

Ali Sunyaev

Wien, Österreich

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Usability of Patient-Centered Health IT: Mixed-Methods Usability Study of ePill

Manuel Schmidt-Kraepelin, Tobias Dehling, Ali Sunyaev

University of Cologne
www.isq.uni-koeln.de

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ePill: Electronic Patient Information Leaflet



Motivation

- Providing patients with information leads to positive effects^{1,2}
 - Increase patients' knowledge, patient empowerment, ...
- Most patients are inclined to read patient information leaflets³

Issues of Written Information on Pharmaceuticals

Readability

Font size is too small^{4,5}

Further formatting aspects are not appropriately chosen⁵

Comprehensibility

Many difficult/technical terms are used (Required reading level is too high)^{3,5}

Headings and bullet points could be used more effectively for text structuring⁴

Content

Provision of irrelevant information^{3,5}

Excessive amount of information^{3,5}

1: Johansson et al. (2010)

2: Sheard et al. (2006)

3: Rajasundaram et al. (2006)

4: Luk et al. (2010)

5: Winterstein et al. (2010)

ePill: Research design

Electronic Patient Information Leaflet

- Design science research paradigm^{1,2,3}
 - Theory-driven design (IS success model⁸, signaling theory⁹)
 - Incremental development approach
 - Multiple design cycles of artifact creation/refinement
 - Qualitative/quantitative evaluation
- Mixed methods evaluation^{4,5}
 - Assess artifact quality with semi-structured interviews⁶ (elicitation of requirements and evaluation through observation)
 - Artifact refinements with a qualitative usability study⁷ (fixed tasks to test functionality and discussion in focus groups)
 - Demonstrate artifact utility and efficacy with quantitative evaluation

1: Gregor and Hevner 2013

2: Hevner et al. 2004

3: Purao 2002

4: Ågerfalk 2013

5: Venkatesh et al. 2013

6: Davis et al. 2006

7: Basch 1987

8: DeLone and McLean 2003

9: Spence 1973

Web Application – Three Basic Tasks

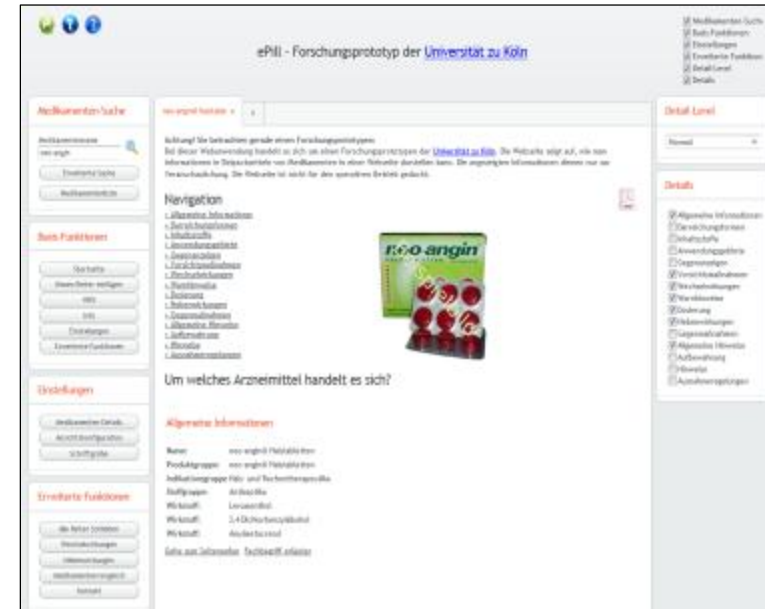
1 Search for pharmaceuticals: Enable users to specify some parameters and search corresponding pharmaceuticals in the underlying database

2 Display information on pharmaceuticals: Enable users to view at least the information provided by printed leaflets

3 Supplementary services: Offer supplementary services like refining the displayed information, linking to similar pharmaceutical information, or aggregating pharmaceutical information

Flexible User Interface

- Different users prefer different GUI designs
 - e.g. simplicity vs. fast access to everything
- ⇒ Let users configure GUI according to their preferences
 - ⇒ Preset selection on home page
 - ⇒ Menu to switch visibility of all GUI components



Similarly, users can configure the categories of information displayed on pharmaceuticals

Usability Study: Motivation and Design

- Neglecting usability principles will lead to applications that fail to generate true value for users¹
- Usability testing can deliver important information to detect potential for optimization

Tasks and Task Questionnaires	Focus Groups ^{3,4}
Short storyline	Eight participants per session
Three tasks consisting of several subtasks	Questioning Route: Structured strategy
Questionnaire after every task	
After all tasks: System Usability Scale (SUS) questionnaire ²	

1: Goldberg et al. (2011)

2: Brooke (1996)

3: Krueger (1998)

4: Krueger and Casey (2000)

Usability Study: Results

- SUS score: **64.91**
- No significant connection between task type and task questionnaire responses
- Significant correlations between demographic items and questionnaire responses

Quotes from Focus Groups

Layout

“I was not able to find all functions. They should be more eye-catching.”

“I like the possibility to decide which information is displayed.”

Displaying general medical information

“The information is not well edited.”

“I would like to have a short summary of every medicament’s main effect in a few words.”

Different Views of ePill

“The term “expert view” is very confusing. For me, only a doctor is an expert in this context.”

Usability Study: Conclusion

ePill's Usability

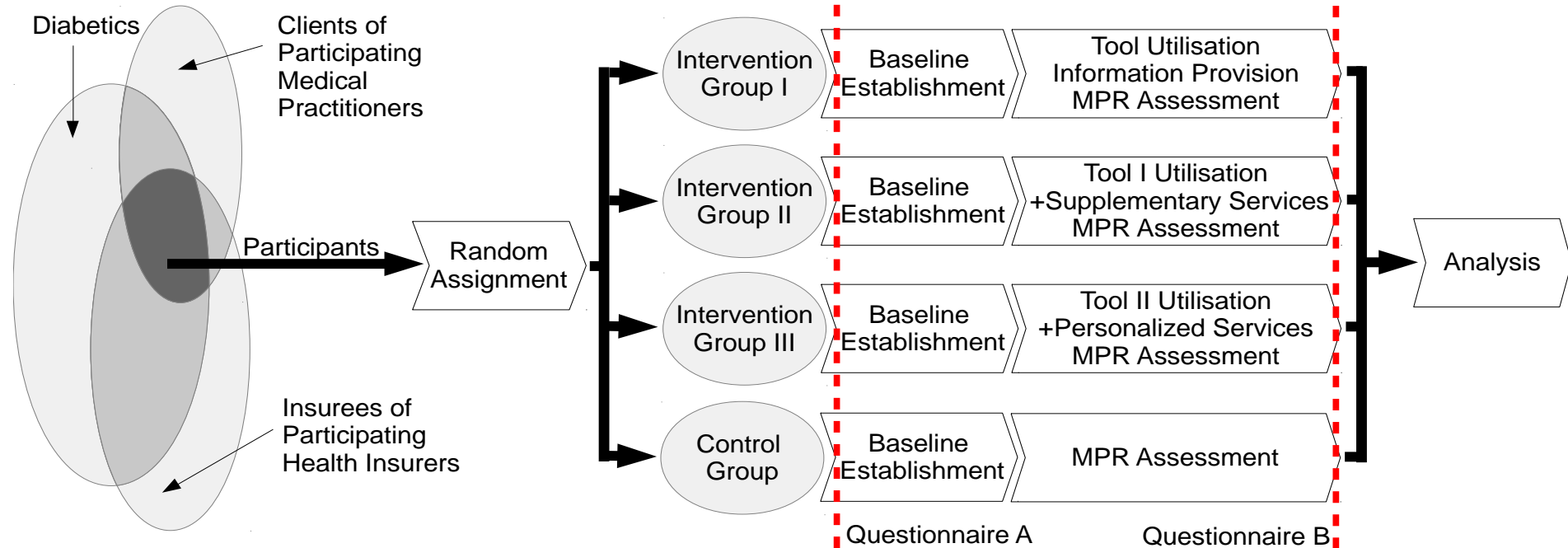
- Basic concept was positively conveyed
- SUS score of 65: rating lying between 'OK' and 'GOOD'¹
- Problems regarding the different views
- Implications for ePill's future development were derived

Study Design

- **SUS:** Useful to derive an approximate, overall classification
- **Tasks and task Questionnaires:** Enabled a more detailed analysis of usability
- **Focus Groups:** Allowed participants to exchange opinions and to create ideas for improvement

1: Bangor et al. (2008)

Outlook: Evaluation Process



Source: Dehling and Sunyaev (2013)

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ePill crowd: epill.uni-koeln.de/crowd

Backup Slide: Motivation

Different Distribution Systems and Quality from Country to Country^{1,2}

Voluntary or mandatory distribution of patient information leaflets

Distribution of leaflets with every or only the first supply of a pharmaceutical

Information offered as package insert, leaflet, or printout at source of supply

Leaflets can be produced by manufacturers or 3rd parties

US: Often only short instructions on container; no standardisation²

EU: Mandatory distribution with every supply of a pharmaceutical; general structure and basic content enshrined in law³

⇒ **Written information on pharmaceuticals has potential for improvement**

⇒ **Address deficits regarding readability, comprehensibility, and content with a web application**

- Focus on Germany, where similar problems have been reported⁴

1: Luk et al. (2010)

2: Winterstein et al. (2010)

3: Council of the European Communities (1992)

4: Fuchs et al. (2007)

Backup Slide: Usability Study - Motivation

- Neglecting usability principles will lead to applications that fail to generate true value for users¹
 - Designing interfaces on the basis of usability principles inspires user confidence and results in usable and useful interfaces²
 - Usability testing can deliver important information to detect potential for optimization
- ⇒ **We conducted a usability study to identify usability problems and examine whether users are able to use core features of ePill**
- ⇒ **We present a mixed-methods research design for usability studies based on the example of ePill**

1: Goldberg et al. (2011)

2: Tsopra et al. (2014)

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References – Backup Slides

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