

# Privacy in Social Networks

## Existing Challenges and Proposals for Solution

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### Agenda

- **Motivation**
- Privacy Settings in Online Social Networks
- OSN Stakeholders and Implications for Privacy
- Enhancing Privacy on the Provider Side
- Addressing User Awareness
- Conclusions


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theguardian  
News | Sport | Comment | Culture | Business | Money | Life & style  
News > Technology > Facebook

Privacy no longer a social norm, says Facebook founder

Bobbie Johnson, Las Vegas  
theguardian.com, Monday 11 January 2010 01:58 GMT  
Jump to comments (78)



People have become more comfortable sharing private information online, says Facebook founder Mark Zuckerberg. Photograph: Eric Risberg/AP



Signs of the social networking times.

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# Who can really see what I am posting?

*Public Tweet of a British woman on the Ukraine crisis*



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# > 45 %

underestimate the visibility of at least one of their items\*

\* Netter, M., Riesner, M., Weber, M., Pernul, G., "Privacy Settings in Online Social Networks - Preferences, Perception, and Reality", In Proc. of the 46<sup>th</sup> Hawaii International Conference on System Sciences (HICSS), IEEE, 2013

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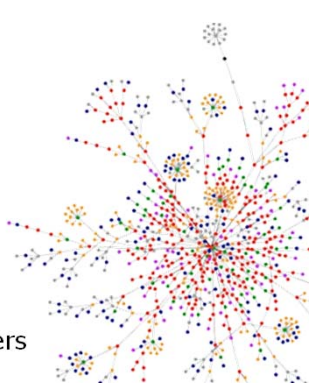


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## Online Social Network (OSN)

- **Three criteria for Online Social Networks**
  - Create own profile
  - Express relationships
  - Traverse “Social Graph”
- **OSNs in the narrow sense can be further categorized**
  - Topic-specific vs. general-purpose
  - Regional vs. worldwide audience
  - Open vs. Closed OSNs
- **Privacy Paradox**
  - Participation in OSNs requires the disclosure of personal information
  - Increasing usage of OSNs
  - But at the same time: Increased concerns regarding privacy towards service providers and towards other users



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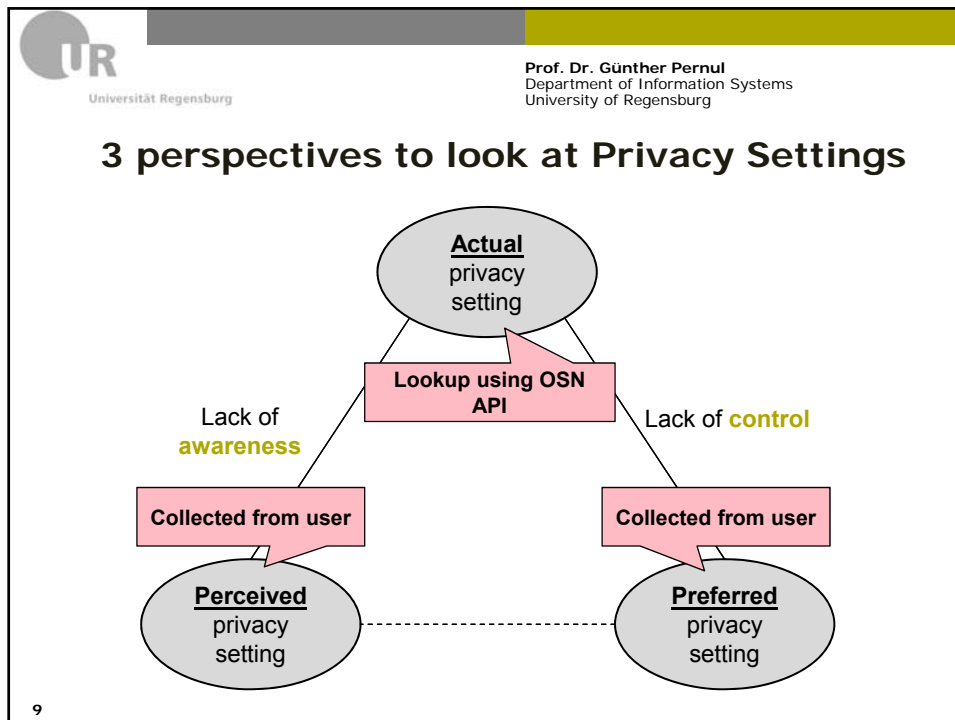
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## Privacy Settings on OSNs

- **Primary means to manage information flow**
- **Determines who can see a shared item**
- **Several options available**
  - Only me
  - Friends
  - Friends-of-Friends
  - Public
  - Custom



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### Conceptualization of User Study

- **Research questions**
  - Do OSN users understand the visibility implications of an OSN access control model? (**Awareness**)
  - Do OSN users' preferred visibility settings differ from the actual visibility settings? (**Control**)
- **Participants**
  - 68 participants (after cleansing)
  - Average age: 23.93 years
  - Mostly academic background (95.59 %)


Gender distribution

■ Male ■ Female

IT background

■ Yes ■ No

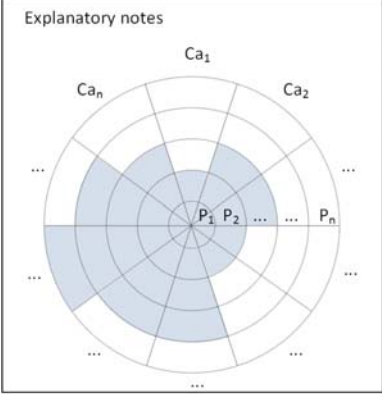
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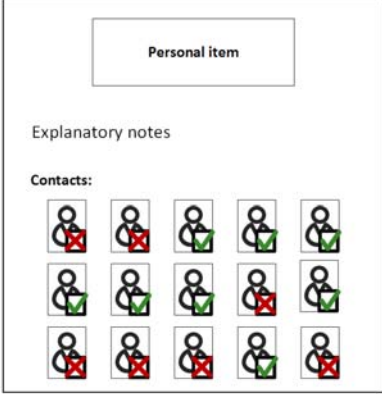
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## User Study Design




**Questionnaire on default settings**



**Questionnaire on item sharing**

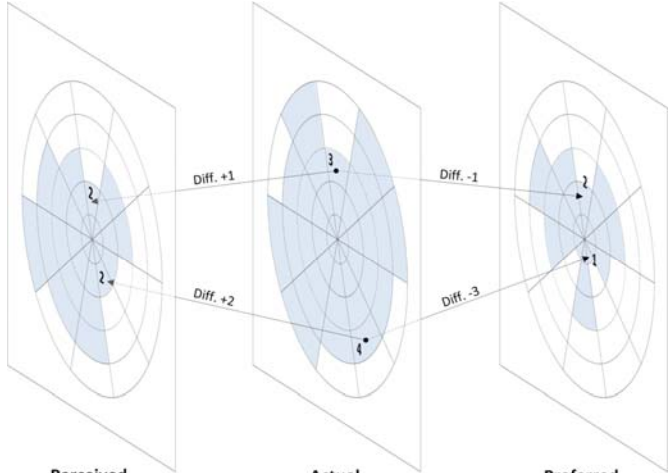
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## Hypotheses – Conceptual example



Perceived  
Default Settings

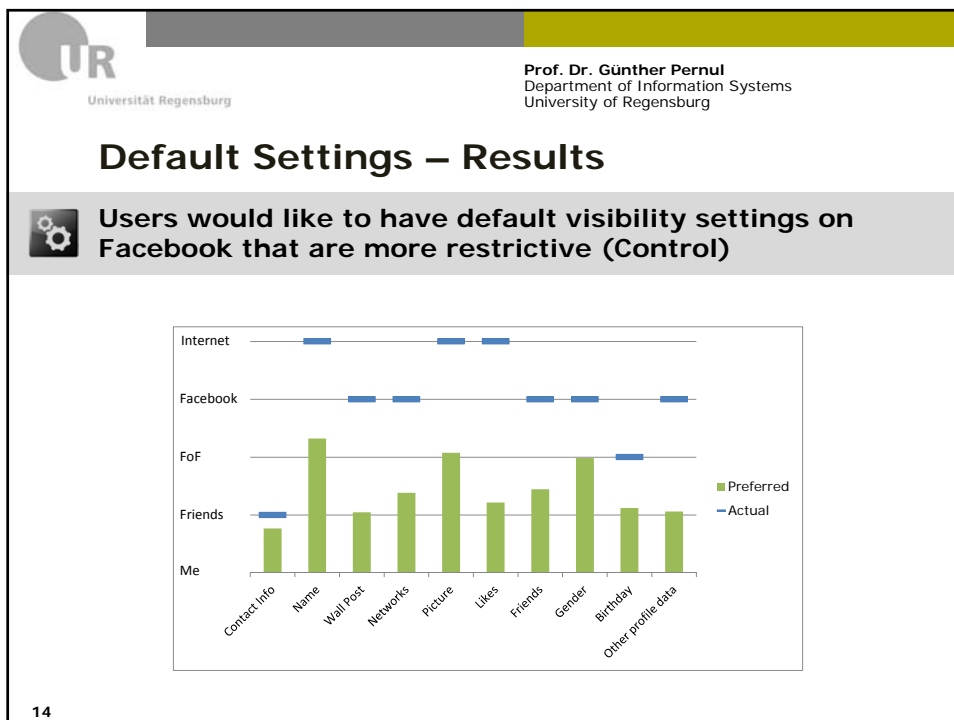
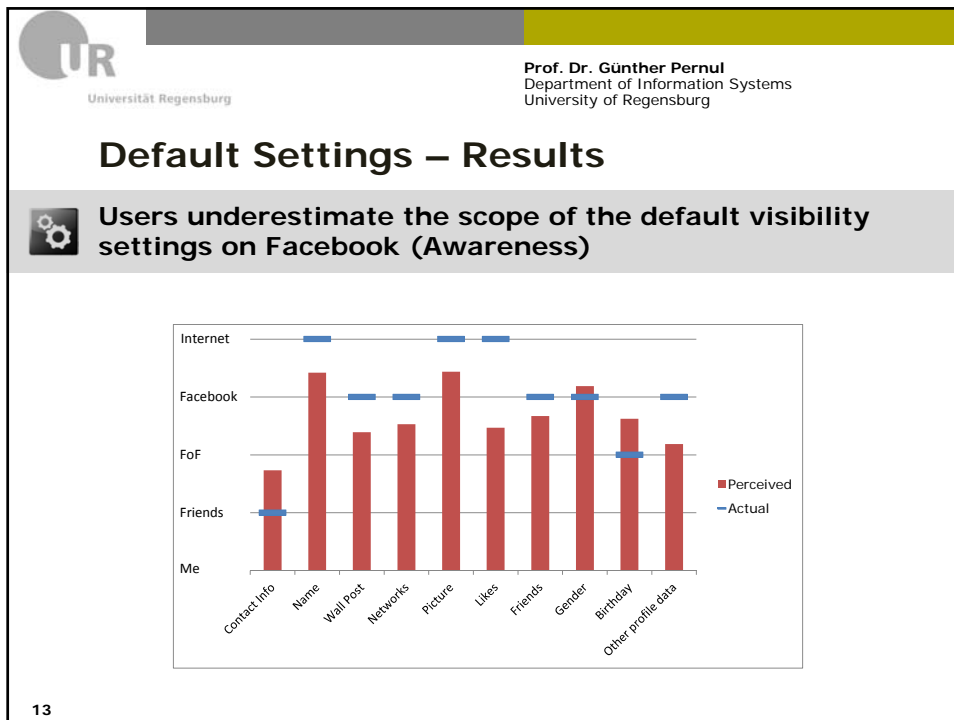
Awareness ??

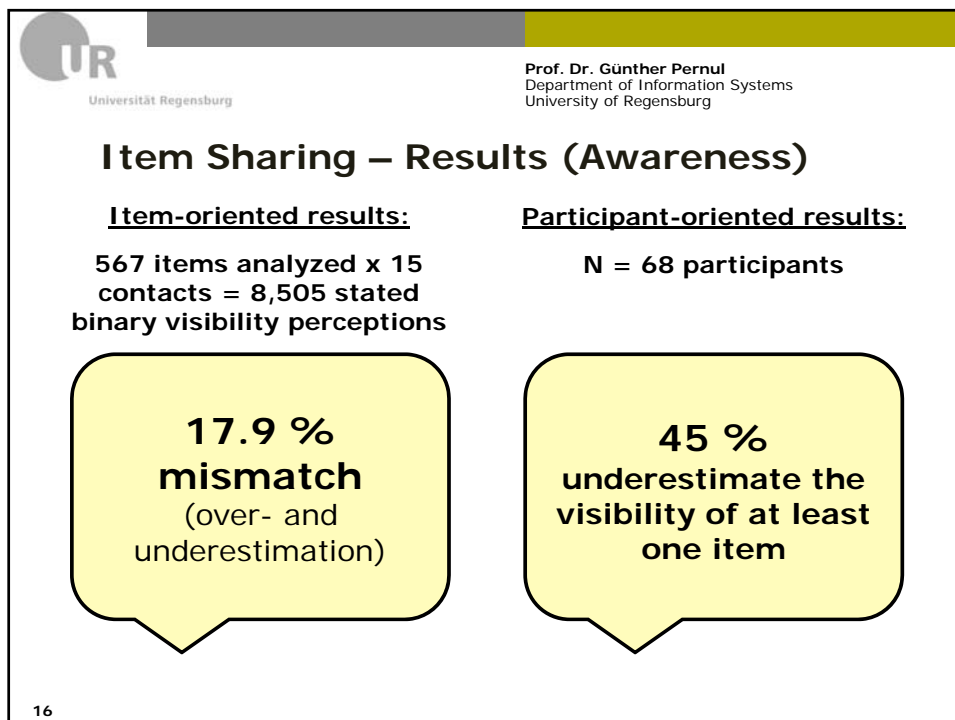
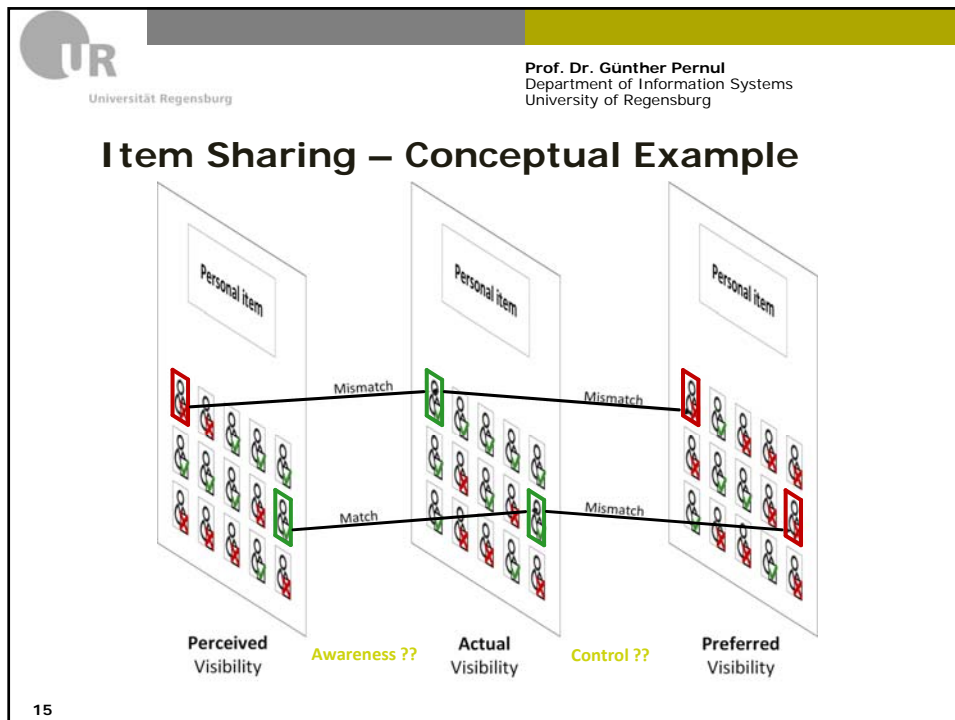
Actual  
Default Settings

Control ??


Preferred  
Default Settings

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## Item Sharing – Results (Control)

Item-oriented results:

567 items analyzed x 15 contacts = 8,505 stated binary visibility preferences


**24.6 %  
mismatch**  
(preferences for both more and less restrictive settings)

Participant-oriented results:

N = 68 participants

**64 %  
want more restrictive visibility settings for at least one item**

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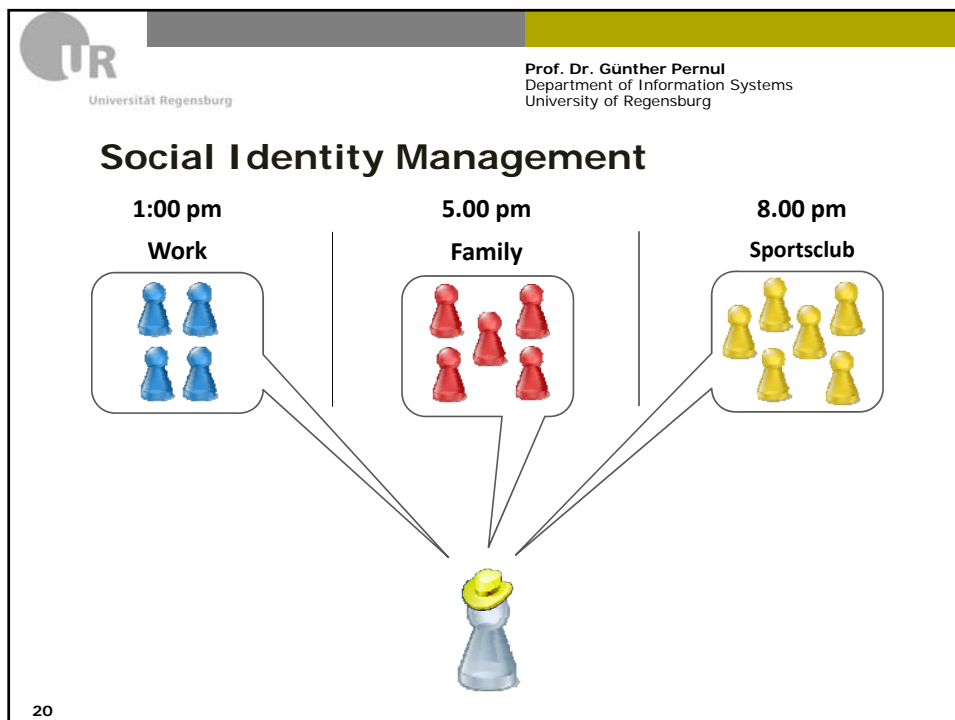
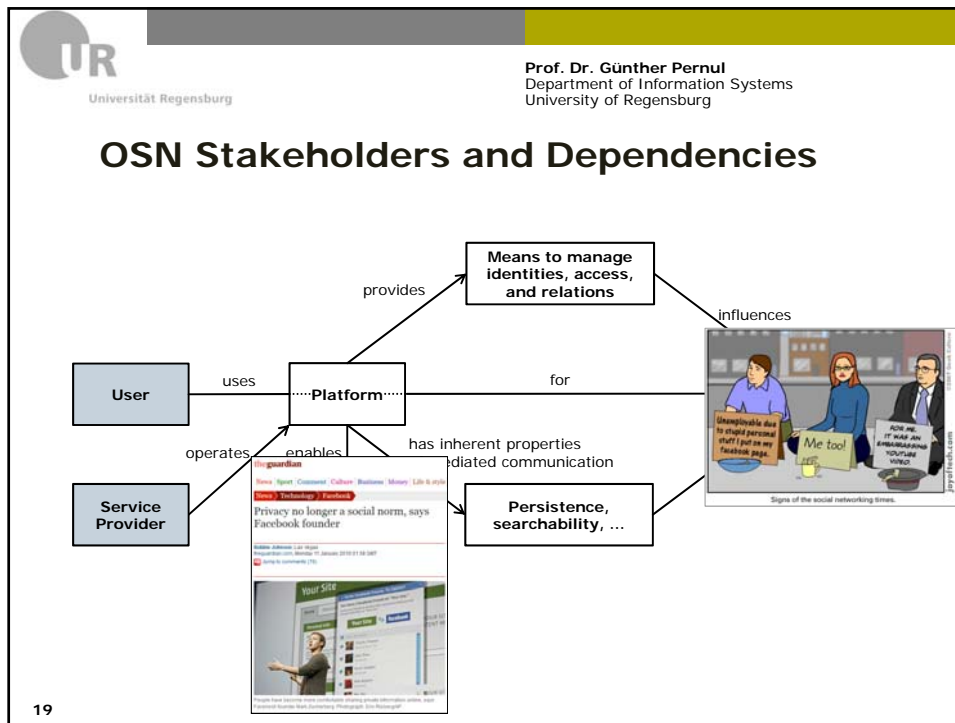
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## Social Identity Management

24/7  
Work, Family, Sports club

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## Protection Against Profiling: Decentralization

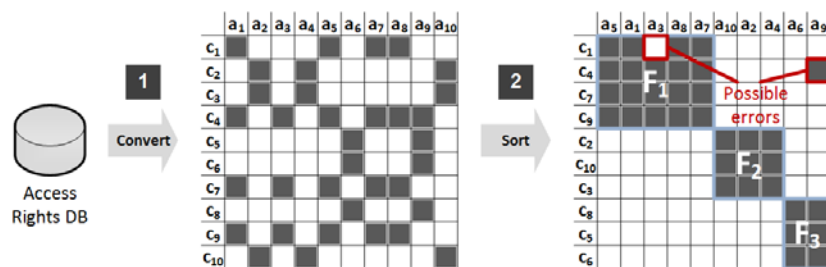
- Decentralized / user-centric approach prevents the service provider from accessing personal information
- Example: Diaspora\*



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## Access Policy Grid\* - lack of control

- **Step 1: Retrieve a user's items as well as their visibility settings and illustrate them in a matrix**
- **Step 2: Sort this matrix to identify similar contacts and similar users (as well as possible errors)**



\* Netter, M., Weber, M., Diener, M., Pernul, G., "Visualizing Social Roles - Design and Evaluation of a Bird's-Eye View of Social Network Privacy Settings", In: Proc. of the 22<sup>nd</sup> European Conference on Information Systems (ECIS), 2014.


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## Access Policy Grid - GUI

Zoom +
 Zoom -
100 %
 Unsort Matrix
 Back to Users


	Charles Gay Rafael Green Mike Kent Julia Celia Grande Diva Strong Herman Rapin Luis Alarcon John Adams Charles Walker Enrico Batis Mick Sims Nancy Bryant Rosario Bryant Ella Jensen Linda Smith Lisa Steele John Gelfi Mary Ann Mary Anso South Pierce Michael Sharon Kell Melanie Mara Link Mary Ann Jennifer Craig Michelle Mike Brown Luis Gray
Last Name: D.	
Picture: Holiday 4.jpg	
Picture: Holiday 1.jpg	
Hometown: Hamburg	
Profile Picture: Picturaz.jpg	
First Name: John	
Status Message: Happy Holidays	
Picture: Holiday 3.jpg	
Location: Stone Bridge Regensburg...	
Profile Picture: Prof pic.jpg	
Picture: Holiday 2.jpg	
Birthday: 04/02/1967	
Picture: Holiday 5.jpg	
Phone Nr.: 333311	
Status Message: Happy Birthday	
First Name: Johnny	
Education: IT Professional	
Picture: Professional 1.jpg	
Last Name: Doe	
Phone Nr.: 999999888	
Profile Picture: PictureProfessi...	
Profile Picture: PictureNews.jpg	
Picture: BusinessMeeting.jpg	
Status Message: Wish you all a h...	
Picture: Family 2.jpg	
Picture: Family 1.jpg	
First Name: Ann	

Item:



Holiday3.jpg


Contact:



Name: Brandon/Rorie  
Audiences:  
- Hometown

[Change Permission](#)

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## Do you know who can see your facebook profile?

Playfully discover who can see your shared items and get advice to improve your privacy.



[www.friend-inspector.org](http://www.friend-inspector.org)

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## Friend Inspector\*

- Serious game to enhance **privacy awareness** on OSNs
- Playfully compare perceived and actual visibility
- Learning objectives:
  - Enhance privacy awareness
  - Learn about privacy settings

The diagram illustrates the Friend Inspector framework, showing the integration of three foundational areas: Privacy Foundations, Friend Inspector Process Steps, and Gaming Foundations. The central process consists of four sequential steps: 1. Motivation, 2. Personalisation (Item Battle), 3. Game (Find Your Friends), and 4. Score & Feedback. These steps are supported by various components: Privacy Foundations (Privacy Awareness, Preselection of Sensitive Items, Comparison of Actual and Perceived Visibility), Friend Inspector Process Steps (Learning Objectives), and Gaming Foundations (Serious Games, Experimental Gaming Model, Frame Story). Arrows indicate the flow and relationships between these elements.

\* Cetto, A., Netter, M., Pernul, G., Richthammer, C., Riesner, M., Roth, C., Sanger, J., "Friend Inspector: A Serious Game to Enhance Privacy Awareness in Social Networks" (Best Paper Award), In Proc. of the 2<sup>nd</sup> International Workshop on Intelligent Digital Games for Empowerment and Inclusion (IDGEI), 2014

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## Step 1 – Motivation

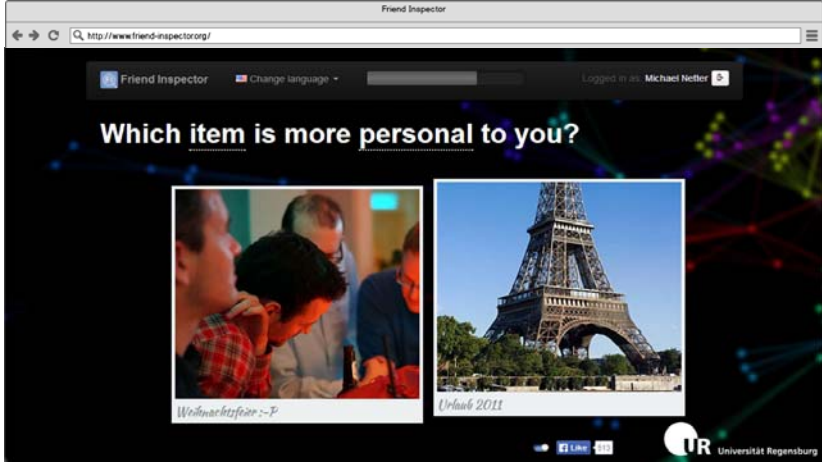
The screenshot shows the Friend Inspector website interface. The main heading asks "Do you know who can see your Facebook profile?" and encourages users to "Playfully discover who can see your shared items and get advice to improve your privacy." A prominent blue "Play" button is visible. The background features a network graph visualization. The website includes a navigation bar with the Friend Inspector logo and a language selection dropdown. Social media links for Facebook, LinkedIn, and YouTube are at the bottom, along with the University of Regensburg logo.

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## Step 2 – Personalization

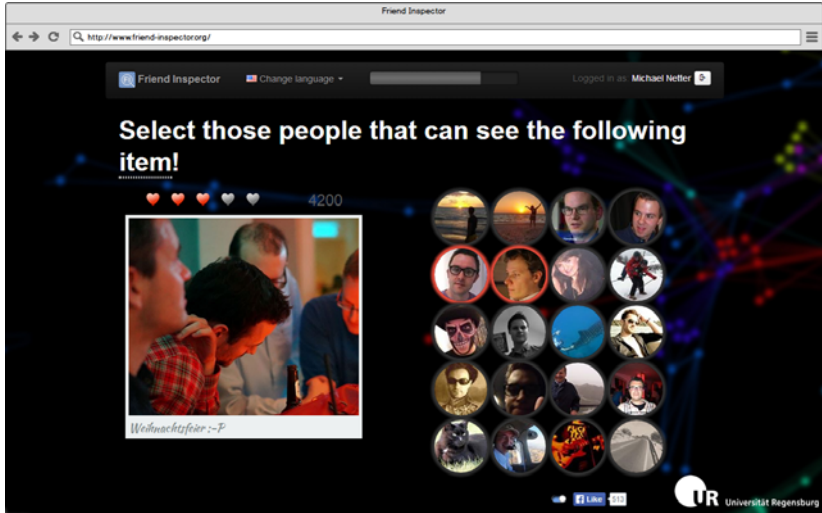


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## Step 3 – Game



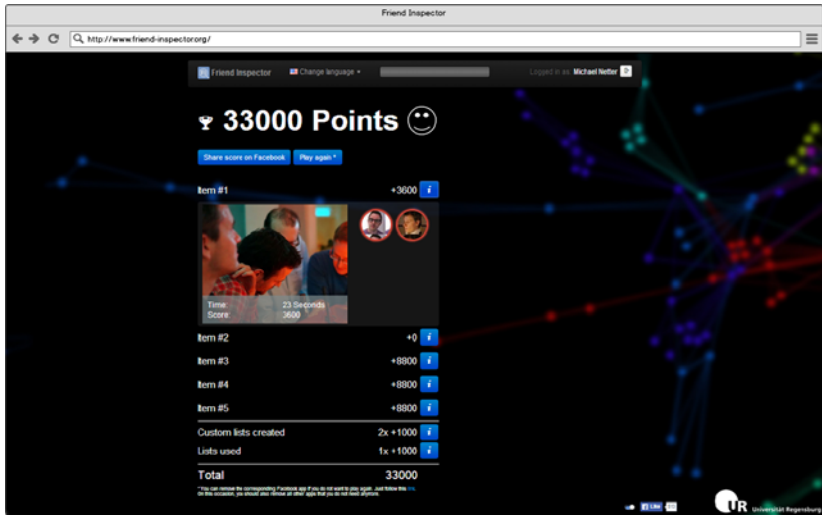
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## Step 4 – Score & Feedback



The screenshot shows the 'Friend Inspector' website interface. At the top, it displays '33000 Points' with a smiley face icon. Below this, there are buttons for 'Share score on Facebook' and 'Play again'. A list of items is shown with their scores:

Item	Score
Item #1	+3600
Item #2	+10
Item #3	+9800
Item #4	+9800
Item #5	+9800
Custom lists created	2x +1000
Lists used	1x +1000
<b>Total</b>	<b>33000</b>

At the bottom, there is a small text disclaimer: 'This app uses the corresponding Facebook API. It is not used to log you in, just to show the results. In this context, you should enter the data you want to see. It's not a game, it's just a tool.'

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## Dissemination, Media Response and Awards

- More than 550 Likes
- Reports in popular German print media and news portals (e.g. Spiegel, Zeit, Focus, SZ)
- TV report by RTL
- Article in MIT Technology Review
- Wolfgang Heilmann Award
- Best Paper Award at IDGEI'14




The screenshot of the Spiegel ONLINE article shows a group of people standing together, with the headline 'Privatsphäre-Check bei Facebook: Wer sieht was? Und will ich das?'. The text below the headline discusses the app's functionality and its impact on privacy.

The screenshot of the TV report by RTL shows a group of people sitting around a table, with the RTL logo visible in the bottom left corner. The text on the screen indicates that the app is being discussed in a meeting.

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## Conclusions

- **OSNs offer many benefits**
  - Keeping alive existing relationships as well as establishing new ones
  - Interactions without any spatial and temporal boundaries
  - Easy sharing of information
  - OSNs as an economically valuable concept
- **But: Privacy research and developments are needed to enable the safe and privacy-preserving usage of OSNs**



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## Contact Information

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## Relevant Publications

- Cetto, A., Netter, M., Pernul, G., Richthammer, C., Riesner, M., Roth, C., Sanger, J., "Friend Inspector: A Serious Game to Enhance Privacy Awareness in Social Networks", In: Proc. of the 2<sup>nd</sup> International Workshop on Intelligent Digital Games for Empowerment and Inclusion (IDGEI), 2014.
- Netter, M., Weber, M., Diener, M., Pernul, G., "Visualizing Social Roles - Design and Evaluation of a Bird's-Eye View of Social Network Privacy Settings", In: Proc. of the 22<sup>nd</sup> European Conference on Information Systems (ECIS), 2014.
- Riesner, M., Netter, M., Pernul, G., "Analyzing Settings for Social Identity Management on Social Networking Sites: Classification, Current State, and Proposed Developments", In: Information Security Technical Report, 17, 4, Elsevier, 2013.
- Netter, M., Riesner, M., Weber, M., Pernul, G., "Privacy Settings in Online Social Networks - Preferences, Perception, and Reality", In: Proc. of the 46<sup>th</sup> Hawaii International Conference on System Sciences (HICSS), IEEE, 2013.
- Netter, M., Herbst, S., Pernul, G., "Interdisciplinary Impact Analysis of Privacy in Social Networks", In: Althuler, Y., Elovici, Y., Cremers, A., Aharoni, N., Pentland, A. (eds.), Security and Privacy in Social Networks, Springer, 2013.
- Netter, M., Hassan, S., Pernul, G., "An Autonomous Social Web Privacy Infrastructure with Context-Aware Access Control", In: Proc. of the 9<sup>th</sup> International Conference on Trust, Privacy & Security in Digital Business (TrustBus), Springer, 2012.
- Riesner, M., Pernul, G., "Maintaining a Consistent Representation of Self across Multiple Social Networking Sites - A Data-centric Perspective", In: Proc. of the 2012 ASE/IEEE International Conference on Social Computing and 2012 ASE/IEEE International Conference on Privacy, Security, Risk and Trust, Workshop on Security and Privacy in Social Networks (SPSN at SocialCom), IEEE Computer Society Press, 2012.
- Riesner, M., Netter, M., Pernul, G., "An Analysis of Implemented and Desirable Settings for Identity Management on Social Networking Sites", In: Proc. of the 7<sup>th</sup> International Conference on Availability, Reliability and Security (ARES), 2012.
- Riesner, M., Pernul, G., "Provider-Independent Online Social Identity Management - Enhancing Privacy Consistently Across Multiple Social Networking Sites", In Proc. of the 45<sup>th</sup> Hawaii International Conference on System Sciences (HICSS), IEEE, 2012


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"On Facebook, 273 people know I'm a dog.  
The rest can only see my limited profile."

A black and white line drawing of a dog sitting at a desk, typing on a laptop. Another dog is sitting on the floor next to the desk, looking up at the first dog. The laptop screen shows a simplified version of a social media profile.

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