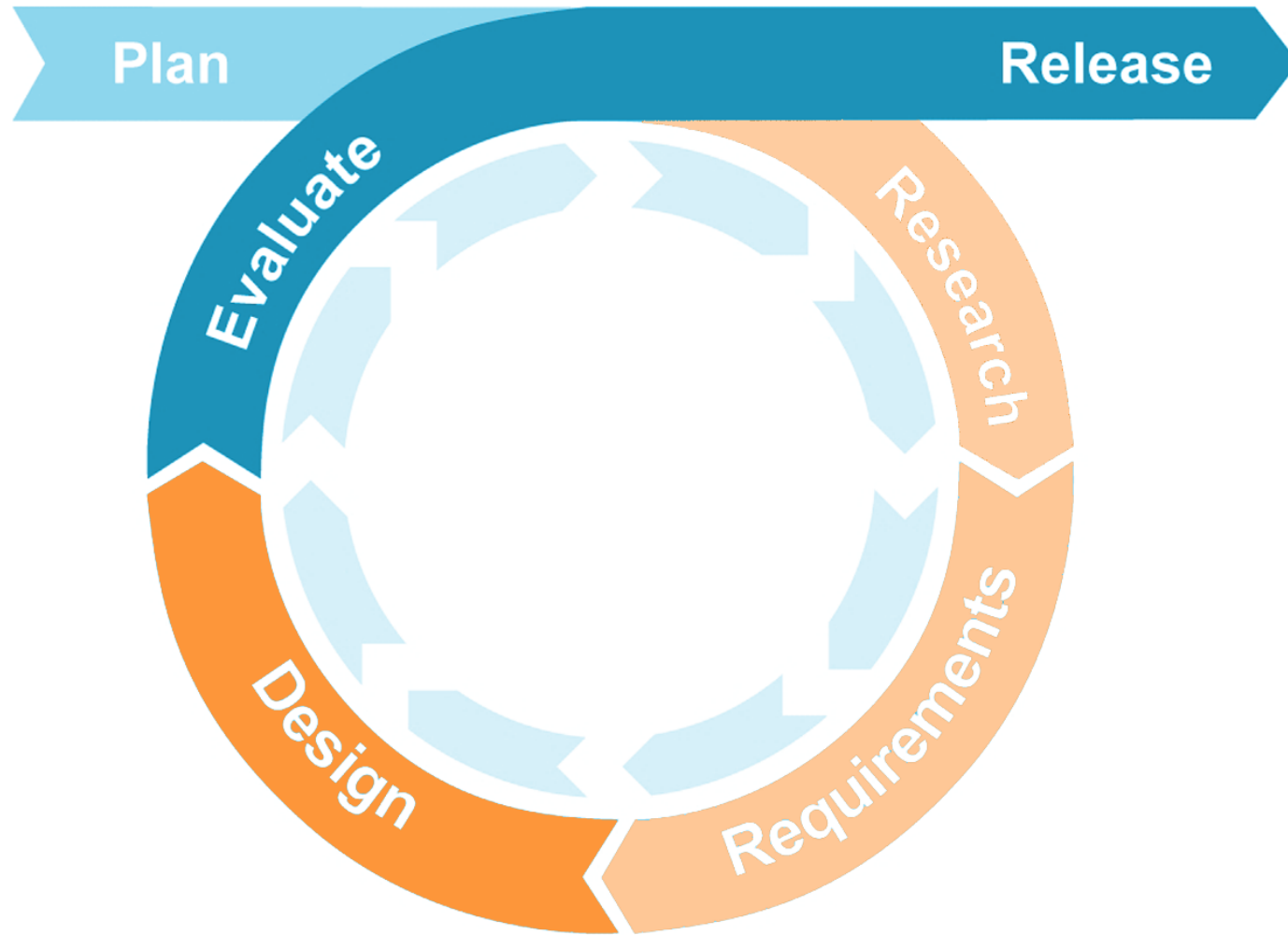
## *Information needs*

- Give **in depth information** about the news on TV
- Give an overview of **past-related news**
- Illustrate multiple **opinions** about the news
- Allow users to consult news in **diverse sources**
- **Alert** users about important changes in news
- Give information about **context, people and organizations** mentioned in the news
- Allow to access **opinions of locals**

## *Desired functionalities*

- Personalization: **easy** configurable **user-controlled**
- Video **control** capabilities
- **Bookmarking** for later viewing
- **Sharing** information

# Design



# LinkedTV News (concept)

## What is LinkedTV News

- *LinkedTV News* is a second screen application for tablets
  - Acts as a companion to viewers when watching the news broadcasts.
  - Its main goal is to enrich television newscasts by integrating them with other media
  - Combines watching TV newscasts and consulting online newspapers and videos.

## What is the target user

- Users between 25 and 45 years of age
- Highly-educated
- Who like to be up to date about the international news
- Watch news broadcasts regularly
- Own a tablet computer or share it with someone in their household.

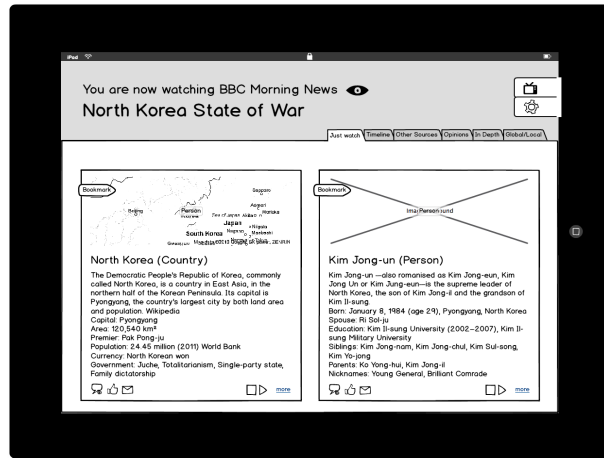
## Interaction

- Synchronous and Asynchronous interaction with the television
  - Interacting with the application while watching TV
  - Bookmarking news and postponing their in depth exploration

## Engagement modes

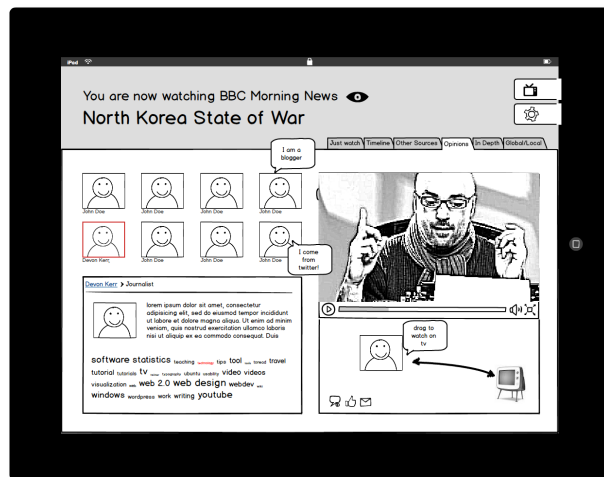
- Two engagement modes represented by two main screens:
  - Lean back
  - Lean forward.

# Engagement Modes



## Lean Back

- Presents condensed information related to the objects, places, persons, and events in the news
  - Slides (a paragraph of text illustrated by an image).
  - This mode is automatic and requires no user interaction



## Lean Forward

- Enables in-depth exploration of each news headline in the categories
  - different sources;
  - opinions of different authors;
  - in-depth articles;
  - timeline;
  - point of view of geo-localized tweets

# The Hi-Fi Prototype

iPad 19:58 100%

NewSync 29 | July | 2013

CURRENT PROGRAM

Snowden applies for Russia asylum

Egypt's Morsi vows to stay in office

Fukushima leak causes Japan concern

Rallies in US over Zimmerman verdict

Royal baby prince named George

GLOBAL TO LOCAL

TIMELINE

IN DEPTH

OPINION

IN OTHER MEDIA

BBC NEWS

Fugitive Edward Snowden trapped in Russia - Putin

15/07/13

CNN

Snowden applies for temporary asylum in Russia

17/07/13

the guardian

Edward Snowden renews Russia asylum bid in attempt to leave Moscow airport

12/07/13

The New York Times

Snowden Seeks Asylum in Russia, Putting Kremlin on the Spot

01/07/13

ALJAZEERA

Snowden submits asylum request to Russia

17/07/13

**FUGITIVE EDWARD SNOWDEN TRAPPED IN RUSSIA - PUTIN**

BBC | July 15, 2013 [original article](#)



©Reuters

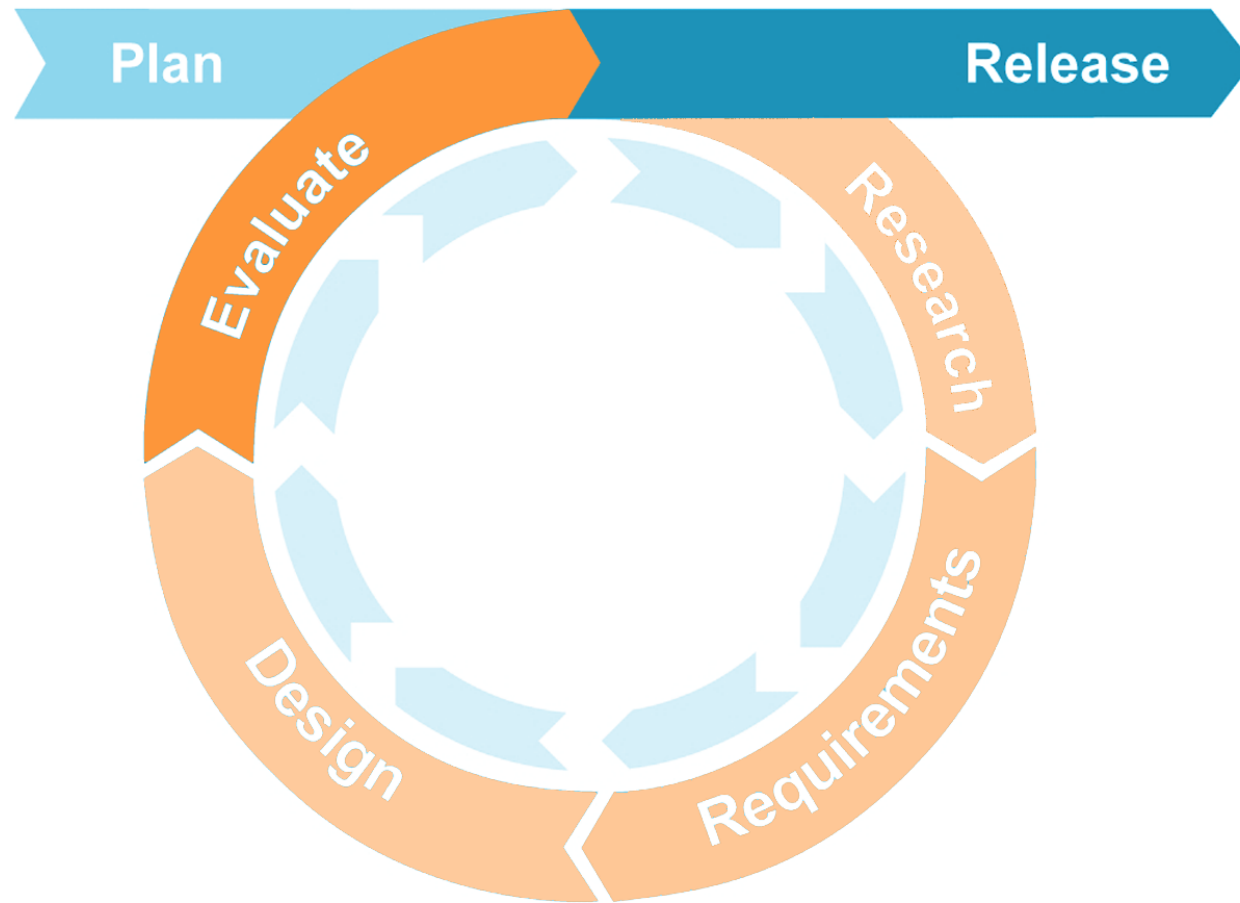
**The US authorities have in effect trapped fugitive intelligence leaker Edward Snowden in Russia, President Vladimir Putin has said.**

But Mr Putin said Mr Snowden would leave if he was able to.



**DEMO TIME**

# Evaluation of the design proposal



# Task based analysis

## PROTOTYPE EVALUATION

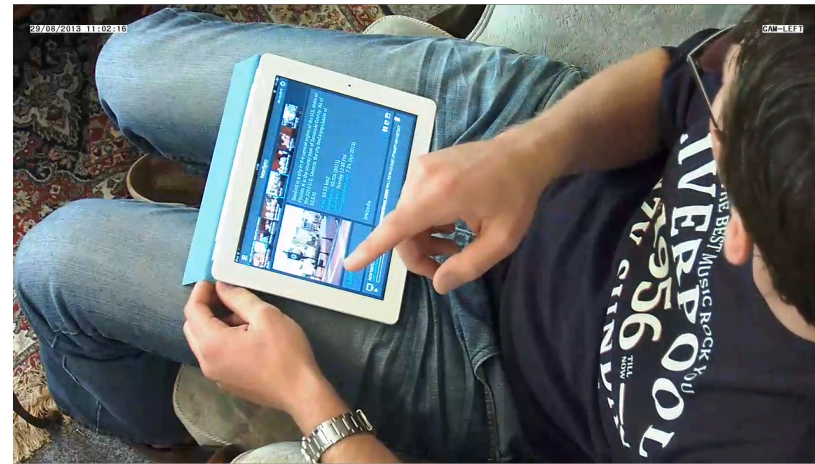
**Setting** =living room environment  
(experiment room)

### Participants

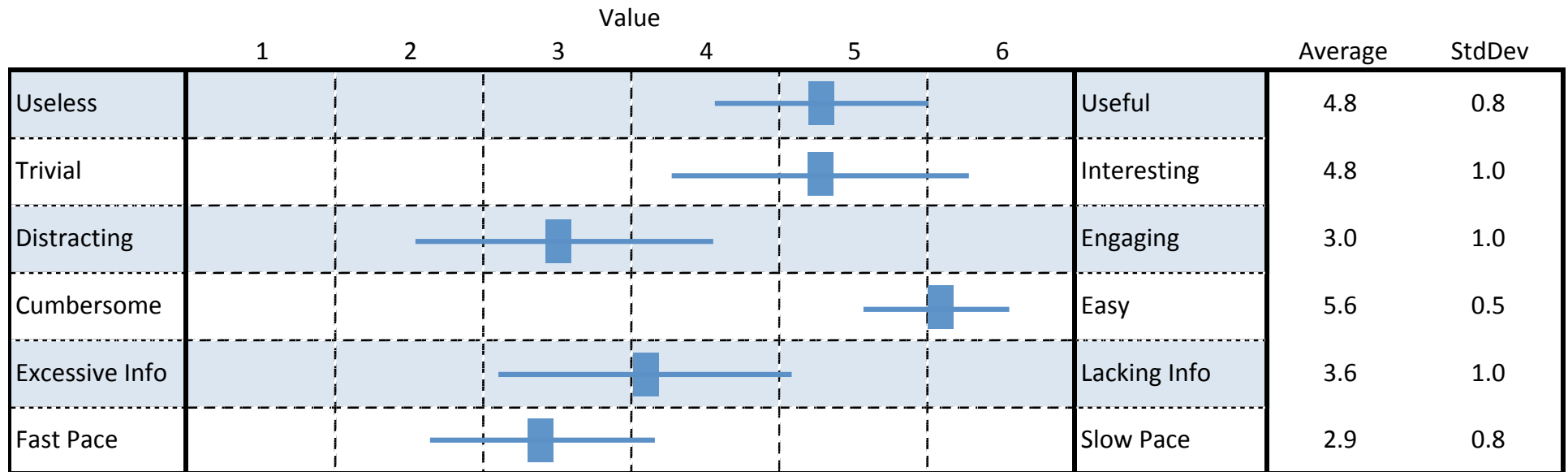
- 8 (3F, 5M)
- mean age: 33, S.D.: 5
- Highly educated.(University graduates and postgraduates)
- Very digitally skilled.
- Regular newscast viewers

### Method

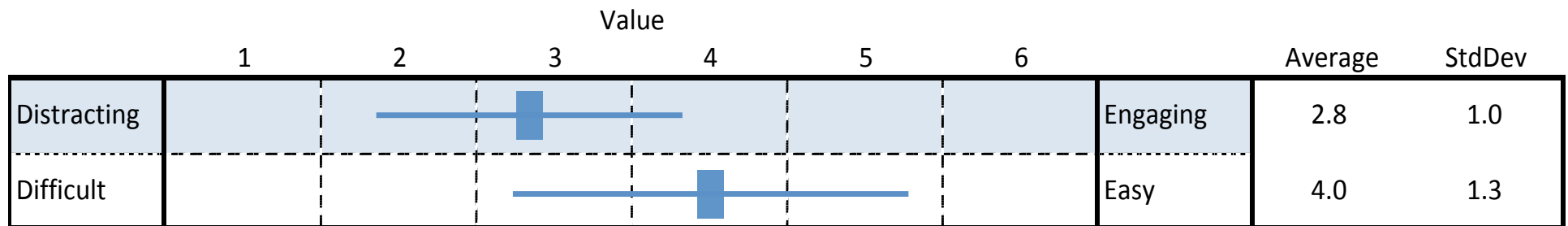
- Demographics + habits Q.
- Task-based study
- ASQ (after scenario questionnaires)
- SUS (System Usability Score)
- USE (Usefulness + satisfaction)
- Interviews



# Evaluation of Lean Back



# Multitasking with Lean Forward



# Free-format questions

Participant Number	1	2	3	4	5	6	7	8
News choice 1	Snowden	Fukushima	Snowden	Snowden	Snowden	Snowden	Fukushima	Fukushima
News choice 2	Zimmerman	Zimmerman	Fukushima	Zimmerman	Fukushima	Egypt	Royal baby	Fukushima
Question 1	what happened? Preacher: What kind of person? Political positions?	More technical background	More NSA related story	Who is Anatoly Kucherenko?	Where else did he apply for asylum?	Details about extradition treaties between US and Russia	When did the leak start?	Map of current radioactive levels of Japan
Q1 answered?	no	yes	yes	yes	yes	yes	yes	no
Question 2	Snowden: Legal conditions for applying for an asylum in Russia?	More opinions	How big is the leak	Where is Zimmerman's family from?	How do they think to solve the problem?	What were Morsi's political decisions that made the process start	What is the baby's name?	Interviews with Japanese living in Japan about the situation
Q2 answered?	yes	no	yes	yes	no	no	yes	no

16 questions were formulated, and participants found answers for 10 of them, giving 62% of answers found without the need to consult the Internet.



# Interviews



*P8 I like it, it's useful. It's so much better to have this tool than not to have this tool. The best is the easiness, it's easy to use; it gives you easy access to different kinds of information with just one click.*

Most valued sections were:

- The timeline
- The headline as it was presented in different media sources.
- The possibility of bookmarking the news in order to postpone the more cognitively demanding tasks.

Accessing geo-localized information through tweets was, unexpectedly, the functionality that participants liked the least.

# Suggestions for improvement



- Make TV area permanently visible
- Make difference between “save” and “bookmark” clear
- Add “skip chapter” to VCR controls
- Use thumbnails for navigating
- Add “related articles” browsing route
- Rename “global to local” section
- Add “search” field
- Reduce distractions from spontaneous screen changes

# What next?

- Analyse link types included in prototype.
- Relate these to links in linked data sources.
- Investigate success of automatic generation.



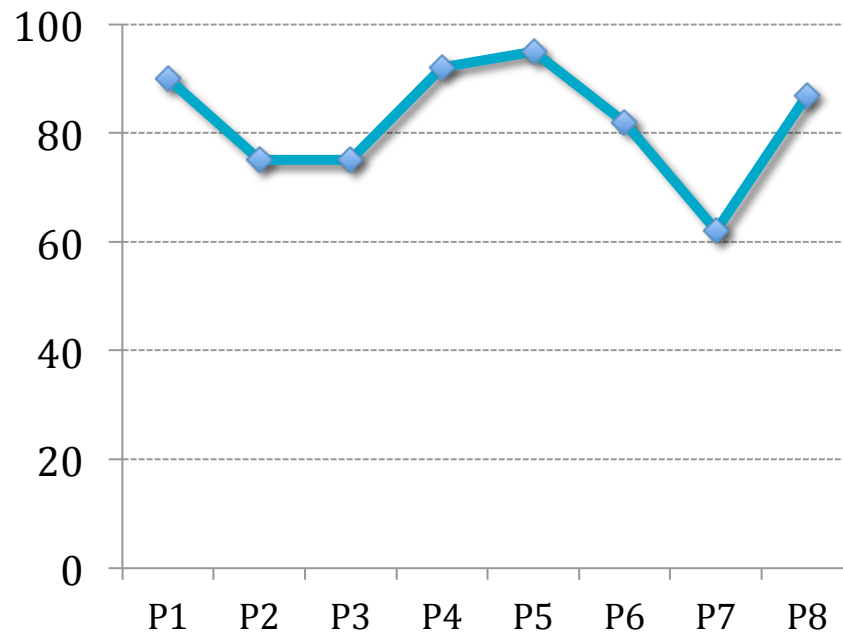
LINKEDTV



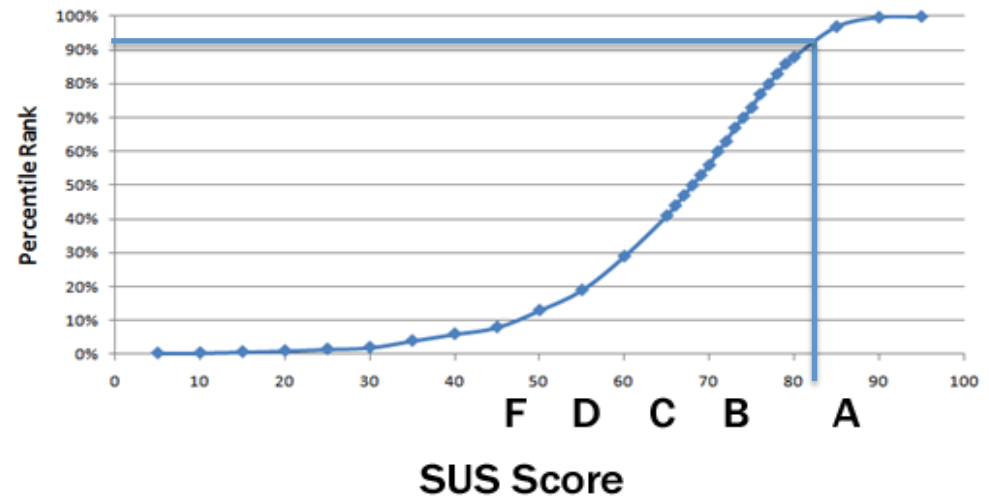




# SUS (System Usability Scale)



Average SUS 83 with a standard deviation of 10.



This gives a 92% percentile, letter A above average (average is 68%)

# Questionnaire for User Interface Satisfaction

USEFULNESS		
1	It helps me to find information more efficiently.	6.2
2	It is useful.	6.2
3	It makes the things I want to accomplish easier to get done.	5.8
4	It saves me time when I use it.	6
5	It meets my needs.	5
6	It does everything I would expect it to do.	4.5

The resulting score was 5.6 with a standard deviation of .7. This would correspond to a percentile of 80%.

SATISFACTION		
7	I am satisfied with it.	5.7
8	I would recommend it to a friend.	6.3
9	It is fun to use.	6
10	It works the way I want it to work.	5.1
11	It is wonderful.	4.7
12	I feel I need to have it.	5

The resulting score was 5.5 with a standard deviation of .5. This would correspond to a percentile of 78%.