International Journal of Computer Science and Applications,
©Technomathematics Research Foundation
Vol. 15, No. 1, pp. 83 – 97, 2018

ONLINE BANKING: A SENIORS' EXPERIENCE STUDY

CHRYSOULA GATSOU*

Technological Educational Institute of Athens
Ag. Spiridonos , 122 10, Athens, Greece
cgatsou@teiath.gr

ANASTASIOS POLITIS

Technological Educational Institute of Athens
Ag. Spiridonos , 122 10, Athens, Greece
politismedia@gmail.com

DIMITRIOS ZEVGOLIS

School of Applied Arts, Hellenic Open University
Aristotelous 18, 26 335, Patra, Greece
zevgolis@eap.gr
http://dzevgolis.eap.gr/

Abstract— Seniors population is growing dramatically worldwide. This paper presents an evaluation of the user experience of two online web-banking sites from an older user's point of view. Therefore a usability test was contacted where 12 seniors took part in order to analyze the needs and issues faced by this user group when performing real-world tasks. The study consists of six tasks where users were required to complete within a certain amount of time. The majority of the participants were interested in learning to use online banking. The results show that older people do not find web-banking sites easy or user-friendly. According to study's findings both of the examined web-banking sites presented problems. Further implications include the need to reconfigure bank websites so as to include guidelines and other suggestions made in this study.

Keywords: online banking; seniors; user experience; usability testing; aging.

1. Introduction

The aging population in the world is already large and is growing. Older adults is a global critical phenomenon. At the present time, the older section of the population lives surrounded by technology, internet- and mobile-based, most of which is, however, not adapted to their needs. However, this increases worldwide in numbers of the aged means that the need for online and mobile technology services will only increase. Older persons use the internet for e-mailing, shopping, to locate health information, to research travel options, to bank online, and to access government sites [Fox and Jones (2009)], [Fisk *et al.* (2012)]. By 2020, it is anticipated that there will be more than a billion older adults, making it essential that websites be designed for easy use by the elderly [Zaphiris *et al.*

* cgatsou@teiath.gr, 25 Botasi, 185 37 Piraeus Greece

(2007)]. Online banking is an exchange that employs laptops or other mobile devices, such as smart phones and tablets. Through online banking, the user can transfer and receive money, pay bills, initiate fixed deposits and perform transactions and other tasks. Online banking can therefore help older adults remain more independent and maintain their quality of life as they experience a decline in perceptual, motor, and cognitive abilities due to natural aging. At the time when research for this paper began, little attention had been paid to the concerns of older adults and their ability to access online banking systems. According to a recent Federal Reserve Board report, only 18% of people over the age of 60 use mobile banking [Federal Reserve Board (2016)].

Providing online banking resources, however, does not guarantee that older adults will be successful at accessing the system or understanding how to complete their tasks. Banking institutions have been creating websites for many years now, although these cannot be said to be user-friendly for older users, in that they create barriers that tend to prevent such users from using their mobile devices to access and use banking services [Gunther (2016)].

It is clearly necessary to adapt applications and services both to the needs and preferences of this increasing number of older users and to the requirements of new economic contexts [W3C/WAI (2010)]. Older users encounter numerous barriers that arise from aging when they interact with computer technology and particularly when they attempt online banking [Lunn *et al.*(2009)]. As is not the case with younger adult users, there are physiological factors due to the normal aging process that affect older users of the internet and specifically online banking.

The purpose of our study was to explore the experiences of "seniors" (persons aged 65 and over) in relation to online banking websites. More particularly, this study attempts to explore the experiences of seniors using two popular online web banking sites, that is, those belonging to two Greek banks, Alpha Bank and Piraeus Bank . The study offers an empirical evaluation of how far online banking interfaces meet the needs of older users and how such persons perceive their online-banking experiences.

We start our paper with a review of the literature, which establishes the theoretical background to our study. We then describe the research methodology employed, discuss the results and offer informal recommendations before the conclusions.

2. Background

2.1. *Defining "Seniors"*

There is no exact point in a person's life at which they become a "senior". However, due to an obvious need for such a definition, various classifications of "seniors" or "older adults" do exist. Nielsen defines "seniors" as users aged 65 years or older, without giving an upper limit. He notes that users aged 65 and older are 43% slower at using websites than users aged 21–55. This represents an advance over results given in earlier studies, but designs should clearly be modified still more, to accommodate the needs of aging users even further. Nielsen points out that the success rate for completing online tasks is typically a third less for those over 65 years of age than for those under 55 years old

[Nielsen (2013)]. Website tasks take seniors on average 7:43 minutes to complete, whilst younger users complete their tasks in 5:28 minutes [Nielsen (2013)]. Nielsen uses a simple definition. For him, "Seniors" are simply users aged 65 years or older. Nielsen also reports that "Between the ages of 25 and 60, the time users need to complete website tasks increases by 0.8% per year" [Nielsen (2002)]. Bailey suggests the following classification system to help clarify age definitions [Bailey (2004)]:

- Young: 18-39 years
- Middle-ages: 40-59 years
- Older: 60-74
- Old-old: 75+ years

In this paper, therefore, we use the word "seniors" to refer to persons aged 65 years or older and do not set an upper end.

2.2. *Ageing*

The aging population in the Europe is already large and is growing. It enjoys considerable social and economic power. Furthermore, people are now living longer. Nearly 80% of the population now survives beyond the age of 65. In 2010, older workers accounted for 17% - 31% of the population of the European Union, while it is forecast that by 2050 these rates will have more than doubled [W3C/WAI (2008)]. As we age, our cognitive abilities gradually deteriorate. A certain amount of cognitive decline is a normal part of ageing. Intimately related to issues involved in the design of new websites or applications for seniors is the importance of understanding the highly complex process of human ageing as cognitive, perceptual and motor abilities decline with age and thus render more difficult many tasks, including basic pointing and selecting, that are commonly used in interaction with a device [Chadwick-Dias *et al.* (2003)], [Czaja and Lee (2003)], [Moffatt (2008)], [Worden *et al.*(1997)].
Seniors tend to have some fears regarding technology. According to Alan Newell, *"Most technologies give the impression of being designed by and for 24-year-old males. Little technology is sensitive to the needs and wants of older people"*[Newell (2006]. Aging changes:

- Perception
- Cognition and
- Control of movements

A key challenge for designers arises from the fact that aging is a very individualized process. This requires that the designer adopt design strategies and solutions that will support a diverse range of users and this involves breaking away from conventional assumptions that seniors are in some way special groups. Aging, rather than being a disability, is part of the normal life cycle that we will all experience.

2.3. *Online Banking*

Online banking makes use of electronic payment processes that allow both customers and financial institutions to perform a wide range of banking transactions through their website. Some online banks are traditional banks which also offer online banking, while

others exist only in cyberspace and have no physical presence. Online Banking is changing the way customers interact with the banks [Wu *et al.*(2014)]. Seniors, however, are not accustomed to computers and are more unfamiliar with the functional use of information technology based services than are middle-aged adults and the young [Lee (2009)]. An online bank offers customers almost about every service traditionally available through a local physical branch, including making deposits, which is done online and paying bills online. One of the insights offered by age-friendly banking is that if a bank can provide good service for its older customers, it can provide excellent service for all.

2.4. *User Experience*

User experience (UX) is a concept widely used in human-computer interaction (HCI), both in research and practice. As devices and applications become increasingly ubiquitous, it becomes ever more important to improve and facilitate UX. The International Organization for Standardization (ISO) defines user experience as *"a person's perceptions and responses that result from the use or anticipated use of a product, system or service"* [ISO FDIS (2009)]. User experience is thus subjective and focuses on use. In regard to user performance when using a device, previous studies have shown that novice users usually face greater difficulties than the experienced do in handling computer devices or in acquiring computer skills [Goodman *et al.* (2004)], [Gatsou *et al.* (2013)]. In Buxton's (2007) view, user experience consists of a combination of visual and experiential aesthetics and usability. Garrett (2011) notes that user experience is the guiding principle of a design process that focuses on the relationship between the user and the product and in essence centres on the reaction of the user when (s)he comes into contact with a product. The experience of online banking on the part of seniors is a mix of positive and negative. A minority of older people uses Internet banking and appreciate its convenience. Many seniors would like to learn to use existing online technologies, but most of them have difficulty in doing so [Kurniawan, (2008)],[Sandberg Madsen (2015)]. The most important barriers in utilizing online banking lay in the fact that would-be users did not know how to get started and that they found existing online banking confusing. Findings arising from user experience should be exploited to eliminate barriers to the adoption of online banking seniors. A good bank website should be easy to understand, thus avoiding frustration on the part of the user. The quality of User Experience is what dictates whether seniors adopt the system or not. Getting the design right improves user experience and may attract new customers [Gatsou *et al.*(2012)].

3. Research methodology

To examine how seniors conceptualize online banking, participants were invited to participate in a usability testing involving interaction with two of the most popular web

banking sites in Greece, namely , the Alpha Bank site (B1) and the Piraeus Bank site. (B2) (Fig.1, Fig.2).

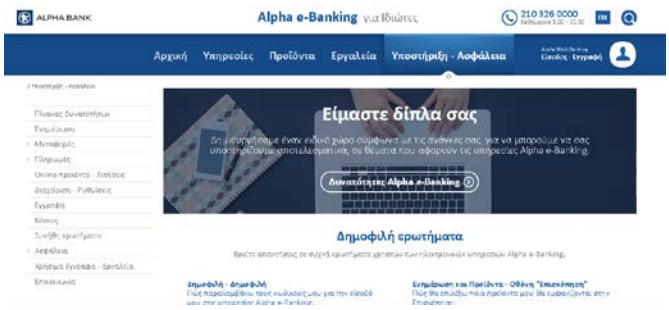

Fig.1 Screen capture Alpha Bank (B1)

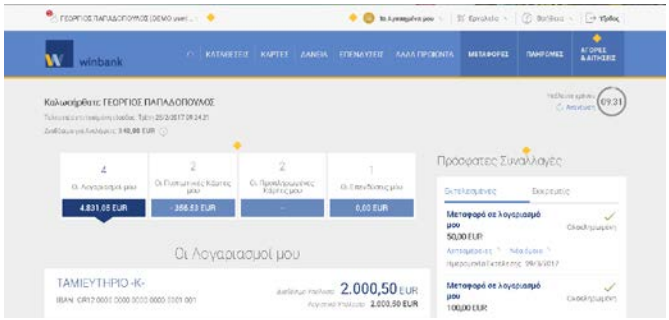

Fig.2 Screen capture Piraeus Bank (B2)

3.1. *Participants*

Twelve participants in their 60s and 70s (7 females and 5 males) were contacted and selected through verbal contact. For this recruitment procedure, we applied the following three criteria:

1. That the seniors wished to use online banking,
2. That they had no previous experience of these two sites and
3. That they had at least some experience of the internet.

The participants are educated, reasonably healthy, active and motivated older users and as mentioned above, have basic computer skills. Given the evidence from our previous studies, the number of people in this experiment was sufficient to provide satisfactory evidence and depth of knowledge. The age and gender of the participants and their assignment to either bank site, which was performed randomly, are shown in Table 1. All participants gave their written, informed consent to participate.

Table 1

Participants' age, gender

Alpha Bank (B1)						
ID	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
Age	62	74	65	72	63	79
Gender	F	F	M	F	F	M
Mean age = 69.2				**SD= 6.3**		
Piraeus Bank (B2)						
ID	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
Age	67	73	66	67	78	63
Gender	M	M	F	F	F	M
Mean age = 69.0				**SD= 5.0**		

3.2. *Procedure*

Our study evaluated two simulated bank websites, Alpha (B1) and Piraeus (B2). A digital camera was used to create a complete record of all user interactions with the website. After being welcomed by the experimenters, participants were told that they were to take part in a user experience test. Participants thereupon completed a pre-questionnaire regarding demographics and computer technology use. Test sessions started with a brief introduction, in which the purpose of the study was explained [Dumas and Redish (1999)]. As older participants are often not familiar with computer and web terminology, we avoided using specialist terminological language when working with them [Komninos *et al.* (2014)]. To ensure the privacy of participants and reproduce a realistic environment, two prototypes were developed that simulated the behavior of the two bank websites through the use of prototyping software. Participants were then shown the home page of the bank website assigned to them and asked various questions about it. Participants were then asked to complete a series of tasks related to each of the two sites.

Overall, the two sets of tasks were similar, but differed in detail, given that the content and the options varied between the two sites. During the test session, a digital camera was used to create a complete record of all user interactions with the interface. The users' voices were recorded and their activity on the website was also recorded by means of screen-capture software. During each session, two experimenters were present, one primarily to engage with the participants, and the other to take notes. User performance was recorded in terms of the effectiveness, efficiency and ease of use of bank websites.

3.3. *User Tasks*

For the usability test, the participants were required to complete the six tasks given in Table 2. The tasks were chosen as being representative of online banking activities. Participants were allowed up to five minutes to complete each task.

Table 2
Participants tasks

Task 1	Turn on device and select the bank site
Task 2	Understanding the home page
Task 3	Login to your account
Task 4	Navigating through the bank site
Task 5	Make a transaction (money transfer)
Task 6	Print the receipt of this transaction

4. Results and discussion.

Our goal was to understand how seniors conceptualize and interact with bank websites. Overall, participants found the websites functional, but frustrating. Most participants had difficulties with the bank site they tested. The results obtained were used to compare our two bank websites in terms of efficiency, effectiveness and ease of use. "Effectiveness" refers to how "well" a system does what it supposed to do. To evaluate task effectiveness, we measured the percentage of steps successfully negotiated within the time limit (5 min).
"Efficiency" refers to how quickly a system supports the user in what he wishes to do. To evaluate efficiency, we recorded the time required to process the task. "Satisfaction" and "ease of use" refer to the subjective view of the system on the part of the user [Redish, (2012)],[Tullis *et al*. (2008)],[Rubin and Chisnell (2008)]. Qualitative and quantitative data were collected from each participant. Qualitative data included the participants' verbal protocol as recorded in video recordings and discussion with each participant after the test.

4.1. *Efficiency-Task completion Time*

Efficiency is a measure that is highly dependent on the amount of time spent completing the task. We recorded the total amount of time required to complete each task on each of the bank websites. Table 3 and fig.3 show information on the mean time spent by the participants. Some tasks were more difficult to complete than others and this is reflected by the average time spent on the task. The results indicate that participants spent more

time (Average time) on task completion when interacting with website B2. Time for each participant is presented in Appendix A.

Table 3
Task completion time

	Average Time for Completion in seconds		**Standard deviation**	
Tasks	**B1**	**B2**	**B1**	**B2**
Task 1	124	141	36.9	82.8
Task 2	94	96	26.8	19.5
Task 3	126	166	40.7	58.3
Task 4	169	250	33.8	73.5
Task 5	234	282	61.4	70.9
Task 6	171	200	28.2	58.0

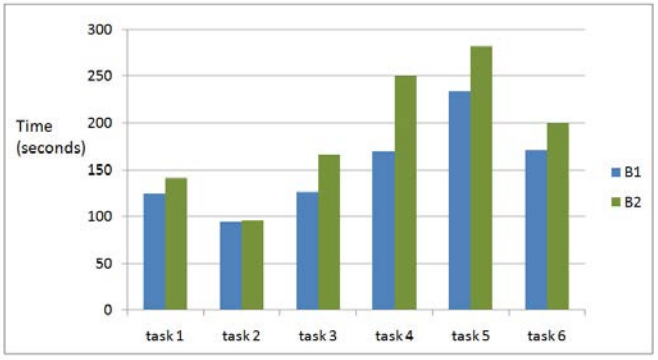

Fig.3. Task completion time per each bank website

Table 4

Success Rate (percentage)		
Tasks	**B1**	**B2**
Task 1	100%	100%
Task 2	83%	67%
Task 3	67%	67%
Task 4	67%	50%
Task 5	67%	50%
Task 6	83%	67%

4.2. *Effectiveness*

The percentage of users that manage to complete a task successfully is the "success rate". This thus becomes a measure of the effectiveness of the design. Our results are shown in Table 4.

4.3. *Post- test Questionnaire*

User satisfaction may be an important factor in motivating people to use a web site, an application or a product and may affect user performance. After completing the tasks, therefore, participants were asked follow-up questions regarding their experiences with the website. The post questionnaire results show that:

- The bank sites were easy to access (B1 (83%), B2 (50%)) and very easy (B2 (17%) (Task 1))
- Participants understood the home page B1 (67%) and B2 (50%)(Task 2)
- When participants were asked about the simulation task that involved logging in to their account, they found it neutral (B1(67%), B2(50%))(Task 3).
- As regards navigation through the two sites, one third of participants found this task difficult, one third found it neutral and one third found it easy. Difficulties arose in identifying the correct button for the action they wanted to complete (Task 4).
- Most participants found the task involving a transaction difficult (B1 (67%), B2 (67%)) (Task 5).
- Participants were very clearly unable to find the icon for printing the transaction receipt. In particular, this task at site B2 was found difficult (83%) to very difficult (17%), due to the small size of the icon involved (Task 6).

All results are presented in table 5 and respectively in Figure 4 and Figure 5 for each website.

Participants commented on their frustration when using their website. In particular, Participant 2 commented "Some tasks were very frustrating", Participant 8 complained that "I can't find my way back to the previous page, when I try to fill in my account number in Task 5".

We observed several other sources of confusion and frustration for the participants, including not understanding "where they were" in the case of both sites. This arose because of the low contrast between the button they had selected and the background. Participant 11 claimed that he was unable to find the "print button" in site B2 to print his transaction. The closer the visual representation is to the intended meaning, the sorter the articulatory distance becomes [Gatsou *et al.* (2011)]. In addition, participants commented that "There is too much to read" and they had to scroll down the page. Several participants did not know how to use cues on web pages (e.g. page titles, menu highlighting) to keep track of where they were on the website and so felt lost.

4.4. *Overall user experience*

Several participants mentioned that they were excited to learn about computers and online banking, because this would enable them to save time and money. Some of them used our study as a learning opportunity, and paid close attention after a task had been completed, in order to learn more about online banking and the correct way to complete tasks.

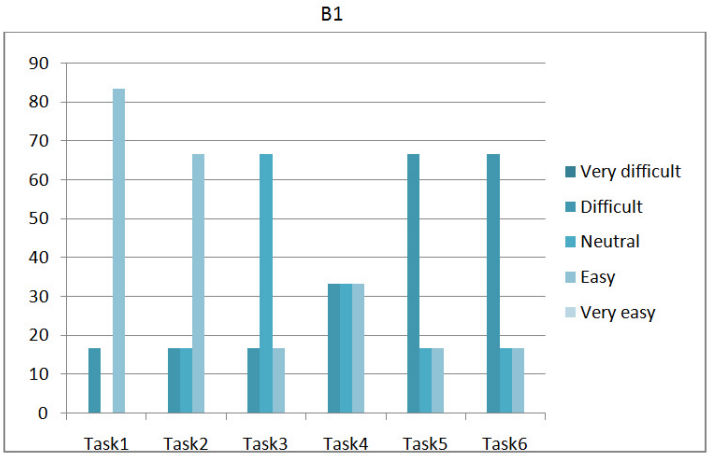

Fig.4. Task difficulty in percentage for B1 bank website

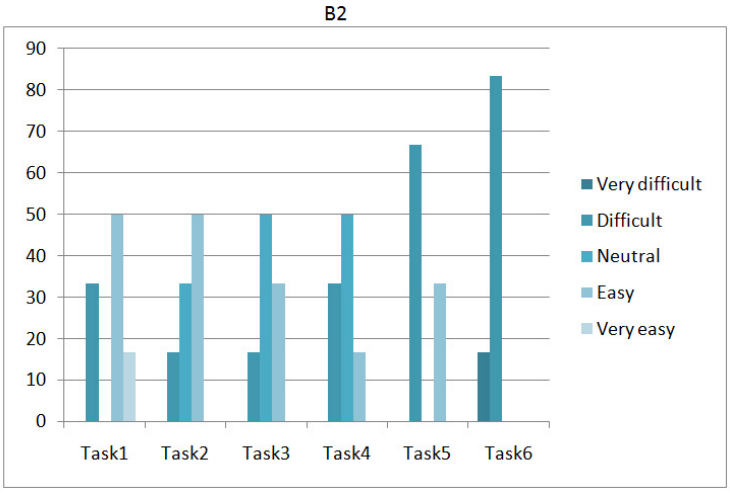

Fig.5. Task difficulty in percentage for B2 bank website

Although many of the seniors showed interest in using online banking, many voiced concerns regarding usability that arose from confusing navigation and layout, small text,

inadequately contrasting colours, very small icons and a lack of comprehension of web terminology.

Regarding interface options and selections, seniors preferred fewer options. Seniors want to learn to use online banking, but are sometimes intimidated. This was apparent to us in discussion subsequent to the post test questionnaire. Some of the critical barriers to seniors adopting online banking include:

- small fonts and very small abstract icons and symbols,
- poor text legibility, due to the use of capitals letters for selection sections (B2),
- difficulties in accessing content indicated by poorly contrasting colours,
- the need for excessive scrolling, in which participants need to scroll the page to read important information,
- small buttons, functions that are difficult to manipulate, such as scrolling a menu (B2) and unnecessarily complicated interfaces,
- difficulty in finding one's location in the site and
- cluttered interfaces

Table 5

Post- test Questionnaire responses (percentage)

	Very difficult				**Difficult**				**Neutral**				**Easy**				**Very easy**			
Tasks	B1		B2		B1		B2		B1		B2		B1		B2		B1		B2	
Task 1	0	0%	0	0%	1	17%	2	33%	0	0%	0	0%	5	83%	3	50%	0	0%	1	17%
Task 2	0	0%	0	0%	1	17%	1	17%	1	17%	2	33%	4	67%	3	50%	0	0%	0	0
Task 3	0	0%	0	0%	1	17%	1	17%	4	67%	3	50%	1	17%	2	33%	0	0%	0	0
Task 4	0	0%	0	0%	2	33%	2	33%	2	33%	3	50%	2	33%	1	17%	0	0%	0	0
Task 5	0	0%	0	0%	4	67%	4	67%	1	17%	0	0%	1	17%	2	33%	0	0%	0	0
Task 6	0	0%	1	17%	4	67%	5	83%	1	17%	0	0%	1	17%	0	0%	0	0%	0	0

4.5. *Design recommendations*

In view of our usability test results and our analysis of our post questionnaire results, we make the following recommendations in the hope of making improvements in the areas in which participants experienced problems, confusion and frustration.

- Inserting more space between sections, employing larger fonts for headers and using more deeply contrasting colors would improve perceptions of hierarchy and help direct seniors to the sections to which they wish to navigate.
- Scrolling menus should not be used, as seniors dislike them.
- A clear distinction should be made between clickable buttons and non-clickable features.
- There should be provision of clear feedback on actions.

Johnson and Finn argue that, if one keeps in mind the usability issues experienced by seniors when one designs interfaces, one can improve the user experience for many people, rather than just the elderly [Johnson and Finn (2017)].

4.6. *Limitations*

Given the small sample size (n = 12), the results of our study cannot claim to offer a comprehensive picture of seniors' interaction with online banking systems. Another important factor limiting the applicability of our results lies in the fact that participants used simulated, rather than real, websites. Furthermore, although participants had to log in to our simulated sites, they were not required to wait for a response from the bank.

This is of importance, as it has been reported in the literature that most senior users abandon their efforts in a few seconds, if they face difficulties during login. Finally, users may log in via a variety of browsers, such as Firefox, Explorer or Chrome, while the quality of their internet connection may vary, both of these factors affecting the conditions in which seniors attempt to use web banking.

5. Conclusion

The aim of our study was to explore seniors' experience of online banking. We used twelve participants and two Greek websites, that of Alpha bank and that of Piraeus Bank to test our experimental methodology. Six of the participants were randomly assigned to one website and six to the other. Because of the small size of the sample (n=12), we evaluated our data on the basis of descriptive statistics. We elicited user experience by means of six tasks.

Several seniors indeed wish to use online banking and the majority of those whom we surveyed are interested in using internet banking, because they understand its benefits. The results of the study show that both in terms of usability and overall impression our participants found the websites to be functional, but felt that they require considerable improvement to ensure a user-friendly experience. Design considerations should include the suggestions made by seniors, such as the use of larger font, the use of highly

contrasting colours in selections, the reduction of features and the use of an intuitive interface and of a structure offering easier navigation. Furthermore, some abstract icons, such as that for the 'print' function, may need to be redesigned, so that older adults understand their function more easily.

In view of the lack of studies on the experience of seniors with banking websites, it is our hope that this study has contributed to the literature, in that it offers findings that will improve the usability for seniors of online banking sites.

Acknowledgments

We express our gratitude to the participants, who enthusiastically gave their time to allow us to understand the value of their experiences.

Appendix. A Time (seconds) on task for each participant

			B1			
Tasks	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
Task 1	80	150	95	142	103	175
Task 2	68	71	78	113	97	302
Task 3	98	120	110	310	85	145
Task 4	143	155	155	305	138	318
Task 5	182	235	193	306	175	310
Task 6	136	195	148	318	161	176
Total	**707**	**926**	**779**	**1494**	**759**	**1426**
			B2			
Tasks	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
Task 1	97	155	103	110	298	79
Task 2	82	303	99	95	315	67
Task 3	91	345	202	189	412	92
Task 4	175	320	301	285	378	141
Task 5	220	342	347	341	258	185
Task 6	195	156	178	225	302	342
Total	**860**	**1621**	**1230**	**1245**	**1963**	**906**

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