Is Web Navigation with Tablet More Difficult Than with Laptop?

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Abstract. Navigating websites is a common daily activity for many people. But websites may introduce usability problems that can disturb activity of web users, which may be more detrimental when users navigate tablet or smartphone (with small displays) and as the complexity of the navigation increases. To test this hypothesis, we carried out a study in which we manipulated the usability quality of the website, support used (tablet-10'1 inches *vs* laptop-17'3) and the complexity of navigational tasks to be performed. 79 students were divided into 4 independent groups: 20 with tablet and usable website, 19 with tablet and non-usable website, 20 with laptop and usable website and 20 with laptop and non-usable website. All the participants performed 3 simple tasks 3 difficult tasks and impossible tasks.

The main results showed that the complexity and the website visited impacted performances: simple tasks were solved easier than difficult and impossible ones, especially when participants performed usable website than non-usable website. But surprisingly, the use of tablet did not impair performances compared to laptop. These results may be due to the task to be performed. Navigating within a website with links is probably easier than to search information with search engine (which requires formulate queries, open many website, etc.).

Keywords: Navigation · Tablet · Usability · Search complexity

1 Introduction

Navigating websites is a common daily activity for many people with various devices such as desktop PC, laptop, smartphone or tablet.

Internet is mainly used for professional objectives, leisure, and education. But navigating the Web may be difficult when websites do not fit users' needs [1] and/or with the increase of complexity of navigational tasks to be performed [5]. Indeed, websites introducing usability problems may disturb activity of web users; for instance, if many irrelevant information elements are displayed, participants may experience difficulties in focusing attention on relevant ones, which may impact the selection of relevant links to be explored and so on. These usability problems may be more detrimental when users navigate tablet or smartphone (with small displays) [4]. Indeed,

C. Stephanidis (Ed.): HCII Posters 2018, CCIS 850, pp. 18–23, 2018.
https://doi.org/10.1007/978-3-319-92270-6_3

if the website is not responsive (e.g. adapted to the screen size), difficulties generated by usability violations may be more detrimental, because information may appear in small size and participants have to zoom on information and use touchscreens to move the zoom and see all information elements.

Because mobile devices like tablets or smartphones present particularities (small screen size, multitouch screen, fingers with lower accuracy than mouse devices) the issue of usability of websites and applications is crucial. A literature review conducted by Shitkova, Holler, Heide, Clever and Becker [7] led to a catalogue of usability guidelines for mobile websites and applications.

In a study on information searching task with tablets [3], it was showed that after an experience with using a tablet, participants stated advantages of tablet like portability and ease-of-use, but also disadvantages like the touch screen's ultra-sensitivity and the lack of participants' experience with a "non-tactile keyboard."

Therefore, usability violations and the complexity of the navigational tasks to be performed should impact negatively search performance of participants, especially when they used tablets. To test this hypothesis, we carried out a study in which we manipulated the usability quality of the website, support used (tablet-10'1 inches vs laptop-17'3) and the complexity of navigational tasks to be performed (simple vs difficult vs impossible tasks).

2 Method

2.1 Participants and Materiel

79 students (from 19 to 31 years old; M_{age} = 24, SD = 1.89), 40 males and 39 females, participated at this experiment. They were under-graduate students in psychology, language and management. They used Internet daily, several hours since many years.

Two versions of the same website were built:

- A usable website (UW) that complied with the usability guidelines for web interfaces (e.g., [6]) – see Fig. 1.
- A non-usable website (NUW) that included usability violations into all pages (each

Fig. 1. Home page of the usable website (UW).

Fig. 2. Home page of the non-usable website (NUW).

page included the same number of usability violations, i.e. colour of the link visited did not change, background/text contrast was low, etc.) – see Fig. 2.

This website presented products related to music (e.g. cds, tickets for concerts).

2.2 Procedure

The participants were divided into 4 independent groups: 20 navigated with tablet and usable website, 19 navigated with tablet and non-usable website, 20 with laptop and usable website and 20 with laptop and non-usable website.

All the participants performed 9 search tasks:

- 3 simples tasks for which the keywords provided matched with words in website.
- 3 difficult tasks for which inferential processes were required to find information.
- 3 impossible tasks for which no answer existed in website.

The same number of links to achieve to the target information was the same in the two websites for all tasks (except for impossible ones, since no answer existed into the websites).

The order of tasks was counterbalanced between participants.

All the actions they made were recorded with BAOBAB, ad-hoc software, which allows capturing traces of participants such as time required, links visited, etc.

3 Results

We computed the number of correct answers per complexity, task time (in sec.), clicks made (webpages opened up), and task statement rereading. These dependant variables were submitted to an analysis of variance (ANOVA) with support (laptop *versus* tablet) and website (UW *vs* NUW) as between-subject factors. Post-hoc analyses (Tukey-HSD) were performed to test significant interaction. The significance level was set at .05 for all statistical analyses. Partial η^2 was used as an index of the relative effect size.

All results are presented in Table 1.

3.1 Correct Answers Per Complexity (Simple *Vs* Difficult Tasks)

The participants provided more correct answers when navigated the UW than the NUW ($F(1,75) = 42{,}47$, $p < .0001$, $\eta_p^2 = .36$). The complexity also had a significant effect ($F(1,75) = 15{,}96$, $p < .001$, $\eta_p^2 = .17$) in favor of simple tasks. No significant effect of support (laptop *vs* tablet) appeared ($F(1,75) < 1$).

The complexity × website interaction was significant ($F(1,75) = 6{,}34$, $p < .05$, $\eta_p^2 = .08$). The post-hoc analyses only showed a significant difference between simple and difficult tasks when the participants performed the NUW ($p < .005$) and surprisingly they provided more correct answers for difficult than simple tasks.

Table 1. Means (and standard deviations) of correct answer, task time, pages visited (clicks made) and rereading of the task statement with regard to the website navigated, the support used and the task complexity.

	Usable website (UW)						Non-usable website (NUW)					
	Laptop			Tablet			Laptop			Tablet		
	Simple	Difficult	Impossible	Simple	Difficult	Impossible	Simple	Difficult	Impossible	Simple	Difficult	Impossible
Correct answers	.96 (.018)	.98 (.13)	–	.94 (.22)	.98 (.013)	–	.77 (.34)	.84(.36)	–	.67 (.44)	.91 (.28)	–
Task time	28.88 (15.01)	31.88 (15.07)	44.67 (31.15)	29.66 (16.03)	28.78 (17.92)	50.22 (58.39)	55.57 (45.82)	58.42 (42.52)	69.64 (75.27)	49.81 (4.35)	52.85 (38.09)	60.63 (48.68)
Pages visited	3.55 (3.56)	2.91 (1.7)	5.82 (4.24)	2.46 (2.24)	2.63 (1.98)	5.96 (5.56)	2.11 (.49)	5.28 (4.23)	11.49 (11.68)	2.33 (1.14)	5.17 (4.37)	10.11 (8.33)
Rereading of task statement	.2 (.43)	.2 (.39)	.1 (.3)	.14 (.32)	.26 (.43)	.22 (.42)	.27 (.87)	.32 (.62)	.18 (.39)	.12 (.36)	.18 (.38)	.23 (.46)

3.2 Task Time (in Sec.)

The participants needed lower time while navigating the UW than NUW ($F(1,75) = 26{,}73$, $p < .0001$, $\eta_p^2 = .26$). The complexity also had a significant effect ($F(1,75) = 7{,}02$, $p < .005$, $\eta_p^2 = .08$): the impossible tasks required longer time than simple and difficult ones ($ps < .01$).

The support had no significant effect on task time ($F(1,75) < 1$). None interaction was significant.

3.3 Number of Clicks (Webpages Visited)

As expected, the participants navigating the UW visited fewer webpages than participants navigating the NUW ($F(1,75) = 45{,}35$, $p < .0001$, $\eta_p^2 = .37$). The complexity of the tasks had a significant effect ($F(2,150) = 76{,}97$, $p < .0001$, $\eta_p^2 = .51$), since participants made more clicks to perform impossible tasks than difficult and simple ones ($ps < .0001$), and to perform difficult than simple tasks ($p < .0001$). The support did not impact significantly the number of webpages visited ($F(1,75) = 1.05$, n.s.).

The complexity × websites interaction was significant ($F(2,150) = 9{,}27$, $p < .0001$, $\eta_p^2 = .11$). More precisely, post-hoc analyses showed that the difficult tasks and impossible ones needed more webpages visited for the NUW than UW ($ps < .005$), whereas no significant difference appeared for the simple tasks between the two websites.

3.4 Rereading of Task Statement

Very few number of rereading was made. No significant effects were observed.

4 Conclusion

The main results showed that the complexity and the website visited impacted performance of participants. Indeed, simple tasks were solved easier than difficult and impossible ones, especially when participants performed usable website than non-usable website. These results corroborated previous studies we carried out [1, 2]: usable website generated higher performance than non-usable one for at both young and older web users.

But surprisingly, the use of tablet did not impair performances compared to laptop. These results may be due to the task to be performed. Navigating within a website with links is probably easier than to search information with search engine (which requires formulate queries, open many websites, etc.). The participants only had to choose the relevant links to be opened up and explored. Although that these actions are cognitively costly, the use of laptop or tablet did not impact, but the usability quality did as shown previously. So, based on these first results, tablets would be useful to navigate website and does not negatively impact users' performance.

Nevertheless, using the Web also involve search tasks with search engines. So, further studies are needed to determine if tablets may impact this activity.

Acknowledgments. This research is part of the project "Learning with Tablets: Acceptance and Cognitive Processes (LETACOP)" funded by the ANR (National Research Agency) – ANR-14-CE24-0032.

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