Interactive Television & Online Video

Course: Current Topics in Media Computing and Human-Computer Interaction

Lecturer: Christian Corsten, M.Sc.
Watching Television in the 1950s
watching TV today

personal screens

on-demand

interaction

individual content
Interactive TV in the 1950s
Interactive TV in the 1950s

http://www.youtube.com/watch?v=u5TdRhNLOPk
From TV to Interactive TV (iTV)

1. Conventional TV
   Watching

2. Enhanced TV
   Teletext
From TV to Interactive TV (iTV)

1. Conventional TV
   Watching

2. Enhanced TV
   Teletext

3. Personalized TV
   Recordings,
   Content navigation
From TV to Interactive TV (iTV)

1. Conventional TV
   Watching

2. Enhanced TV
   Teletext

3. Personalized TV
   Recordings,
   Content navigation

4. Interactive TV
   Return Channel
Online Video

Individual Choice

User Participation

A Power Shift?
A Power Shift?

User Participation

Individual Choice

Online Video

Online Video

Individual Choice

User Participation

A Power Shift?

Online Video

Individual Choice

User Participation

A Power Shift?

Online Video

Individual Choice

User Participation
Trends in iTV: Social TV

Top Ten Series on Twitter

<table>
<thead>
<tr>
<th>Rank</th>
<th>Network</th>
<th>Program</th>
<th>Average Audience (000)</th>
<th>Average Tweets (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AMC</td>
<td>BREAKING BAD</td>
<td>6,026</td>
<td>521</td>
</tr>
<tr>
<td>2</td>
<td>AMC</td>
<td>THE WALKING DEAD</td>
<td>5,668</td>
<td>576</td>
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<tr>
<td>3</td>
<td>ABC FAMILY</td>
<td>PRETTY LITTLE LIARS</td>
<td>4,778</td>
<td>675</td>
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<tr>
<td>4</td>
<td>ABC</td>
<td>THE BACHELOR</td>
<td>3,620</td>
<td>196</td>
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<tr>
<td>5</td>
<td>HBO</td>
<td>GAME OF THRONES</td>
<td>3,507</td>
<td>153</td>
</tr>
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<td>6</td>
<td>MTV</td>
<td>TEEN WOLF</td>
<td>3,342</td>
<td>499</td>
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<tr>
<td>7</td>
<td>FX</td>
<td>AMERICAN HORROR STORY: COVEN</td>
<td>2,837</td>
<td>192</td>
</tr>
<tr>
<td>8</td>
<td>ABC</td>
<td>SCANDAL</td>
<td>2,430</td>
<td>405</td>
</tr>
<tr>
<td>9</td>
<td>NBC</td>
<td>THE VOICE</td>
<td>2,294</td>
<td>271</td>
</tr>
<tr>
<td>10</td>
<td>ABC</td>
<td>DANCING WITH THE STARS</td>
<td>2,060</td>
<td>96</td>
</tr>
</tbody>
</table>

Ranked by Average Unique Audience Sept. 1, 2013-May 25, 2014

Source: Nielsen Data from 09/01/2013-05/25/2014. Nielsen Social measures Tweets in the U.S. from three hours before, during and three hours after airing, local time. Unique Audience of Tweets related to an airing is measured from when the Tweets are sent until the end of the broadcast day of Sun. Prior to 5/14, Nielsen Twitter TV Ratings were only available for English-language networks. Data includes re-airs on Broadcast and National Cable Networks only. Series include programs with less than 5 telecasts.
Trends in iTV: Social TV

TOP TEN SPORTS EVENTS ON TWITTER

<table>
<thead>
<tr>
<th>RANK</th>
<th>NETWORK</th>
<th>PROGRAM</th>
<th>DATE</th>
<th>AUDIENCE (000)</th>
<th>TWEETS (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FOX</td>
<td>SUPER BOWL XLVIII</td>
<td>2/2/14</td>
<td>15,318</td>
<td>25,828</td>
</tr>
<tr>
<td>2</td>
<td>FOX</td>
<td>NFL FOOTBALL: NFC CHAMPIONSHIP</td>
<td>1/19/14</td>
<td>11,383</td>
<td>4,957</td>
</tr>
<tr>
<td>3</td>
<td>CBS</td>
<td>NFL FOOTBALL: AFC CHAMPIONSHIP</td>
<td>1/19/14</td>
<td>10,863</td>
<td>2,492</td>
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<tr>
<td>4</td>
<td>ESPN</td>
<td>2014 VIZIO BCS NATIONAL CHAMPIONSHIP</td>
<td>1/16/14</td>
<td>10,404</td>
<td>4,392</td>
</tr>
<tr>
<td>5</td>
<td>CBS</td>
<td>2014 NCAA BASKETBALL TOURNAMENT: FINAL</td>
<td>4/7/14</td>
<td>9,953</td>
<td>2,613</td>
</tr>
<tr>
<td>6</td>
<td>NBC</td>
<td>XXI WINTER OLYMPICS Opening Ceremony</td>
<td>2/7/14</td>
<td>9,567</td>
<td>1,101</td>
</tr>
<tr>
<td>7</td>
<td>FOX</td>
<td>NFL FOOTBALL: NFC WILD CARD</td>
<td>1/15/14</td>
<td>9,192</td>
<td>1,391</td>
</tr>
<tr>
<td>8</td>
<td>TNT</td>
<td>2014 NBA ALL-STAR GAME</td>
<td>2/16/14</td>
<td>9,026</td>
<td>2,264</td>
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<tr>
<td>9</td>
<td>CBS</td>
<td>COLLEGE FOOTBALL</td>
<td>11/30/13</td>
<td>8,970</td>
<td>2,032</td>
</tr>
<tr>
<td>10</td>
<td>FOX</td>
<td>NFL FOOTBALL: NFC DIVISIONAL PLAYOFF</td>
<td>1/12/14</td>
<td>8,873</td>
<td>1,501</td>
</tr>
</tbody>
</table>

Source: Nielsen. Data from 1/1/2014 - 5/25/2014. Nielsen Social measures Tweets in the U.S. from three hours before, during, and three hours after airing, local time. Unique Audience of Tweets includes all Tweets from all Twitter accounts, regardless of language. Data includes new/move airs from Broadcast and National Cable Networks only. Copyright © 2014 The Nielsen Company. All rights reserved. Nielsen and the Nielsen logo are trademarks or registered trademarks of Nielsen Next Generation, LLC.
Trends in iTV: Social TV
Trends in iTV: Social TV

The World Cup of Tweets

Vote for your Team!

Deutschland

What if the World Cup were won by mentions of each team on Twitter? Vote for your team here and see how the tournament would play out if the fans were in charge. Click on the dropdown menu above to choose a team.
Trends in iTV: 2nd Screen Apps
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Trends in iTV: 2nd Screen Apps
The New Multi-Screen World  
(Survey by Google, 2012)

Purpose: understanding cross-platform consumer behavior

We also multi-screen by using more than one device simultaneously:

- Smartphone & Television: 81%
- Smartphone & Laptop/PC: 66%
- Laptop/PC & Television: 66%

TV no longer commands our full attention

77% of TV viewers use another device at the same time in a typical day.

Consumers search for things they see on TV

- Percent of search occasions that were prompted by television:
  - TV (Net): 22%
  - Smartphone:
    - Seeing a TV commercial: 17%
    - Seeing a TV program: 7%
  - PC/Laptop:
    - TV (Net): 10%
    - Seeing a TV commercial: 6%
    - Seeing a TV program: 6%

"I'll be watching a movie or TV show and I'll look up the actor or actress on IMDB or I'll Google image them, or I'll see when it was made or how it was filmed. I'm always doing that. And I use my phone a lot for stuff like that." - Jer

"I'm sometimes shopping, sometimes looking for recipes, sometimes typing them up, you know. Sending emails, reading. I could do anything on there. It's not often that I just sit and watch TV and do just that." - Lori
## Cross-Screen Engagement

### Device | Role within Pathway
--- | ---
**TV & Streaming Console Content** | • Used at home and in the evening, often with others present  
• Likely shows normal TV content, often as background noise—it’s often a secondary device to other activities on the partner screen  
• The TV’s purest ‘everyman’ and ‘jester’ performance, simply providing some entertainment and little else

**Laptop** | • More likely to be chosen if alone—and sometimes in the morning, when more pragmatic and time-sensitive tasks are carried out  
• Brings control and efficiency—the TV is there to soften the task and ensure there is some enjoyment involved  
• A workhorse in this situation, often used for investigation and understanding as it relates to decision-making

**Mobile** | • More likely to be used if others are present  
• Distracts less from company and from the other device being used  
• One-to-one communication is the key task here, important emails or texts  
• Brings a social aspect to the activity; it’s less of an intimate ‘lover’ and more of a ‘caregiver’ and ‘everyman’  
• Can also help with information if required, however

**Tablet** | • Slightly more likely than the phone to be used when alone, partly because it takes a bit more attention away from the moment  
• Often used for involved activities such as gaming or video viewing, distracting from what’s on the other screen  
• A demanding ‘ruler’, but can also deepen the enjoyment of the entire situation—tablet + TV is often more enjoyable than TV alone, even among separate multi-screening scenarios

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### Television: The Everyman

Television, our most established screen, has fully grown into “The Everyman”; it’s the most popular device for multi-screening behavior. TV delivers passive entertainment, enjoyment, familiarity and comfort. It’s best positioned to provide emotional brand experiences that are intuitive and easy to understand, but more and more consumers are using a second device while watching television: seven out of 10 consumers use a second device while watching TV. Marketers will likely find deeper engagement when driving consumers from the TV to alternate screens, such as the tablet.

“Something about a giant TV makes you feel less lonely. I’m a student living alone, and having the TV on as background noise as I’m folding laundry or doing other menial tasks makes me feel less like a crazy cat lady.”

Nicolette, US

(Survey by Microsoft, 2013)
Cross-Screen Engagement

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(Survey by Microsoft, 2013)
What are we doing with the 2nd screen?

### TABLET OR SMARTPHONE ACTIVITIES WHILE WATCHING TV

- **Looked up information in general**: 76% (tablet) vs 63% (smartphone)
- **Surfed the web**: 68% (tablet) vs 55% (smartphone)
- **Visited a social networking site**: 53% (tablet) vs 52% (smartphone)
- **Looked up information on actors, plotlines, athletes, or teams**: 49% (tablet) vs 34% (smartphone)
- **Read conversations about the program on social networking site**: 21% (tablet) vs 18% (smartphone)
- **Buy a product/service that is being advertised**: 20% (tablet) vs 13% (smartphone)
- **Watched certain TV programming because of something you read on a social media website**: 15% (tablet) vs 10% (smartphone)
- **Voted or sent comments to live program**: 13% (tablet) vs 13% (smartphone)
- **Purchased coupons or deals related to TV program**: 13% (tablet) vs 9% (smartphone)
- **Wrote blurbs on the program you are watching**: 13% (tablet) vs 8% (smartphone)

**Source:** Nielsen
iTV on the 1st Screen

• Multimedia Home Platform
  First specification: 2000

• Interactive Java applications

• Backchannel support
  • Home shopping,
  Interactive quizzes,
  Information retrieval

• Discontinued in Germany
iTV on the 1st Screen

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iTV on the 1st Screen

- Hybrid Broadcast Broadband TV
- “Red button”
- HTML5-based
- Better graphics
- Catch-up services
- Polls
- High definition video text
iTV on the 1st Screen

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DEMO | arte +7 HbbTV Portal
iTV on the 1st Screen

Various broadcasters, various applications

How to interact?
navigate, select

How to ensure consistency?
Design Patterns for iTV Applications

Pattern Language (42 patterns):

A. Page Layout
B. Navigation
C. Remote Control Keys
D. Basic Functions
E. Content Presentation
F. User Participation
G. Text Input
H. Help
I. Accessibility & Personalization
J. Specific User Groups
5.3.3 Pattern Group C: Remote Control Keys

**Name**

CHOOING THE RIGHT KEYS (C1)

**Examples**

![BBC News (BBC, UK)](image1)

![Sky News Active (Sky, UK)](image2)

**Context**

Based on CHOOING THE RIGHT PAGE LAYOUT (A1) a layout has been chosen and based on MULTIPLE WAYS TO NAVIGATE (B1) one or more ways to navigate have been chosen too.

**Problem**

The design of remote controls varies widely. Some keys are standardised and provided by every remote control:

- ARROW KEYS (C2): Up, down, left and right
- OK-KEY (C3)
- COLOUR KEYS (C4: Red, green, yellow and blue
- NUMBER KEYS (C5): 0–9

However, these keys vary a lot in their form, position and labelling from control to control. Besides the standard keys some remote controls offer SPECIAL KEYS (C6), e.g. a key for GOING ONE LEVEL UP (E7). Each kind of these keys has specific pros and cons to be considered when deciding on which of them to use.

**Advantages**

<table>
<thead>
<tr>
<th>Arrow keys</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily found by touch without viewing the remote control.</td>
<td>Usually several keys have to be pressed: choosing an item with arrow keys and confirming the choice with the OK-key.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OK-key</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily found by touch without viewing the remote control.</td>
<td>Not good for choosing between options, only for confirming a user or a default choice.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colour keys</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually only one press of one key.</td>
<td>Only suitable for up to four options.</td>
</tr>
</tbody>
</table>

**Solution**

- Arrow keys: Use arrow keys to choose an item, like an item in a secondary menu. Use arrow keys together with the OK-key.
- OK-key: Use the OK-key to confirm a choice.
- Colour keys: Use colour keys for choices which have to be efficient and for choosing items in the main menu.
- Number keys: Use number keys too for efficient choices. If arrow keys are used to choose items in a main menu, use number keys too as shortcuts.
- Special key: Use special keys only as shortcuts. Ensure that the same user action can be carried out without using a special key. Use special keys for actions commonly needed or useful for all or most applications.

**Evidence**


**Related Patterns**

**Name**

ARROW KEYS (C2)

**Examples**

![BBC Sport (BBC, UK)](image3)

![iNews prototype (TU Ilmenau)](image4)

**Context**

Based on CHOOING THE RIGHT KEYS (C1) the arrow keys have been chosen as most suitable.

**Problem**

- **Advantages:** Easily found by touch without viewing the remote control.
- **Disadvantages:** Usually several key presses are needed: Choosing an item with the arrow keys and confirming the choice with the OK-key. The confirmation is useful in lessening the consequences of typing errors.
- **Typical use:** Choosing an item: Usually in combination with the OK-key (C3). The arrow keys are used to choose an item and the OK-key to confirm the choice, e.g. to choose an item in a MENU.
In-Class Exercise

Pattern G1: Multiple Ways to Input Text

Task: Roughly sketch

• Examples
• Problem
• Solution
• Evidence

for this pattern!
TNT – A Numeric Keypad Based Text Input Method

Ingmarsson et al., CHI 2004
TNT – A Numeric Keypad Based Text Input Method

Ingmarsson et al., CHI 2004
Industry Demands

- Conformity to standards, legacy
- Advertisement is important (e.g., CI+ standard: no ad skipping)
- Broadcaster dependency
- Interactivity vs. attention
- Creeping featurism sells better (e.g., “Smart” TVs with a browser)

In-class exercise:
How about research?
Selected Research Papers from TVX 2014

- ACM SIGCHI conference
- Former EuroITV conference
- 2014: 140 attendees, 20 papers
- Industry track

Who are the users?

- iTV consumers (i.e., viewers)
- iTV producers (e.g., content editing)
Input Devices for iTV (1)


RQ1: How does the performance of older and younger adults differ when controlling iTV applications with different input modalities?

RQ2: Is there a difference in the UX of older and younger adults when using different input modalities, in terms of usability, effectiveness, satisfaction, and efficiency?

Nutrition Tracker

Photo Browser
Input Devices for iTV (1)


- Usability, effectiveness, satisfaction, efficiency: 
  - $G$ rated lower than $T, R$ (sig.)

- Mirrored $T$ works best
- $G$ were not accurate and robust
- $R$ works well for linear tasks

Figure 3: Task completion times for all experimental conditions. Error bars show 95% CI.

Figure 4: Interaction graph for Interaction Modality x Age (left), Interaction Modality x Application (middle) and Application x Age (right).

Figure 5: Ranking of the input modalities in percentage for Photo Browser (PB) and Nutrition Tracker (NT).
Input Devices for iTV (2)

Vatavu et al.: Leap Gestures for TV: Insights from an Elicitation Study, TVX 2014

**RQ:** What are users’ preferences for interacting with iTV using free-hand gestures?

**Experiment**
- Based on elicitation study (*)
- 18 participants
- TV + Leap Motion Controller
- 21 referents (effect of a gesture) based on 4 categories:
  - Basic, generic, channel, feature
- Task: perform a gesture for a referent (show as text)

(*) Reading Assignment
Wobbrock et al.: Maximizing the Guessability of Symbolic Input, CHI ‘05
**Gesture set**

- Look at the paper! (appendix)
- Based on highest agreement
- Goal: inspire designers

<table>
<thead>
<tr>
<th>Volume up</th>
<th>Move hand upward</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>hand in pinch pose expanding fingers, thumbs-up with moving to the right, thumbs up moving upwards twice, move hand upward, rotate imaginary button to the right, draw “+”, opening hand from thumb-index pinch, draw triangle pointing up, open palm, draw circle clockwise, hand performing the “go away” cultural gesture</td>
</tr>
<tr>
<td>Volume down</td>
<td>Move hand downward</td>
<td>from open palm to index-thumb pinch, thumbs-up with moving to the left, thumbs up moving downwards twice, rotate imaginary button to the left, move hand from left to right, draw triangle pointing down, closing into a pinch all (all finger tips touching), draw circle counter-clockwise, hand performing “come closer” cultural gesture</td>
</tr>
<tr>
<td>Volume mute</td>
<td>Closing fingers into pinch</td>
<td>fist followed by extending little finger, open palm, thumbs-down to thumbs-up, draw “X”, close fist, open palm to index-thumb pinch, thumb-little finger pinch, open palm facing down move left to right, draw crossed zero, draw circle counter-clockwise, move hand downward, move hand left to right, move hand right to left, move palm away from body</td>
</tr>
</tbody>
</table>

**Design implications (selected)**

1. Finger and hand pose gestures are preferred to remotes, but there is low agreement between users.
2. Users fall back on previously acquired gesture interaction models.
3. Preference for 2-D gestures.
4. Users prefer either motion or hand pose gestures, and combinations of these two are less likely.
9. Users show preference for drawing letters in mid-air to execute tasks whose names start with those letters.
Designing 2nd Screen Apps

Geerts et al.: In Front of and Behind the Second Screen: Viewer and Producer Perspectives on a Companion App, TVX 2014

- **RQ:** How to design companion apps?
- **How?** Interviews with professionals, recordings at home, analytics on 2nd screen app usage
- **Criteria:**
  - Ease of use
  - Timing
  - Social interaction
  - Attention
  - Added value
Designing 2nd Screen Apps

Geerts et al.: In Front of and Behind the Second Screen: Viewer and Producer Perspectives on a Companion App, TVX 2014

- **Ease of use**
  - No accounts!
  - Single app per broadcaster!

- **Social interaction**
  - App is catalyst for conversation (e.g., polls)
  - Use app as personal remote, promote results on 1st screen

- **Timing**
  - **Live viewing**
    - Text messages
    - Polls
    - Broadcasters sync by hand
  - **Delayed viewing**
    - App not in sync, unusable
    - But: recordings more important than app
Designing 2nd Screen Apps

Geerts et al.: In Front of and Behind the Second Screen: Viewer and Producer Perspectives on a Companion App, TVX 2014

• Usage

![Graph showing user activity](image)

Figure 3: Number of users (y-axis) per day (x-axis) for the "De Ridder" companion app (full season)

• Users look back at info updates
• Provide update history!
• App mostly used only when show is being aired
  • Against broadcasters interests
Designing 2nd Screen Apps

Geerts et al.: In Front of and Behind the Second Screen: Viewer and Producer Perspectives on a Companion App, TVX 2014

• **Attention**
  - Use timer to indicate when next update is due!
  - Users expect updates on certain events (e.g., actors text messaging)
  - If no updates for a while: users will switch to other apps
  - If an update contains too much content: not consumed, content might be missed
Designing 2nd Screen Apps

Geerts et al.: In Front of and Behind the Second Screen: Viewer and Producer Perspectives on a Companion App, TVX 2014

• **Added value**
  - Character quotes: only funny quotes
  - Polls: answer must not be obvious
  - Diegetic content (e.g., text messages, newspaper articles, pictures)
    - very much appreciated because it’s additional content
  - Non-diegetic content (meta information)
    - appreciated but must be concise/short

- Broadcasters fear distraction from 1st screen
  - *Challenge*: right balance between engagement and distraction
- Producers fear effort of designing 2nd screen app does not pay off
Evaluation

What to evaluate?

• Usability
  
  *Is the system/application easy to use?*

• Sociability
  
  *Is the social interaction supported well?*

• Sociability testing requires good usability
  
  ‣ Do not combine usability and sociability testing!
Evaluation

What’s different for TV?

- Physical characteristics of interaction
- Social characteristics
- Time-related aspects
- Broadcast-related aspects
- Watching TV is optional/additional task

Pemberton et al., HCI International 2003
Evaluation

Users
- Single vs. group interaction
- For groups: users must know each other!

Content
- Must match the users’ preferences!
- Genres must be sociable
- Pre-recorded: content might be known
- Live: difficult to control
Where?

• In the field (~ at home)
  + Natural environment
  + Suitable for long-term studies
    – Technical set up complexity
    – Observation difficult
      • Diary studies, logs, video recordings (?)
• In the lab
  • More or less the opposite of in the field
WHAT’S NEXT? | Beyond a limited, flat screen?
DEMO

Philips Ambilight

http://www.ambilightplayer.philips.com
VIDEO | IllumiRoom, Microsoft Research

CHI/SIGGRAPH 2013

http://www.youtube.com/watch?v=relEatGRV0w
Conclusion & Take-Aways

TV is not dead.

(Live) TV is a social event.

Backchannel for interactivity.

From lean-back to lean-forward.

Input beyond a classic remote.

We multi-screen.

Social TV and 2nd screen.

Industry vs. research.

Usability and sociability.

Augmented TV beyond a flat screen.

#BRAGER
Today, 10pm