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Search results on flight booking websites: Displaying departure and return flights on a single page vs two consecutive pages

Tatiana Zlokazova¹[0000-0002-2627-0303], Irina Blinnikova²[0000-0001-5163-6859],
Sergey Grigorovich³[0000-0002-8777-5516], Ivan Burmistrov⁴[0000-0001-5352-7859]

Lomonosov Moscow State University, Mokhovaya 11/9, Moscow 125009 Russia
¹ t.zlokazova@gmail.com ² blinnikovamslu@hotmail.com
³ grigorovich.sergey@gmail.com ⁴ ivan@interux.com

Abstract. Flight ticket booking engines on airline and online travel agency websites use two different designs to present roundtrip flight search results: some websites display outbound and return flights on a single page, while others show them on two consecutive pages. In our pilot experiment with 23 users we compared these two design options on a model flight booking website. Usability metrics like speed of performance and error rate were accompanied by eye-tracking and mouse-tracking indicators of cognitive load. The experiment produced mixed results: two-page design outperformed simultaneous presentation of outbound and inbound flights in terms of performance speed, but it also caused almost three times higher error rate and incurred a higher cognitive load compared to one-page design. Further research, with more users representing different age groups, different levels of task complexity, and analysis of users' subjective preferences, is necessary.

Keywords: Flight Ticket Booking, Usability, Eye Movement, Mouse Cursor Movement, Experimental Research

1 Introduction

The possibility of booking flights online first appeared on Alaska Airlines and British Midland Airways websites in 1995, and then rapidly spread to other airline websites. Soon thereafter air ticket booking engines were introduced to online travel agency (OTA) websites like Expedia and Travelocity [1]. The typical user flow on a booking engine is inherently linear and consists of five steps: (1) a search form where users enter departure and destination airports and dates of travel; (2) a flight search results page (FSRP) with lists of available flights and airfares; (3) a selected flight review and confirmation page; (4) a traveler details form; (5) a payment page. Research publications on the usability of airline and OTA websites started appearing in the late 90s; now this area is quite well researched (see for example [2-6]). In particular, a strong correlation between usability and the customer conversion rate on travel websites has been found, so websites that are easier to use, are more likely to convert [7].

However, almost no special attention has been paid to the design of a key aspect of the flight booking process – FSRP. This is where the supplier displays their core product, flights, and where travelers make their purchase decisions. Our 12-year longitudinal analysis of the evolution of FSRPs on major airline and OTA websites revealed that there are two popular design solutions for displaying roundtrip flights: some websites (eg Alitalia, Lufthansa) always showed outbound and return flights on a single webpage, while others (eg Air France, KLM, Delta) always used two consecutive pages. During the period analyzed, some websites (eg British Airways) changed their FSRP from single-page to two-page design, while some others (eg Expedia) went in the opposite direction.

From a theoretical point of view there may be arguments in favor of either design option, so this is a question that needs empirical research. In this article we present the results of pilot research into two competing FSRP designs: the presentation of outbound and inbound flights on a single page and on two pages. In this work we analyzed not only traditional usability metrics like time on task and error rate, but also a number of eye-tracking and mouse-tracking indicators of cognitive load.

2 Method

The experiment modeled choosing flights on a simulated OTA-style FSRP (ie it displayed the airfares of multiple airlines). The task for participants was to search for air tickets within certain given time parameters, for example: “*outbound flight: first flight departing after 08:00 from Moscow to Rome; return flight: first possible return flight to Moscow not less than 4 hours after arriving in Rome*”.

Within-subjects factor was webpage design with two levels: (1) combined display of outbound and return flights on a single webpage; (2) display of outbound and return flights on two consecutive webpages. The experiment consisted of 2 series, each of which was devoted to one type of design (see stimuli examples in Fig. 1) and consisted of 8 tasks.



Fig. 1. Stimuli: one-page (combined) design (left), two-page (consecutive) design (right).

The order of the different series was counterbalanced. The position of the “correct” flight was randomly distributed between the 9 flight options in each list of the flights. Before each series the participants were given instructions and one training task.

Apparatus: 17" LCD monitor with 1280x1024 screen resolution; eye-tracker Eye-Link 1000 with a sampling rate of 500 Hz. Participants: 23 university students (12 female and 11 male), aged between 19 and 34 (mean: 22.6). As a result of the experiment 365 trials were recorded.

Three groups of dependent measures were analyzed: (1) search time and number of search errors; (2) oculomotor indicators of cognitive load (fixation duration and saccade amplitude) [8]; (3) parameters of cursor movements (number and amplitude of saccades), and gaze-cursor coordination that reflect user's search strategies [9].

3 Results

The results are given in Table 1. The effect of webpage design on search time was significant (1-way ANOVA, $F=4.8$, $p<0.05$). The mean time of completing one search task was 37.8 seconds with the single-page (combined) design and 34.3 seconds with the two-page (consequent) design – on average, two-page design allowed users to save nearly 10% of search time.

In addition, the error rate was analyzed. Each list of flights comprised only one correct pair of outbound and return flights satisfying the search criteria; any other answers were considered errors. As each search task consisted of two lists of flights, the subject could make a maximum of 2 errors. The results have shown that mean error rate was significantly (almost 3 times) higher with two-page (consecutive) design ($F=29.4$, $p<0.001$).

Table 1. Mean (σ) of the recorder parameters.

Design type	One-page (combined)	Two-page (consequent)
Search time (<i>sec</i>)	37.8 (21.4)	34.3 (14.2)
Error rate (%)	10,3 (5.5)	29,6 (19.3)
Eye fixation duration (<i>ms</i>)	349.7 (53.7)	368.7 (55.5)
Eye saccade amplitude (<i>px</i>)	149.8 (32.6)	125.9 (20.1)
Cursor saccade count (<i>num</i>)	14.9 (9.8)	14.1 (8.4)
Cursor saccade amplitude (<i>px</i>)	253.3 (88.9)	239.3 (89.1)
Eye and cursor time delay (<i>ms</i>)	417.7 (252.0)	377.6 (235.7)

For the average duration of fixations significant effects of design were obtained ($F=25$, $p<0.001$): the two-page design was associated with longer fixations, which indicates the higher cognitive complexity of the tasks performed. As for the saccade amplitude, they were significantly longer with one-page ($F=163$, $p<0.001$), which is not surprising since the subjects frequently had to move their gaze between outbound and return lists of flights on the webpage.

For the average cursor saccade count no significant differences in tasks with different webpage design were found. The amplitude of the cursor movements showed near-significant effect ($F=3.3$, $p=0.072$), which is also an expected result as it was in

the case of eye saccade amplitude. Also near-significant effect of the webpage design was obtained for eye and mouse cursor time-delay parameter ($F=2.9$, $p=0.079$). With two-page design the discrepancy between the eye and the cursor was lower, which may indicate that the user tends to use mouse cursor as an auxiliary tool more intensively under these conditions.

4 Discussion and future work

The experiment produced mixed results: speed of search was significantly better for two-page design, but at the same time, the error rate and amount of cognitive load (as shown by eye and cursor movements) were higher compared with one-page design.

A possible way of thinking may be that although time on task is definitely an important usability factor, the higher error rate perhaps outweighs it, because errors are of primary concern when booking flights. Errors lead to logistical problems and serious financial losses for customers when flights are cancelled or rebooked.

However, at this stage in our research it may be premature to formulate concrete practical user interface design recommendations. Further research involving higher number of users representing different age groups, different levels of task complexity, and analysis of users' subjective preferences regarding two design options is still necessary to build on our results.

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