Third Ager's Frequent Usability Problems and Temptations in Web Services

Keywords: HCI, Internet, e-service, e-travel, travel web service, senior user, older people
CR-classes: H.5.2, K4.4, K.4.2

1. Background and central state of the art references

The western world is getting older. By 2020 almost a quarter of Finnish population will be over 65-years old [SVT, 2012a]. The UN predicts that by 2050 there will be over two billion over 60-years old people globally [Theng et al., 2008]. The age group from 65 to 74 years is the fastest growing group in Internet usage. Between 2010 and 2013, their use of the Internet increased by 22 percent [SVT, 2013].

Human's physical and mental performance varies through the age. Seemingly older people are not as efficient searching information from the Internet: although their actions are slower, they make better choices which lead to fewer clicks and eventually equal efficiency compared with younger users [Chin and Fu, 2012]. Older people's superior crystallized knowledge and different behavioral models help them to compensate the reduced cognitive performance [Schneider et al., 2008; Doubé and Beh, 2012]. Using the same already learned routines might also be a downside, as older people cannot readjust to the changes as efficiently as their younger counterparts who use trial and error method. Beside this, they are not willing to learn new practices without some compulsion [Talsi, 2014]. This inflexibility and slowed down or even stopped development has to be solved by giving options that work with older people or by creating content that is usable for both young and old.

The social community can have a major effect on older people's technology adaptation and usage [Braun, 2013]. Community can help older people to adopt new technologies and practices by showing example and by forming a social pressure. On the other hand they can feel like been second class citizens when they are not using the services that they believe to be common among the community [Talsi, 2014].

2. Aims and importance

In the target area, the majority of studies is theory-driven and based on unmonitored questionnaires [Pyhältö, 2014]. This approach does not necessarily find the real life usability issues and by the lack of understanding the problems are not fixed before older people abandon services [Subasi et al., 2011].

This study provides understanding about older people's frequent usability issues with their own voice. Like in Kaapu's [2010] dissertation, it focuses on their individual experiences by moving away from the researcher's frame of reference. The problems and temptations are been described closely with clear examples. This offers properly understandable basis for further research like solutions for found problems and temptations.

The aim is to have a well categorized and described set of the frequent usability problems and temptations, that are presented as older people have experienced them. To have *an authentic set*, the aim is to find problems and temptations based on literature, questionnaire and empirical design. To have *a categorized list* of the problems and temptations the aim is to use findings from the literature to make categorizing. Although this study is about problems and temptations, a *clear description* is achieved by using Zajicek's [2004] Pattern Design -model originally designed for the usability guidelines. To have the *frequent problems* and temptations, the aim is to have prevalence of the problems and temptations found from all three data collection methods.

3. Research questions

The primary research question is examined trough the perspective of e-travel as it is the fastest growing business among older people [SVT, 2012b]: **What are the frequent problems and temptations among older people that affect to their will to use travel web services?**

SQ1: To enable simultaneous use of problems and temptations derived from different sources, a categorization is made by asking: *What categories can be obtained from the problems and temptations found in literature?*

SQ2: To be able to form a non-biased list of problems and temptations it has to be solved; *What differences are there in frequency of found issues among different data collection methods?*

SQ3: To study the generalizability of problems and temptations, the frequency of found issues is compared between two nations: *What are the differences in frequency of found issues between two empirical studies conducted on Finnish and American citizens?*

SQ4: Using the experiences gathered from the different data collection methods, a comparison of benefits and drawbacks can be made between own results and the literature: *What benefits and drawbacks are there in different data collection methods by the literature and by own research results?*

4. Research methods, materials and analysis

The general approach to this study is a single voiced (older people) and it combines data- and theory-driven methods to seek the information. Older people tell and show issues without mediator, which enables unplanned things to emerge. Beside this the issues are been searched under the control of researcher. The use of multiple search methods reduces the biasing effect due to compensating characteristics among individual methods e.g. questionnaire can cover a large population, but it is more fixed on researcher's perspective, where the empirical research gives more freedom for the answers, but the results cannot be considered as accurate because of smaller amount of participants. Features of used research methods are described in Table 1.

Extended literature review is used to find current knowledge about the problems and temptations that consider older people, usability and e-travel. Material for the literature review will be searched from the scientific databases like ScienceDirect. Combined knowledge from the several scientific articles is used as a frame of reference for this study. The objective for the analysis is to find:

1) *Name* is the category for the class e.g. Semantics of data structures.

2) *Description* explains the meaning of the category e.g. "user's preconception of the path that leads to the wanted information".

3) *Example* is a real-life case, which realizes the category, e.g. "problem: the air conditioning is not mentioned in hotel specifications".

Empirical testing is used to find problems and temptations in the field [Kaapu et al., 2013]. The researcher's guiding influence towards the specific answer can be kept minimal, and still the method is flexible and allows necessary attention to unplanned issues and the new insights. The researcher can help subject to express themselves in cases where the subject does not have "the right words" due to insufficient knowledge. Beside this, the research situation can be obtained similar and possible distractions can be minimized or at least recognized by the researcher [Lazar et al., 2010, 178–179].

Subjects will do travel-related tasks in the travel web services and tasks are been recorded by computer and video camera for further analyzing. To make the test session comfortable and

more authentic, it will be conducted on at most suitable place for the subjects. This method was experimented in my master's thesis [Pyhältö, 2014]. Suitable informants are "third agers", meaning that they are on retirement but in relative good health and they can use computer and the Internet on adequate level. For the analysis, test persons are advised to tell when they bump into a problem, temptation or insurmountable obstacle during the task. They are also encouraged to think out loud. In addition to the above-mentioned, abnormal facial expressions like wrinkled eyebrows or wide open eyes and "searching" cursor movements are been observed.

The wanted output in the case of temptation is to have a name, description and the opinion, what makes the property good when compared to the subject's idea of other implementations. In the case of problem, the output includes the name and description, and also the solution which the subject comprehends. If the subject needs help, the questions are how they were helped, did they understand the logic of the system, and what development ideas would fix the problem. In addition to the task observations, the researcher makes notes about procedures benefits and drawbacks that emerge during the session.

The data gained in empirical research is compared to the data from the literature review. The similarities and differences in descriptions, frequencies and the way old people interpret issues are been compared. This gives information about how constant is the view between literature and empirical research and what are the reasons for the possible diversity.

Research method	*Extended literature review (SQ1, SQ2, SQ4)*	*Empirical testing (SQ2, SQ3, SQ4)*	*Internet-based questionnaire (SQ2, SQ4)*
Data to be found	Current knowledge about the problems and temptations.	Problems and temptations in a real-life-situation.	People's opinions about problems and temptations.
Data types	Literature.	Video and audio (computer screen and informant).	Free text and Likert-scale answers.
How to search data	Keyword search from scientific databases.	Informants do travel related tasks in travel web services.	Internet-based questionnaire.
Informants included	Well proofed scientific data bases like ScienceDirect and SpringerLink. No fewer than 5 data bases.	30-50 "third agers" per nation: on retirement, good health, children live on their own and they are self-contained.	200 answers from "third agers". At least 1000 invitations sent.
Analysis	Names, descriptions and examples of problems and temptations. Frame of reference for the study. Dimensions: category and frequency.	Comments about problems and temptations. Unusual body postures and cursor movements. ⟶ Comparison of frequencies, descriptions and interpretation between methods and nations.	Likert-scale about problem severity and temptation intensity (problems and temptations from previous studies), free text comments. ⟶ Comparison of frequencies between methods, correlating problems and temptations. Confirmation by t-tests.

Table 1. Research methods, materials and analysis for the study. SQ1, SQ2 etc. are the research questions to be answered.

User attitudes towards web services and technology vary by the overall development of information society. The needs for good usability also differ geographically [Vladimirov, 2012]. In the comparison between two empirical researches from Finland and United States it can be seen if there are variations in issues mentioned above.

Internet-based questionnaire is used to find additional opinions about problems and temptations in travel web services without monitored and possibly obtrusive test session. In relaxed, comfortable situation the subject does not try to please the researcher. This can produce more truthful answers as well as more insights. A questionnaire is easy to share for a large population, its answers can be collected automatically into a computer for analysis and results from the large population reflect better the target population [Lazar et al., 2010].

Researcher's views should guide test persons as little as possible. This is why the order of elements in questionnaire is important: first there is a picture and an empty text field in which test persons could write about their feelings. On the second page there are Likert-scale choices that measure the severity of the problem or the intensity of the temptation. Additional text field at the end provides possibility to write about insights that may have come during the process. Problems and temptations used in Likert-scale choices are the most frequent issues found from the previous studies (literature review and empirical researches).

Analyzing is started by arranging problems and temptations by severity and intensity. Unusual results like high densities or correlating problems and temptations trigger closer inspection of the corresponding text fields. Separations and connections are confirmed by t-tests. The data gained from the questionnaire is compared to the data from empirical research and literature to find differences or commonalities in frequencies and interpretations between different research methods and between two nations.

Third agers are been invited to the empirical testing and to the questionnaire by computer courses related to older people, organizations for senior citizens and social media.

5. Expected results and their contribution in respect to earlier research

By during the study, the primary knowledge is gained about the frequently occurring usability problems and temptations among older people. The frequency comparison of found problems and temptations between different data collection methods and between Finnish and American citizens is reflected with the primary results. Reflection is also made on the basis of found benefits and drawbacks.

This study gives the well-grounded and methodology-independent accuracy to the nowadays questionnaire and theory based information about the frequent usability problems and temptations among older people. It also considers a new perspective of e-travel and older people in the field of web usability. The combination of descriptions and examples enables easy understanding and meaningful, efficient development.

6. Current state of the study, time schedule and resources

Pyhältö [2014] has gathered a superficial knowledge about the literature (ca. 20 articles have been reviewed). At the same study empirical testing procedure and results has been obtained by conducting pilot- and actual testing on 11 participants. Results from the study suggest that there are some contradictions between literature and empirical testing what comes to the frequency of found problems and temptations. In test results some categories had more problems than temptations, when the literature had an opposite view Pyhältö [2014]. The questionnaire is on the design phase.

The majority of courses will be accomplished during the first year. At the same time the first conference article based on literature will be finished. The dissertation is based on articles (2 journal, 4 conference) which are been made during the whole studying period. During the second and the third year there is a six months exchange period possibly in United States, where the empirical search for the third article is been conducted. The exchange period also includes some courses. In total, the dissertation process will be finished in less than four years during 2014-2018. Detailed information about schedule can be seen on Table 2.

Data collection and processing Method, article, other information	**Planning, writing and other activities**	**Time** month/year
Literature review, C1	Conference article 1 (C1)	8/2014
Empirical research, C2, Finland		12
	Conference article 2 (C2)	4/2015
		8
Empirical research, J1, USA	Journal article 1 (J1)	12
		4/2016
Questionnaire, C3	Conference article 3 (C3)	8
		12
	Conference article 4 (C4)	4/2017
Literature review (previous studies), J2	Journal article 2 (J2)	8
		12
	Compiling dissertation	4/2018
		8

Table 2. Schedule divided into the four month slots.

Resources. To make the literature review, an access to the university libraries and scientific databases is required. For the empirical study there is a need for two laptop computers, 2 monitors, 2 external usb-microphones, 2 pointing devices (mouse), and 2 keyboards. Also 2 video cameras, stands and recording media for approximately 60 hours are required. For the questionnaire, a webserver with database- and php- (or equivalent) support is required.

To be able to study full time, the salaried doctoral student position is required. For exchange studies the external scholarships like ASLA-Fulbright Pre-Doctoral Research Fellows -program will be applied for.

Field of the topic (research question to be answered)	**Type** abbreviation	**Preferred place of publication** (jufo-class)
Problems and temptations from the literature (SQ1, SQ2).	Conference C1	ICIS - International Conference on Information Systems (2)
Problems and temptations from empirical research (SQ2).	Conference C2	ECIS - European Conference on Information Systems (1)
Problems and temptations among American and Finnish citizens (SQ3).	Journal J1	Information Technology & People (2)
Older people opinions about problems and temptations (extensive questionnaire, SQ2).	Conference C3	ACM CHI - Conference on Human Factors in Computing Systems (2)
Different data collection methods on collecting data from older people (SQ4).	Conference C4	SCIS - Scandinavian Conference on Information Systems (1)
Problems and temptations found in literature and previous studies (SQ1, SQ2, SQ3).	Journal J2	International Journal of Human-Computer Studies (2)

Table 3. Detailed plan of the article publication.

It is beneficial for the study to be among people whose problem areas and expertise are mutually associated. This would provide help and change to transfer information between those who really can take advantage of it. The research environment provides possibility to learn working skills and option to participate courses that are closely related to the field and the study. The group for this study consists of supervisor (Tarja Tiainen), head researcher (Kimmo Pyhältö) and two assistant researchers (MSc students) for supporting empirical research.

Associations that work with older people and computers can help on distributing information about participating on empirical research and questionnaire. Reckoned candidates are found in Pyhältö's [2014] Master's thesis. On abroad assistance is needed for instance in contacting subjects, learning cultural aspects in research procedures and having equipment that is needed in empirical research. Human-Computer Interaction Institute of Carnegie Mellon University and University of Colorado Boulder looks promising. As a backup, CIRCLE-center in University of Leeds (UK) has specialization on older people and usability, and supervisor Tiainen has contacts to it.

7. Publication and dissemination plan

This dissertation consists of four conference articles and two journal articles. Dissemination will be published on spring 2018. Detailed information about publication plan can be seen on Table 3.

References

[Braun, 2013] M. T. Braun, *Obstacles to social networking website use among older adults.* 2013. Madison: Wisconsin–Madison University.

[Chin and Fu, 2012] J. Chin and W.-T. Fu, Age Differences in Exploratory Learning from a Health Information Website. In *CHI'12*, 2012, 3031-3040. Austin.

[Doubé and Beh, 2012] W. Doubé and J. Beh, Typing Over Autocomplete: Cognitive Load In Website Use By Older Adults. In *OZCHI'12*, 2012, 97-106. Melbourne.

[Kaapu, 2010] T. Kaapu, *Reaching the Diversity of Users' Understandings: A Methodological Renewal*. Doctoral Dissertation. University of Tampere, School of Information Sciences, 2010.

[Kaapu et al., 2013] T. Kaapu, T. Tiainen and A. Ellman, User Interpretations of Virtual Prototypes: Physical Place Matters. In *Scandinavian Journal of Information Systems*, **25**(2), 2013.

[Lazar et al., 2010] J. Lazar, J. Feng and H. Hochheiser [2010], *Research*
Methods in Human-Computer Interaction. West Sussex: John Wiley & Sons Ltd.

[Pyhältö, 2014] K. Pyhältö, *Kolmannen iän merkittävimmät käytettävyyden ongelmat ja houkutukset matkailun verkkopalveluissa*. Master's thesis. University of Tampere, Human-Technology Interaction, School of Information Sciences, 2014.

[Schneider et al., 2007] N. Schneider, S. Schreiber, J. Wilkes, M. Grandt and C.M. Schlick, Foundations of an age-differentiated adaptation of the human-computer interface. In *Behaviour & Information Technology*, **27**(4): 319-324, 2007.

[Subasi et al., 2011] O. Subasi, M. Leitner, N. Hoeller, A. Geven and M. Tscheligi, Designing accessible experiences for older users: user requirement analysis for a railway ticketing portal. In *Universal Access in the Information Society*, 10: 391-402, 2011.

[SVT, 2012a] Official Statistics of Finland (OSF), *Population projection*. 2012. Helsinki: Statistics Finland.

[SVT, 2012b] Official Statistics of Finland (OSF), *Use of information and communications technology by individuals*. 2012. Helsinki: Statistics Finland.

[SVT, 2013] Official Statistics of Finland (OSF), *Use of information and communications technology by individuals*. 2013. Helsinki: Statistics Finland.

[Talsi, 2014] N. Talsi, Kodin Koneet. Teknologioiden kotouttaminen, käyttö ja vastustus. In: *Dissertations in Social Sciences and Business Studies*, 75, 2014. University of Eastern Finland, Joensuu.

[Theng et. al, 2008] Y.-L. Theng, J. Chia ja M.Y. Lim, *Web-based Information Needs of the Chinese Senior Citizens: A Singapore Study*. 2008. Singapore: Nanyang Technical University.

[Vladimirov, 2012] Z. Vladimirov, Customer satisfaction with the Bulgarian tour operators and tour agencies' websites. In *Tourism Management Perspectives*, 4: 176-184, 2012. Sofia: St Kliment Ohridski University.

[Zajicek, 2004] M. Zajicek, Successful and available: interface design exemplars for older users. In *Interacting with Computers*, 16: 411-430, 2004.