



# AndProtect

Privacy Enhancing Requirements of Mobile Application Users: Initial Findings of AndProtect User Research about Mobile Privacy Concerns and Usability of Permission Applications

Berlin, 28.10.2016

Workshop „Mobile Privacy – Challenges, Risks, and Solutions“

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([Professorship of Cognitive and Engineering Psychology](#), TU Chemnitz)

GEFÖRDERT VOM



Bundesministerium  
für Bildung  
und Forschung

secuvera



DAI-Labor  
TU Berlin



ALLGEMEINE UND  
ARBEITSPSYCHOLOGIE  
TU CHEMNITZ

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# Our Research Project

**Title:** „AndProtect: Personal data privacy by means of static and dynamic analysis for Android app validation “

**Duration:** 11/2015-10/2017

**Funding:** German Federal Ministry of Education and Research

**Project partners:** secuvera GmbH (coordinator), DAI-Labor (TU Berlin) and Professorship of Cognitive and Engineering Psychology (TU Chemnitz)



# Our Research Project

## Research Goal:

The development of a usable tool for non-professional Android users to support them gaining knowledge about information flows on their mobile apps.



# Our Research Project

1. **Static analysis (DAI-Labor, TU Berlin):** identification of internal and external app information flow, “Androlyzer” used as basis in the project
2. **Dynamic analysis (secuvera):** information flow during app usage, results of the static analysis are used as input (e.g., timer, views), automated usage of an app
3. **User research (TUC):** investigation of privacy concerns with regard to mobile applications (survey), usable design of user interfaces (usability test), evaluation of the entire system (field trial).

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## Our Survey

**Aim:** How do users evaluate the potential privacy threat of different types of data which apps may collect in the mobile context?

**Conduction:** 02/2016 – 05/2016 (10 weeks)

Successful **invitation** by: students/staff-mailing lists, personal contacts of the project partners, test participant panel of our professorship, invitation of related projects.



# Our Survey Participants

Completed questionnaires :  $N = 227$ ;  $n = 81$  female (36%),  $n = 146$  male (64%)

## Our typical respondent...

...owns a smartphone for 5 years and has tried out more than 50 mobile apps...

...uses his Android phone approx. 2h a day to read e-mails and chat with friends on the way...

...holds a university degree, works full-time in the information and communication branch..

...describes himself as: technically experienced and concerned about his privacy...

male, 35 years old...

..has particular concerns that third parties get access to his personal data by the usage of an app.





# Our Survey Structure

## Welcome and introduction to the survey

- Usage map/navigation app, messenger app, weather app and shopping app?
- Privacy threat of 15 different types of data for every respective app type a) during interaction b) continuously in the background
- Demands for improvement of mobile privacy protection
- Technical affinity, knowledge, privacy concerns, privacy violations in the past, demographic variables (age, education, etc.)

## Closing of the survey





# Our Survey Structure

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- Usage map/navigation app, messenger app, weather app and shopping app?
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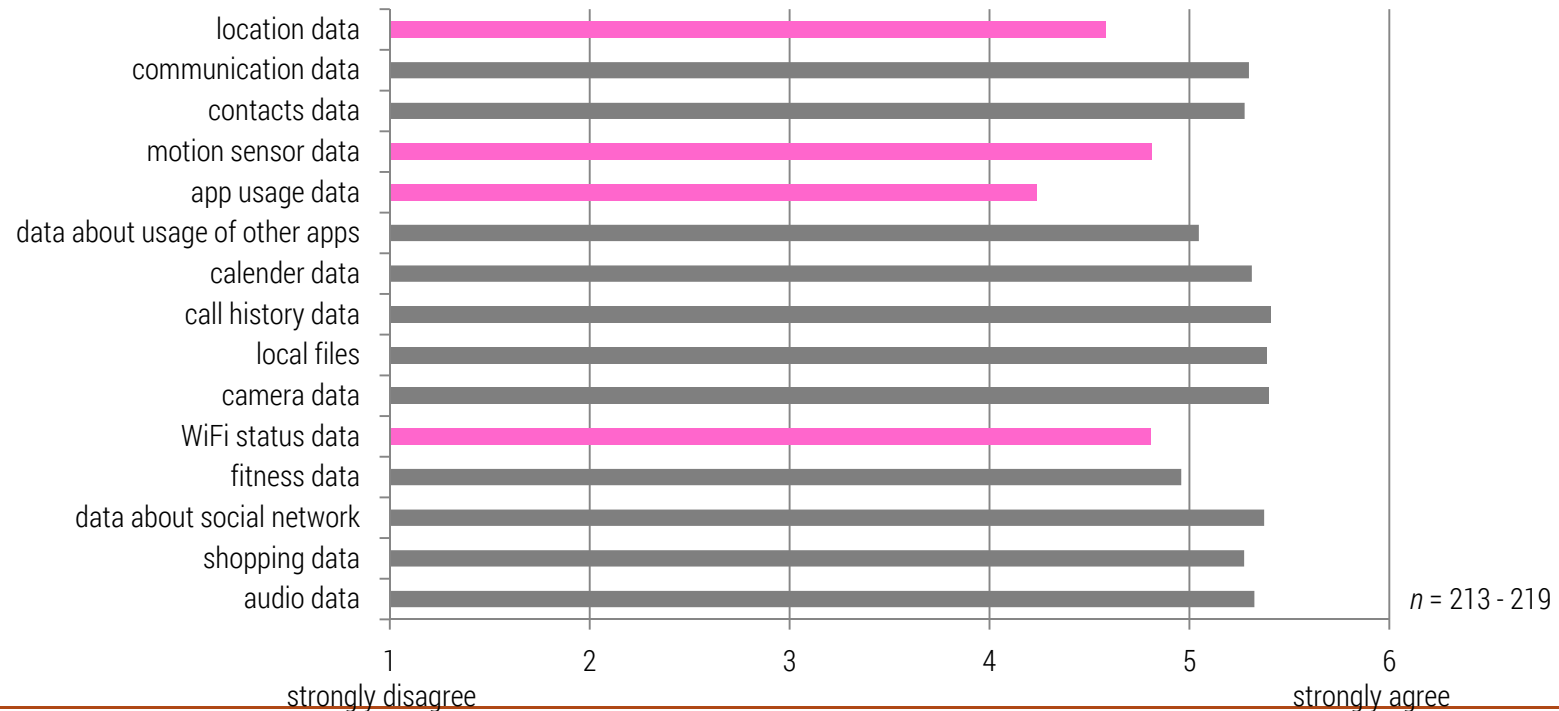
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# Data Related Privacy Concerns

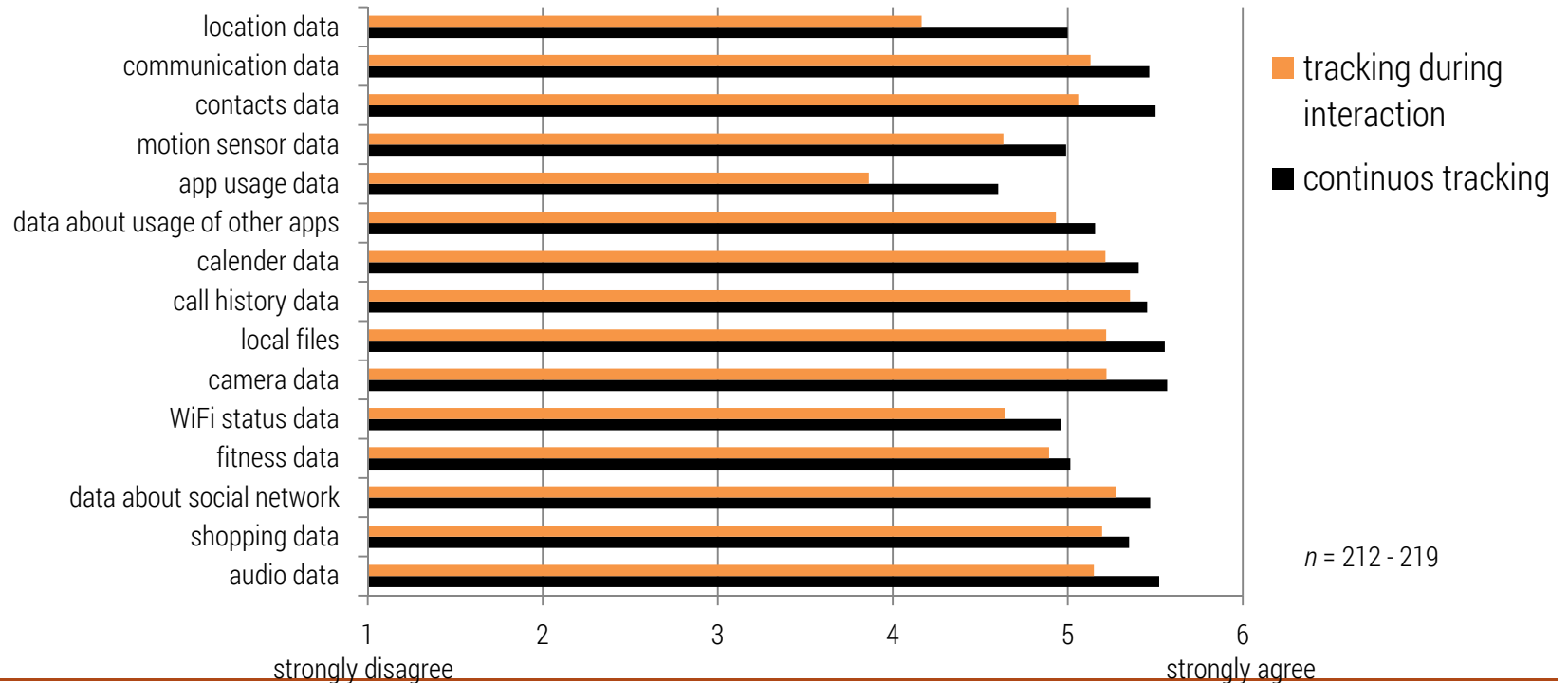
„I feel my privacy threatened if my [map/navigation app, messenger app, weather app, or shopping app] uses...





# Data Related Privacy Concerns

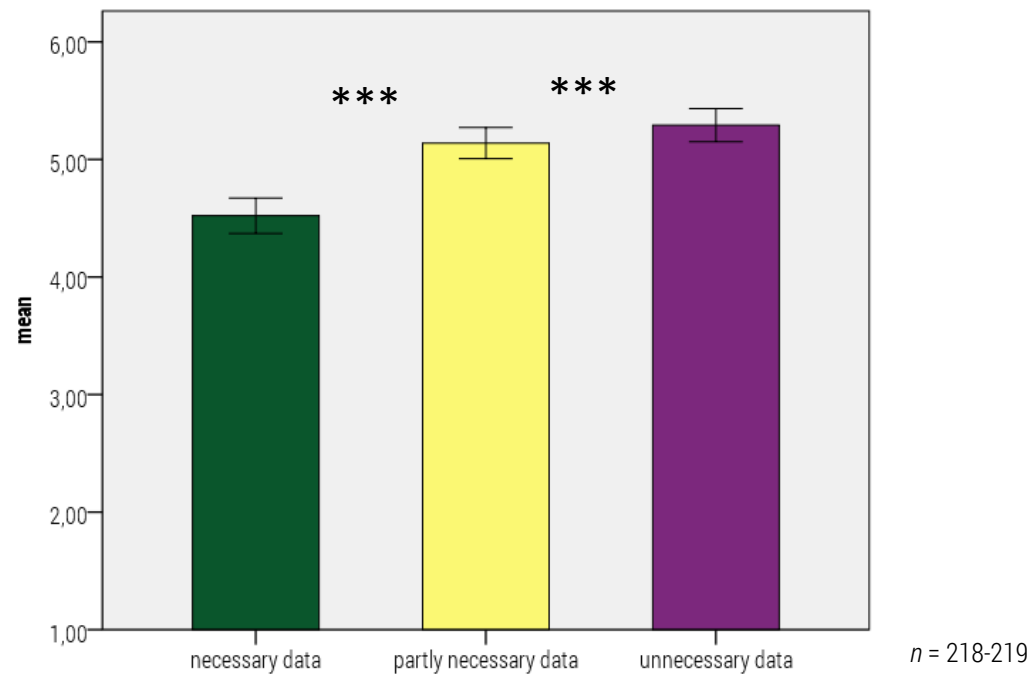
„I feel my privacy threatened if my [map/navigation app, messenger app, weather app, or shopping app] uses...





# Data Related Privacy Concerns

Taking the necessity of data for the provision of the respective service of an app into consideration...





# Data Related Privacy Concerns

We found no correlations/differences between evaluations of privacy threat and...

- age
- technical affinity
- knowledge
- negative Experiences
- men and woman
- installation process (app was installed by the user vs. was preinstalled by the manufacturer)
- relevance of the respective service of an app

Only the self-assessment of information privacy concerns and mobile privacy concerns showed consistent medium correlations with the evaluation of privacy threat.



# Our Survey Structure

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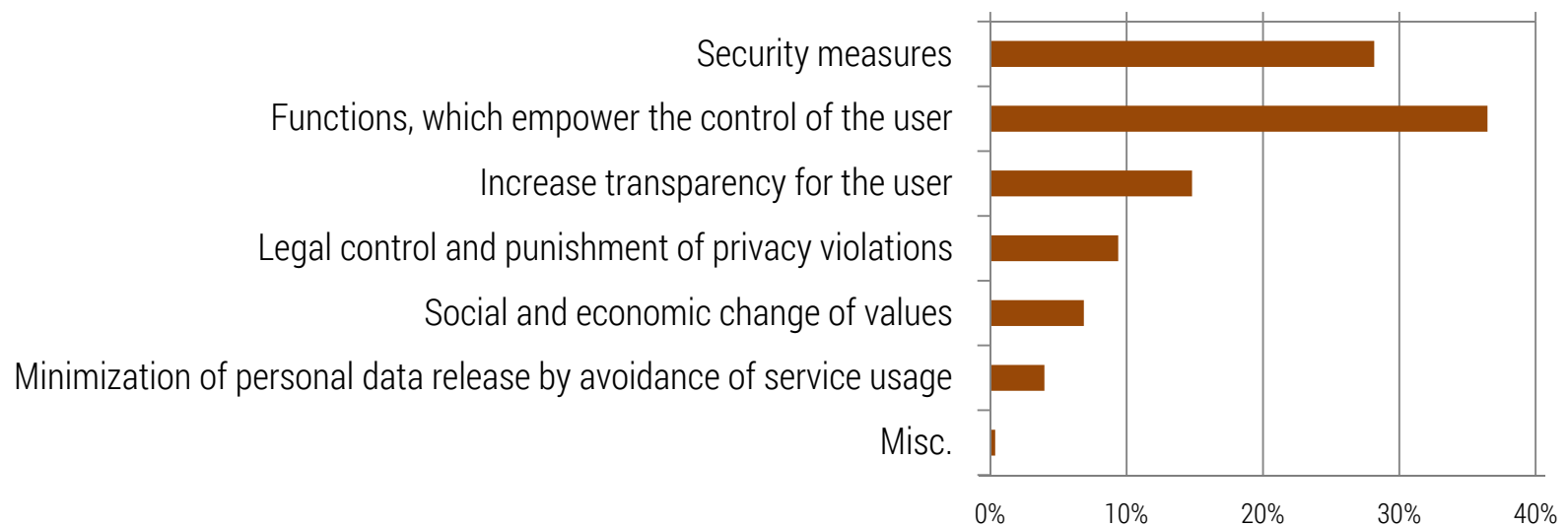
- Technical affinity, knowledge, privacy concerns, privacy violations in the past, demographic variables (age, education, etc.)

Closing of the survey



# Demands for Improvement

- $n = 194$  respondents answered on the question „*How privacy protection could be improved in the mobile sector? Do you have requests or ideas for an implementation?*“
- and made 277 qualitative suggestions for improvement
- these answers were analyzed and assigned to 7 categories





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## What we learned is that:

Mobile privacy concerns have nothing to do with: age, gender, knowledge, technical affinity, t experience of the user...

... nor installation process, or relevance of respective service of the app.

...and if the use of data is not necessary for providing the respective service of the app.

The users request for measures and functions they can actively apply to protect their privacy...

...especially if an app uses data continuously in the background...

...or at least increase the transparency about the usage of their data.

Smartphone users are concerned about their mobile privacy...







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# What we didn't know was...

...how can we support “the normal user”  
in a usable way to recognize a mobile  
privacy threat?

...or at least increase the transparency about  
the usage of their data.





# Our Usability Test

Research questions:

1. Which **guidelines** can be derived for the **development of permission-apps**?
2. Which **facets** of the concept of **user experience** are important for the assessment of **permission-apps**?



# Our Usability Test

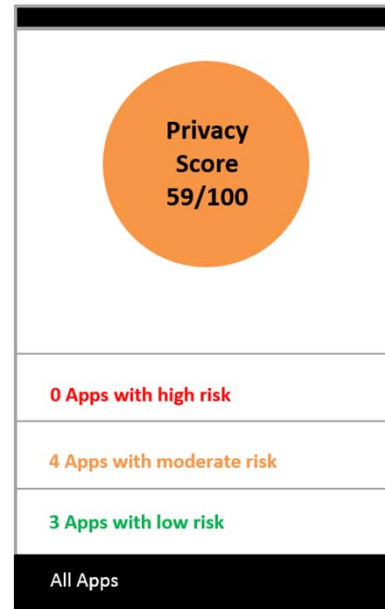
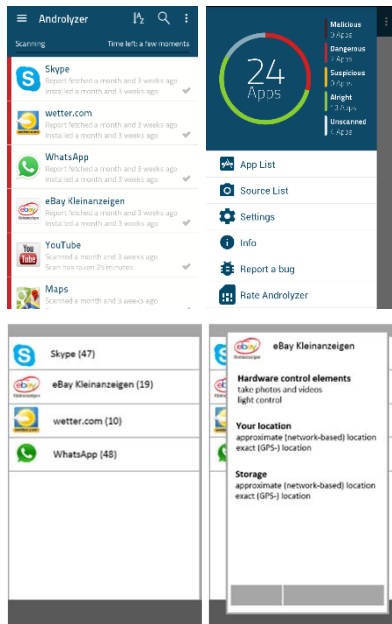
## Prestudy

- Facets (derivated from questionnaire *AttrakDiff2* from Hassenzahl, Burmester & Koller, 2003)
  - attractiveness
  - description and valuation of permissions
  - options for action
  - navigation
  - comprehensibility
  - stimulation
  - identity
  - information about the app and the provider
  - credibility



# Our Usability Test

Prestudy

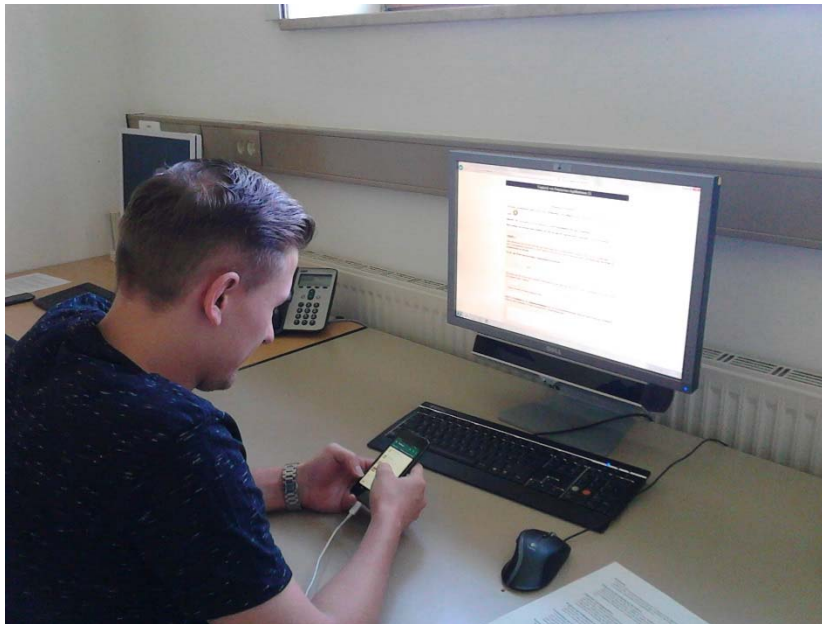


Skype	●
eBay Kleinanzeigen	●
wetter.com	●
WhatsApp	●



# Our Usability Test

Main study



- 3 tasks per app
  - *Could app X collect location data?*
  - *Which app could read contacts/read SMS/establish an internet connection?*
  - *Is there information about the potential risk of a scanned app?*
- Questionnaires
  - derived UX-facets
  - other usability/UX-questionnaires (and open questions)
  - privacy concerns
  - technical experience



# Our Usability Test

## Main study

$N = 31$ ;  $n = 20$  female (64.5%),  $n = 11$  male (35.5%)

## Our typical participant...

owns a smartphone for 5 years and has tried out 20 mobile apps (but no permission-app)

uses her Android-Smartphone approx. 2h a day for messaging, reading e-mails, using social media and searching for information

studies psychology in 4th semester

describes herself as: averagely technical experienced and concerned about her privacy

female, 23 years old...



has particular concerns that third parties get access to her personal data by the usage of an app



# Our Usability Test

Research questions:

2. Which facets of the concept of user experience are important for the assessment of permissions-apps?

Results

- attractiveness
- description and valuation of permissions
- options for action
- navigation
- comprehensibility
- stimulation
- identity
- information about the app and the provider
- credibility

1. Which guidelines can be derived for the development of permission-apps?

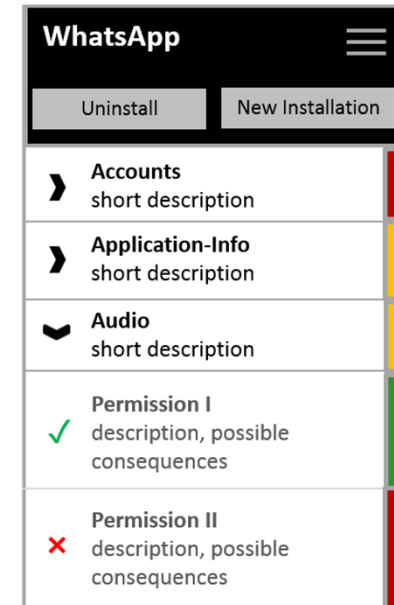
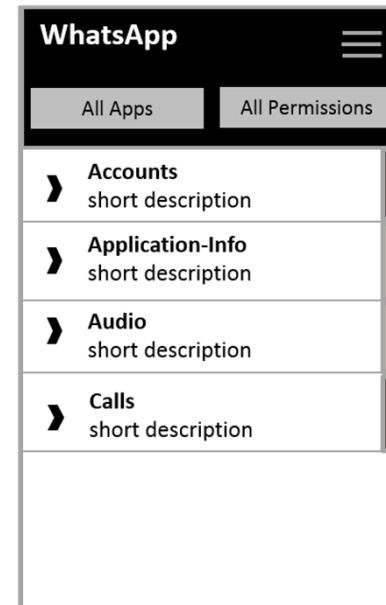
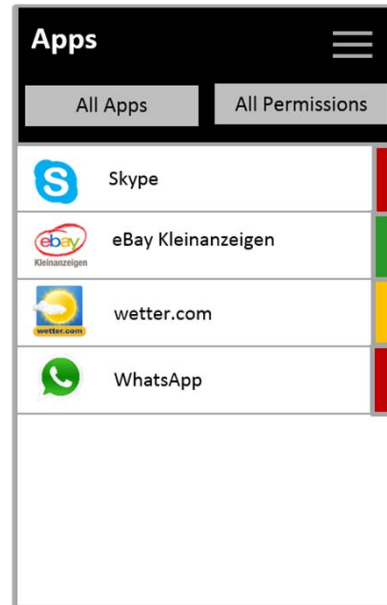
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Guideline I – navigation:  
„Provide a data and an app centered view!“

Guideline II – navigation:  
„Provide a fast, clear and hierarchical navigation!“

Guideline III – description and valuation of permissions:  
„Explain permissions as simply as possible!“

Guideline IV – description and valuation of permissions:  
„Show the potential risk of a scanned app!“



Guideline V – options for action  
„Provide comprehensive options for action!“

Guideline VI – stimulation  
„Highlight the potential risk of an app and the options for action!“

Guideline VII – credibility  
„Avoid permissions for your permission-app!“





# AndProtect

Thank you for your attention!

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Website: [www.andprotect.de](http://www.andprotect.de)

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