



Usability Study of Travel Websites

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Abstract

A usability study was conducted to identify usability problems as well as recommendations for improvement for three travel sales websites. The study performed testing on twenty participants, between the ages of 19 and 65, recruited from the university campus consisting of students, faculty, and staff. The three websites tested were Expedia.com, Orbitz.com, and Travelocity.com. Each participant was given general instructions and a pre-survey to determine their demographics and level of Internet experience. The usability study tested participants on the task of finding the same itinerary on each travel website. The participant during testing was under observation of the experimenter that maintained an observation log. A post-survey along with a debriefing session was conducted to gather additional feedback. The average testing time for participants was 30 minutes. The results of this study are presented as well as a future research discussion consisting of the development of usability guidelines for designers of travel websites.

Keywords

Experiment, Heuristics Evaluation, Usability data analysis, Usability Testing, and Web Usability

Introduction

Humans rely heavily on technology and especially the Internet to carry out both professional and personal

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business. As usability researchers and practitioners, one of our roles is to help humans optimize efficiency in interacting with technology. Because of the desire to improve the user experience with technology, there is a growing interest in enhancing usability of the user-interface design (Shneiderman & Plaisant, 2005).

Current usability literature focuses on guidelines in general for the Internet. However, there is a gap in the literature with regards to usability guidelines applicable to specific types of websites. Although research has been undertaken by authors such as Bainbridge (2003) in the development of usability heuristics for hotel sales websites, there is a need for more research specific to travel sales websites. Therefore, a usability study was performed to identify the usability problems as well as recommendations for improvement of three travel sales websites, Expedia.com, Travelocity.com, and Orbitz.com.

The usability study conducted is phase 1 of a 4 phase study that will eventually result in the development of usability design guidelines, heuristics, for travel sales websites. The other 3 phases of the study are discussed in the future research section of the manuscript with the last phase of the research resulting in the development of usability heuristics specific to travel sales websites. The study performed testing on 20 participants, between the ages of 19 and 65, recruited from the university campus consisting of students, faculty, and staff. Formal usability testing and questionnaires were utilized to carry out the study.

Literature Background

Human-Computer Interaction & Usability

Human-Computer Interaction (HCI) is an interdisciplinary design science that combines data-gathering methods and intellectual framework of experimental psychology with computer science tools to create effective interfaces producing business success stories and Wall Street sensations (Shneiderman & Plaisant, 2005). The ever changing and growing field of HCI has contributors consisting of industrial psychologists, instructional and graphic designers, human factors and ergonomics practitioners and researchers, anthropologists, sociologists, economists, lawyers, privacy advocates, and ethicists as stated by Shneiderman & Plaisant (2005). HCI is rooted in three main areas: Industrial Engineering, Human Factors, and Cognitive Psychology (Sarmento, 2004). HCI is mainly concerned with the development of human capabilities to use machines, the designing and building of interfaces, process optimization between man and machine, interface usability, and better communication between man and machine. Human Computer Interaction studies the workings of man and machine together, and usability studies can ensure effectiveness.

Application of HCI in technology results in usability, universality, and usefulness (Shneiderman & Plaisant, 2005). Usability as defined by Bainbridge (2003) is "a user interface is the aspect of a website (or application) that the user interacts with and experiences first-hand. Usability is a quantitative and qualitative measurement of the design of a user interface, grouped into five key factors: learnability, efficiency, memorability, errors,

and satisfaction.” The five factors discussed in the definition above is based on Nielson’s (1993) five attributes. Learnability refers to the ease of use in learning the system to enable users to quickly begin working their system tasks. Efficiency looks at how productive the system user can be once having learned the software. The memorability attribute refers to the user being able to recall how to use the system even after a certain period of time has elapsed. An example of this may be an individual who goes on vacation for three weeks being able to immediately remember upon return how to use their system. Usability testing also involves looking at the number of errors that users of the system make and once an error is made if a user is easily able to recover from the error. The last attribute tested is the level of satisfaction users have from interacting with the system. Satisfaction attributes primarily consist of how pleasant the system is to use.

Usability Heuristics & Evaluation

Usability evaluations come in different forms such as heuristic evaluation, cognitive walkthroughs with a single user or group cognitive evaluations, and pluralistic walkthroughs. In any usability evaluation, there are always discussions regarding how many users are enough for a test. Virzi (1992) suggests that five users will uncover approximately 80% of usability problems. A study by Nielson (1993) further suggests that five users are enough. Research by Faulkner (2003) suggests that as many as 85% of usability problems but that as few as 55% could be found as well with using only five users. With increasing the number of users to 15, the range of problems found can be 90-97%.

Heuristics are rules of thumb or design guidelines to incorporate in the design of products. Jakob Nielsen (1994) is known for his ten usability heuristics, which are ten general principles for website design. The ten design guidelines consist of visibility of system status, match between the system and real world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose, and recover from errors, and help and documentation. Shneiderman and Plaisant (2005) also identified a list of heuristics. The rules consist of strive for consistency, cater to universal usability, offer informative feedback, design dialogs to yield closure, prevent errors, permit easy reversal of actions, support internal locus of control, and reduce short-term memory load. Furthermore, research by Bainbridge (2003) tested websites for travel sales that involve hotel bookings that resulted in hotel booking specific heuristics. The categories of these heuristics include the overall structure of the booking process, displaying rate values, children, and multi-room check-out. Although Bainbridge (2003) developed usability heuristics specific for hotel sales websites, there is a need for more research specific to travel sales websites. Ultimately, there is a need for the development of usability heuristics specific to travel sales websites.

Heuristic evaluations can either be performed by experts in website usability or volunteers that are recruited and trained on how to evaluate the systems (Fichter, 2001). With heuristic evaluation, help is frequently given once the evaluator has identified usability problems (Nielson, 1994). During evaluation, the evaluator goes through the interface many times

and measures various dialogue elements against the heuristics. The results of a heuristic evaluation are listings of usability problems with reference to the actual design principle violated.

Cognitive walkthroughs can be performed with a single expert but more commonly with a group of experts that go through a series of tasks that are common for a user (Lazar, 2001). The purpose of the walkthrough is to analyze in great detail the goals, expectations, and reactions of users in performing typical tasks (Nielsen, 1993). Through performing typical user tasks, the expert(s) obtains information on websites that could have usability problems such as being confusing or unclear. Pluralistic walkthroughs are another kind of walkthrough that involves multiple experts that are developers, users, and usability engineers that collectively analyze a system to identify usability problems.

Usability Testing

The most fundamental usability method to acquire direct information on how people use technology and the challenges faced is usability testing (Nielsen, 1993). Many of today's computer systems and websites are a user-centered design for that same reason as feedback from users is irreplaceable (Kubie, Melkus, Johnson, & Flanagan, 1996; Nielsen, 1993). Usability testing results in the discovery of mistakes that users make when using an interface (Nielsen, 1994). During testing, experimenters are reluctant to give frequent or in-depth help as participants are expected to use the technology to seek assistance. In performing usability testing, selecting a target user population truly representative of the user population must be

accomplished (Lazar, 2001). The users are then recruited. The setting of the test can vary. A usability laboratory can be used for a controlled experiment. A workplace test can be used to test the user in their normal work environment such as at their desk during a routine work day. There is also web-based usability testing also referred to as remote usability testing where the user and experimenter are not physically located in close proximity of each other.

Usability tests are typically performed to identify trends in behavior; the individual comments can also disclose pertinent design feedback (Augustine & Greene, 2002). However, usability can be difficult to measure as users' reactions can vary by region and ethnic or cultural background (Riedman, 2000). The different categories of usability tests consist of such as performance measurement, thinking aloud protocol, coaching method, retrospective testing, constructive interaction, and questionnaires (Nielsen, 1993; Lazar, 2001). Performance measurement takes place when quantitative measures are taken during the testing such as the number of tasks completed successfully by the user, length of time to complete the test tasks, number of errors, and time spent recovering from errors. Thinking aloud protocol exists when users vocalize their thoughts and therefore share their positive and negative interpretations of different website features. The coaching method enables the users to ask questions and receive answers which give researchers insight into the type of help documentation or better technology design needed. Questionnaires are also a form of testing as it provides an opportunity to gather more usability feedback from a user after a testing session. Nielsen (1993) discusses retrospective testing which consists of a usability test that is

videotaped. The videotape will then be played back while a user is present so that discussion between the user and experimenter can freely flow to better assess the technology. Constructive interaction is another type of testing where two users work together to problem solve enabling the experimenter to capture all the comments made by the users.

Several groups, including IBM (Karat, Brodie, Karat, Vergo, & Alpert, 2003) and the Memorial University of Newfoundland Libraries (McGillis & Toms, 2001) performed their own usability studies for the redesign of their websites. IBM Corporation performed a heuristics evaluation together with usability testing to understand the value of personalizing a website to users' needs (Karat, Brodie, Karat, Vergo, & Alpert, 2003). The usability testing suggested that users only care for personalization to the degree needed to complete the task at hand. At the library website for the Memorial University of Newfoundland, usability testing consisting of participants performing six tasks, follow-up questions, and a website usability survey resulted in the researchers learning about the problems users faced with the website (McGillis & Toms, 2001). All of the different types of usability testing give researchers insight into specific usability problems as well as ideas for usability enhancement in general. Although there have been extensive usability testing of the Internet and general usability guidelines developed for the Internet, there is a gap in the literature in identifying usability issues and guidelines for specific types of websites such as travel sales websites. Therefore, a usability study was performed to identify the usability problems as well as recommendations for improvement of three travel sales websites as discussed in the next section.

Method and Process

A usability study was conducted because of the need for more usability literature specific to travel sales websites. The usability study consisted of six steps involved in preparing and performing the usability study on travel sales websites, which included the following steps:

1. A task was identified to test as part of the study. The task consisted of having each participant go to three travel sales websites, Expedia.com, Travelocity.com, and Orbitz.com, one at a time and finding a flight itinerary from and for a specific destination at a specific time and date. An example of the task tested is to find a flight itinerary for one adult from Orlando to Las Vegas with a departure time of 6 pm from Orlando and departure time of 2 pm from Las Vegas with the travel to occur from July 23rd – 26th. After each website visited, the participant would identify the closest time and date options found for the flight. As part of the identification of the study task, it was determined that the following steps would be the process each participant would go through in participating in the testing session:
 - Reading of the pretest instructions
 - Reading and signing of the informed consent
 - Reading of the task instructions
 - Filling out a pre-test survey
 - Performing the task
 - Filling out the post-test survey
 - Debriefing
2. Approval to conduct a test on human participants was supplied from the Institutional Review Board at the university where the

testing took place after submitting an information packet application.

3. Documentation for the usability testing was prepared that consisted of the following:

- Pretest Instructions: General instructions were given to participants to read prior to being given the actual testing instructions. Information on the general instructions includes a thank-you to the participant for being part of the study and study environment information such as the purpose of the session, risk level for the experiment, and steps that the participant will go through as part of the testing session.
- Pre-Test Survey: The survey asked the participants to supply their background with familiarity with each of the three travel websites tested along with their Internet experience. Demographic type data was also collected regarding age range, ethnic background, gender, and affiliation with the university.
- Participant Written Instruction: Contains the specific instructions to be followed in the testing. For instance, participants were instructed to visit each of the websites, and enter the same information in regards to travel dates, destinations, and desired departure times to identify a specific itinerary from each of the three travel websites being tested.
- Informed Consent Form: The form contains the agreement between the experimenter and the participant to be signed by both parties. The form indicates

that the participant's participation is voluntary and that the participant can decide to not participate at any time during the study.

- Experimenter Form: The form contains an area for the experimenter to document the participant's comments and actions during the test. The typical categories on the form are task step, experimenter's comments, recorded user's actions, and recorded user's comments.
 - Post Test Survey: The survey contained a questionnaire for the participant to fill out upon completion of the usability test. This additional information provided the participant with open ended questions enabling the participant to voice what they liked best, least, and recommendations for future improvement for each site, along with any other comments they may have regarding the three travel websites visited. The close-ended questions were also included on the survey regarding website colors and fonts, page layout of the screen, layout of available flights, and ease of using the website, as well as a ranking of "Like" or "Dislike" for each website.
4. Participants were recruited to perform the usability test. The participants consisted of undergraduate students, graduate students, faculty, and staff from the university. In some cases, extra credit points were given to undergraduate students to take part in the study. However, it was strictly voluntary for participants to participate or to not participate in the study.
5. The testing of the 20 participants recruited was

conducted in an office setting with only the participant and the experimenter present. A laptop with an Internet connection was provided for the participants to perform the study task. The 20 participants were randomly selected to one of three groups. Each group contained 6-7 participants. Since there are three different travel websites that will be tested, each of the three groups utilized the three websites in a different order so the learning curve is evenly distributed in the results of the study. Regarding confidentiality, the data collected did not contain the names of the participants or any unique identifier of the participants. Therefore, the data collected can not be linked to a person's name.

6. Analysis of the data collected during the study consisting of the experimenter form, pre-survey, post-survey, and debriefing session was conducted to enable researchers to identify recommendations for usability improvements to travel websites. The pre-survey also enabled the researchers to have background information on our participants to look for any possible trends among certain backgrounds such as between different user groupings such as undergraduate students, graduate students, and faculty/staff.

Results

The usability testing study resulted in the analysis of data indicating many trends in user preferences of travel websites. Data consisting of demographics is discussed and displayed in section 4.1. In 4.2, the amount of Internet experience including familiarity with the sites tested is displayed. In 4.3, trends discovered along with other pertinent usability data are presented.

Demographics

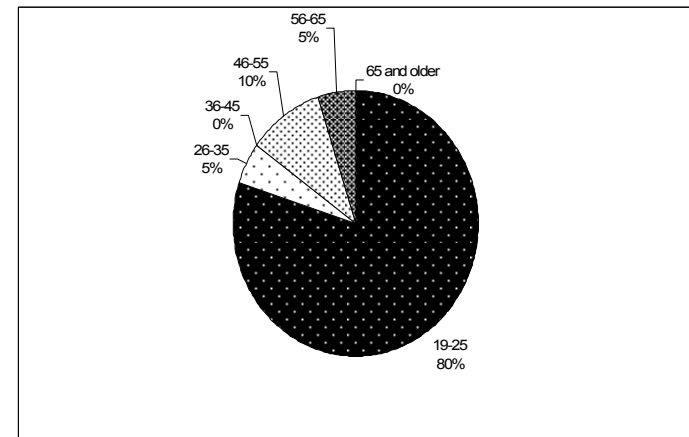


Figure 1: Age Range of Participants

For this study there were a total of 20 participants. Of these, there were 12 males (60% of the participants) and 8 females (40% of the participants) that participated. The participants ranged in age from 19 to 65 with 80% of the participants representing the 19 to 25 age group as displayed in Figure 1. The participants represented different ethnic backgrounds such as Caucasian, African American, Hispanic, Asian, Middle Eastern, and Other as displayed in Figure 2. All of the participants tested were affiliated with a local university with 75% of the participants consisting of undergraduate students, 10% graduate students, and 5% representing either faculty or staff members.

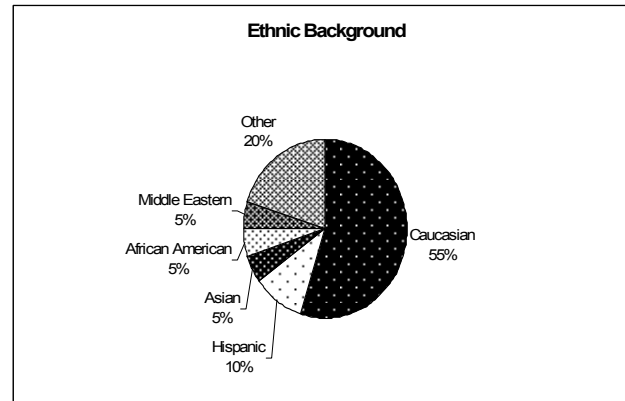


Figure 2: Ethnic Background of Participants

Internet Experience

Of the 20 participants in the study, participants claimed to have either "some experience" (25% of the participants) or "significant experience" (75% of the participants) with the Internet. The other two options available for participants to claim in relation to Internet experience was "no experience" or "little experience." However, none of the participants claimed either one of these categories. In the Pre-survey, questions were asked to the participants regarding how frequently the different websites, Expedia.com, Travelocity.com, and Orbitz.com, have been visited. The answer could be never, sometimes, or often. The pre-survey suggests that Expedia.com is the most popular travel website with only 25% of the participants responding "Never", 65% responding "Sometimes", and 10% responding "Often" for the number of times visited. For Travelocity.com, 40% of the participants responded "Never", 50% "Sometimes", and "10% responded "Often" for the number of times visited. For

Orbitz.com, 40% of the participants responded "Never", 45% responded "Sometimes", and 15% responded "Often" for the number of times visited.

Usability Testing

The results from the actual usability test are presented in this section. There were differences in the amount of time it took individuals to complete the task of finding an itinerary on each of the websites. Figures 3, 4, and 5 display the amount of time individuals spent in finding an itinerary on each of the three websites examined. The amount of time ranged from two to twelve minutes on each travel website. The interesting aspect of this research is displayed in Figure 6 where the participant task time is sorted by the frequency of website visits to the different websites. The frequency of website visits was information gathered during the pre-survey and is discussed in section 4.2.

The experimenter's comments that were recorded were similar from one participant observation to another. For instance, there were many comments recorded suggesting that the participant didn't complete the task properly as the instructions were not fully read or not understood as written. During the study, many of the participants made comments that were also recorded by the experimenter. Some were related to the study such as noticing similar website design for each travel sales website. Others noted their dislike of the laptop provided or the lack of a normal mouse to navigate web pages as the laptop mouse is a touch-screen.

After the 20 participants completed the surveys, the data was combined to provide statistics for each site. Figures 7, 8 and 9 display the results for each of the three websites tested in terms of the number of "Likes"

or “Dislikes” associated with different usability characteristics.

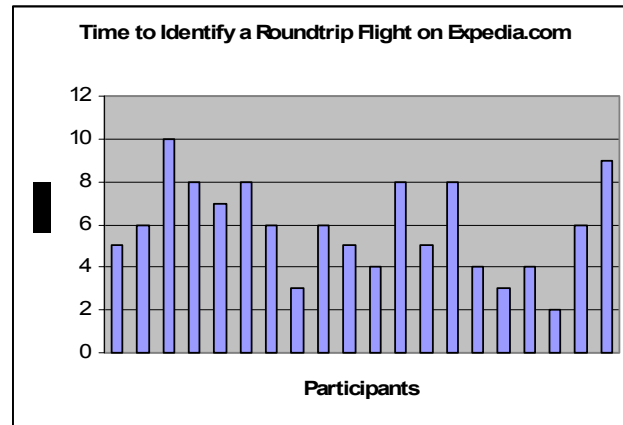


Figure 3: Expedia.com task time: The minutes to perform the task are shown as 1-10 minutes with the average time line being 5.85 minutes.

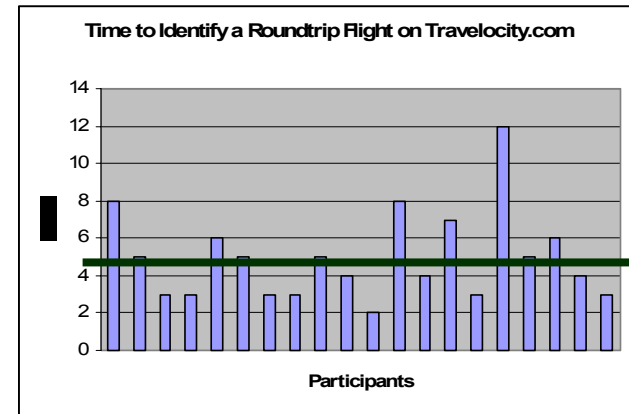


Figure 4: Travelocity.com task time: The minutes to perform the task are shown as 2-12 minutes with the average time line being 4.95 minutes.

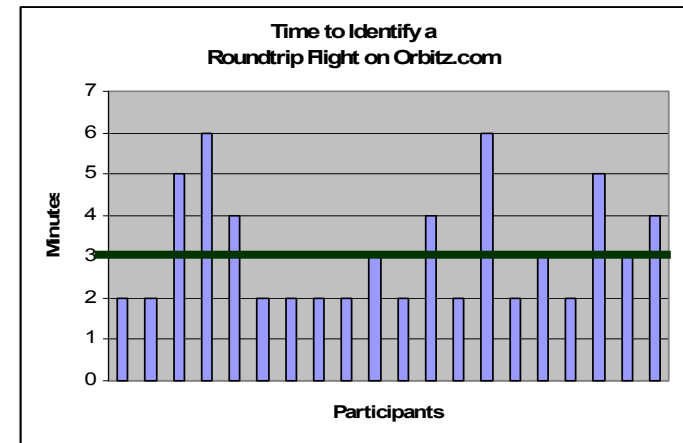


Figure 5: Orbitz.com task time: The minutes to perform the task are shown as 2-6 minutes with the average time line being 3.15.

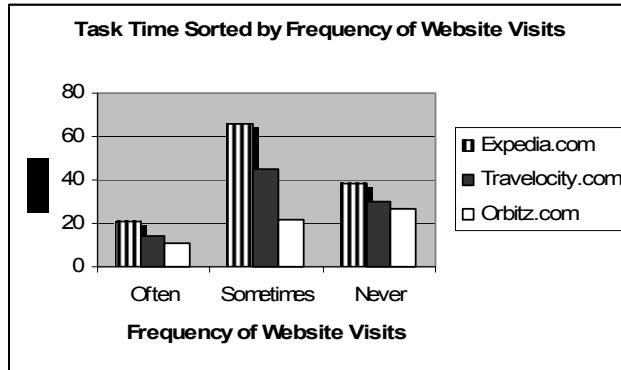


Figure 6: The minutes to perform the task sorted by the amount of times participants in the past have visited the website.

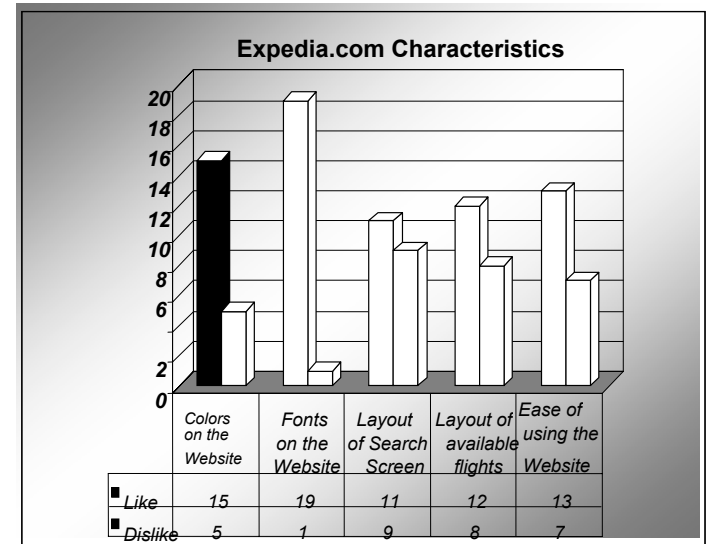


Figure 7: Expedia.com Post-Survey Results

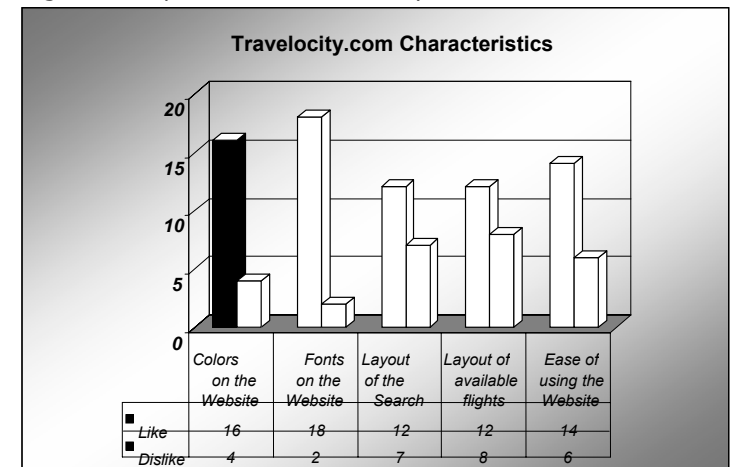


Figure 8: Travelocity.com Post-Survey Results

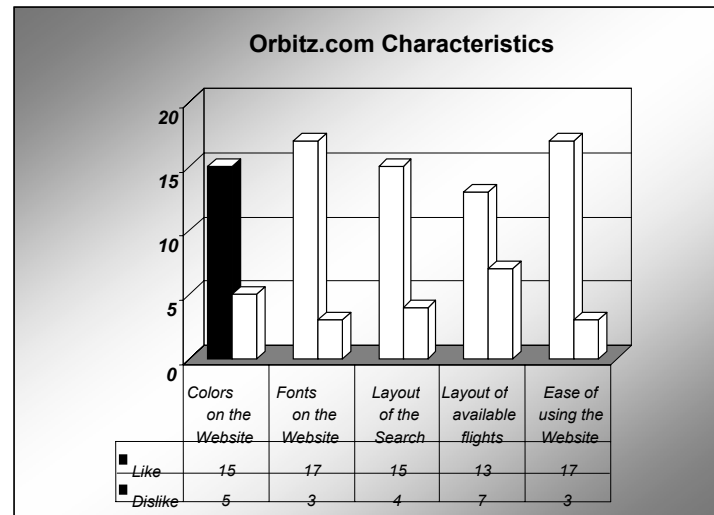


Figure 9: Orbitz.com Post-Survey Results

Post-Survey

The post-survey consisted of both close and open ended questions. The close ended questions asked participants whether they liked or disliked the colors, font, page layout, layout of the flights, and ease of using the website for each website. The open ended questions gave participants the opportunity to write their own comments on what they liked best and least about the site, and recommendations for website improvement. The most interesting and frequently made written comment was for Expedia.com, individuals commented that the site was easy to use as what was liked the most. However, the most popular dislike was that the site was not clear and not user-friendly. For Travelocity.com, most individuals commented that the site was easy to use, but they

didn't like the way the flight results were displayed. Comments were similar for Orbitz.com; the majority of individuals commented that the searches were simple to perform, while also saying they disliked the display of the search results.

Examples of the recommendations for website improvement provided by the participant for Expedia.com consist of more narrow searches, need more visibility in flexible date options and one-way trips, have better time options rather than morning, noon, or evening, scroll down departure times, provide output to better match times selected, more simple page layout, and less cluttered space.

Examples of the recommendations for website improvement for Travelocity.com was to change website colors, provide more narrow searches, provide more returning flight options, provide more information on connecting flights such as arrival and departure times, use better colors, give better output to match times selected, provide larger font, and provide less cluttered space.

Examples of the recommendations for website improvement for Orbitz.com include to separate departing flights from returning flights, provide more narrow searches, present clearer results of flights, provide less cluttered space, have larger selection buttons, use an updated color scheme, include more options in the main window, and highlight flight times for quicker referral of the different flights.

Conclusion

Discussion

All three travel websites: Expedia.com, Travelocity.com, and Orbitz.com are very similar in how the flight searches are performed as well as how the search results are displayed. To supplement the usability testing data, a partial heuristic evaluation was performed on each website with the results in Table 1 displays how the different websites measured against specific usability evaluation criteria. The post-survey data collected enabled participants to share recommendations for website improvements. The results of this was very interesting as most participants did not like the morning, noon, or evening flight time option on Expedia.com as opposed to the other sites that allowed users to type in actual times. Travelocity.com received the fewest negative comments but also was the site where only 25% of the participants had "Never" visited where the other sites had a much larger percent of "Never" visited. The common recommendation for improvement theme for Orbitz.com consisted of separating departure from returning flights.

Checklist Criteria	Expedia	Travelocity	Orbitz
Good First Impression (Simple URL, content in 8 seconds,	Loads quickly, simple URL, easy on the eyes.	Loads quickly, simple URL, website colors are hard on the	Loads quickly, simple URL, easy on the eyes.

attractive)		eyes.	
Friendly Image (Key info above the fold, easy to read, images, printer friendly).	Easy to read and understand.	Colors of background and text are harsh on users eyes, other than that the site is very useful.	Easy to read and easy to navigate.
Easy Navigation (clear text links, consistent, search tool and sitemap).	Easy to navigate, simple searches, useful links.	Easy to navigate, simple searches, useful links.	Easy to navigate, simple searches, useful links.
Useful Content (Clear objective, organization of content, regularly updated, useful links).	Easy to locate a search for a flight, hotel, car, vacation, combination, etc. Link for first class or business class customers.	Easy to locate a search for a flight, hotel, car, vacation, combination, etc. Drop down menu for economy, first, or business	Easy to locate a search for a flight, hotel, car, vacation, combination, etc. Link for first or business class difficult to locate.

		class.	
Appropriate for Audience (Appropriate style and tone, access for disabled, easy order-processing).	JAWS 7.0 is not compatible with the site (typing in flight data wouldn't work as the software perceived the typed information as a command to read more of the website. The buttons on the screen are large enough for a left hand mouse.	JAWS 7.0 is not compatible with the site (typing in flight data wouldn't work as the software perceived the typed information as a command to read more of the website. The buttons on the screen are large enough for a left hand mouse.	JAWS 7.0 is not compatible with the site (typing in flight data wouldn't work as the software perceived the typed information as a command to read more of the website. The buttons on the screen are large enough for a left hand mouse.
Clear Contact Information (Branding for every page,	Clear links for feedback and company information.	Clear links for feedback and company information.	Clear links for feedback and company information.

contact on every page).			
Good Search Engines (clear text with keywords, clear text links).	In-site searches are simple to conduct and recognizes text entered even if entered incorrectly. Links on the website to provide additional information to the user were clearly labeled.	In-site searches are simple to conduct and recognizes text entered even if entered incorrectly. Links on the website to provide additional information to the user were clearly labeled.	In-site searches are simple to conduct and recognizes text entered even if entered incorrectly. Links on the website to provide additional information to the user were clearly labeled.

Table 1: Usability Evaluation Measurement Criteria

The results may have been different if we had participants with less Internet experience or without prior knowledge of using these websites. Furthermore, if more of the participants had a technical background in website design, there may have been more information provided by the participants in the post-survey regarding usability standards that were or were not met. From the research results as well as debriefing discussions, it can be concluded that people of all ages already frequent these websites for their travel needs, looking for the most inexpensive fares. The color of the website or fonts utilized didn't have a significant impact

on whether or not a person will use the site as the individuals tested were willing to undergo usability discomfort provided the individual was receiving the best flight fare deal.

Future Research

The study results presented are from phase 1 of 4. The 3 remaining phases of the study are presented in this section. The future areas of research that will be conducted consist of the following three specific areas a). Usability testing of complex tasks; b). Usability testing focused on international HCI; c). Usability heuristics development for travel websites.

First, usability testing of the same travel websites to uncover any usability strengths and challenges present with performing more complex tasks will be performed as a phase 2 research effort. Future complex tasks to test will consist of participants finding flight accommodations for flights that are not performed every day of the week and are not available for the date tested in the usability test itself to determine users' behaviors and actions, flights during holidays, first-class and business flight accommodations, accommodations for different people number combinations consisting of adults, seniors, and children, and accommodations along with tour, event, and rental car reservations.

Second, usability testing with an effort on international HCI and accessibility aspects of a travel website will be conducted as a phase 3 research effort. It is desired to uncover any cultural barriers to human-computer interaction and specifically usability barriers which consist of anything that poses as a challenge humans

interacting with technology (Carstens, 2005). It is also important to capture any barriers for disabled individuals that must be designed out of current websites. Examples include poor organization of a web site and language conversion issues for international HCI challenges. Examples include small font, button sizes, and screen reader software compatibility.

Third, the development of specific usability heuristics for travel websites will be developed and tested as a phase 4 research effort. The travel sales website heuristics will serve in the future to aid website designers in the creation of a global website appropriate for diverse users such as multi-cultural users and disabled individuals.

PRACTITIONER TAKE-AWAYS

The study revealed insight into current usability gaps that have been turned into three opportunities for practitioners to enhance the design of their travel sales website. First, prior to website implementation, practitioners must perform simple measures to ensure accessibility such as testing the compatibility of the website with screen reader downloads. Second, the post-survey revealed insight into users' preferences in terms of recommendations for improvement specific to the need for less cluttered pages within the travel sales websites. This can be achieved through the use of more white space along with surveying users to identify the type of information that users deem important for display. Third, capability for narrow searches was also a recommendation for improvement identified in the post-survey that was given for all three websites. Practitioners can accomplish this through the design of more in-depth search capabilities enabling users to

perform more narrow searches specific to time of day, types of aircraft, and airline companies. Incorporation of these practitioner take-aways will enhance the user experience in visiting your travel sales website.

Acknowledgements

Special appreciation is given to the Florida Institute of Technology campus community for their support in serving as participants in the study.

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