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| Requirement Analysis and Design | 0 | 20 | 15 |
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Travelsearch User Interface Design and Evaluation

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ABSTRACT

In the world of holiday finding there are a number of ways in which people find holidays but none of them are very user friendly or efficient. It is for this reason that Travelstart came up with the idea to let users find holidays using descriptive words or phrases. This human computer interaction project was intended as a means to create a user interface that is efficient, easy to use and easy on the eyes.

Travelsearch's user interface was created using an agile iterative approach and 4 iterations namely, paper prototypes, interactive prototypes, a merged prototypes and an integrated prototype were used to achieve the goal. Each of these iterations were user centered and after each iteration, a set of tests were performed. An intensive qualitative testing regime was undergone using a range of test methodologies. These include, informal tests, one-on-one interviews, over the shoulder observations and Google analytics. We went on to evaluate results and implement changes for the next iteration.

After the testing and evaluations of results we found that users were interacting with our system better. All the "bugs" we had found in earlier test phases had been removed. We also used our interaction and observations of TripAdvisor to further enhance our website through looking at the negative aspects of their site. From these evaluations we saw the effective nature of user-centered development.

CCS Concepts

•Human-centered computing → Usability testing;

Keywords

Human computer interaction, user centered design, prototype, iteration

1. INTRODUCTION

An unfriendly user interface is mainly caused by the neglect of a user interface in a system development life cycle. Interface design is usually the last step in the system's development, after budget and time are both low [7]. This is a big reason for the germination of this project. This project intends to create a Travelsearch user interface that is efficient, easy to use and easy on the eyes through user-centered design and development through an iterative process.

Walden and Anckar [32] identified one of the potential benefits of the internet in relation to the travel sector as "a tool for joint holiday decision-making". Currently when a user would like to plan for a holiday, they are catered for by sites such as TripAdvisor, bookings.com, lastminute.com and Expedia. All these sites have managed to overlook one important factor of the holiday finding process, which is the fact that a user needs to know where they want to go. When a user does not know where they would like to travel but know what kind of holiday they would like to go on, they should be catered for. This is Travelstart's attempt at providing for that need in the market.

Other than not providing for the identified need, the other booking sites also lack where user interfaces are concerned. Most of the above mentioned competitors have cluttered websites that can be hard to use at times. This is a big problem as knowing your customer should be one of the very first and most important design tasks [8].

With the goal being, the implementation of an easy to use system, we used a user centered approach as a result of realising the importance of the user early in the development cycle. The purpose of a user-centered design is to allow designers to model user attributes and tasks [16]. An agile iterative design approach was also implemented in the quest to design a user friendly interface.

2. BACKGROUND

There are number of ways in which a system can be designed. Some methods value people more than anything else, while some value the tasks. There seems to be a bias towards building software and only evaluating it under laboratory settings [17]. Kjeldskov and Graham [17] go on to argue that this inhibits growth in the field of Human-Computer interaction HCI.

2.1 HCI approaches

There are three settings in which HCI research can be carried out; natural settings, artificial settings and environment independent settings.

2.1.1 Natural settings

Natural settings have three possible research methods that can be used, the first being case studies. The second research method are field studies. When conducting a field studies the pros include the fact that they are replicable but the biggest con is that data collection is rather difficult. The

last of the methods available in a natural setting is action research. Action research, is a method by which the researcher participates in the invention of the study and evaluates the results at the same time [17].

2.1.2 Artificial settings

Artificial settings only have one way of conducting such experiments which is laboratory experiments. Unlike field studies laboratory experiments are done in a controlled environment created for the purpose of research. Laboratory experiments do not have to take place in actual laboratories but can take place in places such as hallways or simulators. This facilitates for the ability to collect various types of data [17].

2.1.3 Environment independent settings

Environment independent settings consist of three separate methods. The first method is survey research. This consists of mass gathering of information from a known sample of people then quantitatively analyzing the data. The next method is applied research. This consists of actually developing a product as a means of testing a concept or hypothesis. The goal of such research is the output, which is the product. The third method is basic research and this is made up of, researchers developing new theories or working on existing theories. Basic research is based upon a trial and error approach [17].

2.2 Task centered design

Clayton Lewis [20] says the only way to design what can be considered an acceptable user interface, one must first figure out who is going to be using the interface and for what reason they will be interacting with it. One may think their design is well put together and that all users will want and be able to use it, but history says they would be wrong. This is a problem that is faced by all area of design including contract design as the requirements may be “spelt” out for you, but this does not lead to good system design.

As with the Travelsearch project, a system spec had already been drawn up and it was a matter of meeting requirements by building a system. However a system that fails to work for any of users does not benefit any of the parties involved.

In their paper, Lewis and Rieman [20] specify a number of steps that developers must go through to accomplish task centered interface design:

- Getting in touch with the user. This involves going out and finding some real potential users of the the system.
- Learning about the users’ tasks. This involves finding out, in detail, what tasks the users want the system to support.
- Use of the tasks in design. This involves thinking of the tasks when designing the system as well as thinking of how the user will be performed step-by-step.

2.2.1 Task analysis

The role of task analysis in design has been in the past because task analysis may lead to “non-creative redesign” [29]. In addition to this, task analysis makes accommodating complex tasks difficult [13]. Although this may be a factor, the positive reasons for including task analysis in design far

outweigh the negatives. The positives include precise prediction of time taken to complete a task, and insight into user behavior in relation to that task [13].

Richardson et al [29] talks about ways to lessen “non-creative redesign” problem. Their main way of addressing this was by looking at task analysis as user goals rather than task implementation.

2.3 User centered design

The design of everyday items is not always completely intuitive, which leaves users frustrated due to their inability to complete simple tasks due to bad design. The basics of user centered interface design is a process or development cycle in which users influence how design takes shapes. User centered design involves consulting user at each step in the design process [1].

When doing user centered interface design the main focus is usability. Even simple designs involve a large number of aspects that have to be considered. Norman and Draper [25] list a number of aspects that should be assessed for each task, these include;

- Goals and intentions of the task.
- The psychological process the user is likely to go through in order to accomplish the task.
- The mapping of psychological sequence to action sequence.
- The mapping of physical mechanisms and system state.
- Lastly, the evaluation of results, which usually leads to a new set of intentions and goals.

These aspects when considered, will lead to increased usability [25]. Norman [24] gives use 4 guidelines of how design should be;

- Users should easily determine which actions are possible at any given time.
- Visible should be evident, including the conceptual model of the system and alternative actions to the results of actions.
- Users should easily see the current state of the system.
- System should follow natural mapping between intentions and the user’s required actions, as well as between those actions and the resulting effect.

These guidelines place the user at the center of the design. The designer’s goal is to design the interface in a way that allows the user to use the interface with minimal learning required [24].

2.3.1 Ethnography

Developers in recent years have turned to ethnography to complement user centered design. Ethnography is, in a system development context, the study of people socially so as to develop a system that takes social context into consideration [15]. Ethnography in system design was a result of designers realizing that “the social real world” holds importance in system design. Ethnography is used to inform design [6].

2.3.2 Persona

Randolph [28] suggests that personas could almost be used alongside prototyping in small system development projects.

This is a result of them being an early way to start identifying users. Randolph goes on to suggest that for the system to be a success, the needs of the primary persona must be met. Dantin suggests creating personae via informal interviews of potential users [7]. However persona can also be created off credible research and to an extent, designer assumption [4].

2.4 Qualitative evaluations

Qualitative data is richer than quantitative data and enables designers to have information in the collected data. Qualitative data also increases the range of the data provided which increases confidence in the quality of results via "triangulation, multiple analyses, and greater interpretive ability" [10].

2.5 Design principles

When doing interface design there are guidelines one should try stick to. Some times these guidelines may be contradictory and therefore ones goal should be to try include as many of the guidelines as possible. Guidelines are also never complete but only act as a guideline of what designers need to know [31]. Ben Schneidermans [31] eight golden rules of interface design are the most widely used in interface design. They consist of:

- Aim for consistency, which may be the most crucial rule in interface design.
- Cater for all users that will interact with the system.
- Offer the users useful feedback. For frequent and minor actions, the response must be modest, whereas for infrequent and major actions, the responses should be significant.
- The order of actions should always be organized into beginning, middle and end sections as well as give feedback at the end of the group of actions.
- Prevent errors through good interface design.
- Facilitate for easy reversal of actions. Most of the actions performed by a user should allow for reversal.
- Provide shortcuts for experienced users and provide them with some control over the interface.
- Lessen short-term memory load. This is in direct proportion to the simplicity of the display.

2.6 Related work

2.6.1 Problems and guidelines

According to Chariton and Choi [5], there are a number of travel website usability problems that are not covered by the current set of guidelines that exist for online shopping. This is as a result of the focus being on tangible goods. The goal of their study was to increase usability of travel website. Most solutions they brought forward incorporated the eight golden rules including the proposed additional guidelines for travel agency websites.

The main problem areas in travel websites are in the presentation of information and in the functionality offered to users [11]. Chariton and Choi [5] went through these problems in detail. The first problem has to do with the limitations of the internet. A customer cannot receive the same information from a website that they would be able to receive from an agent. This information includes the base fare, taxes, meals etc. It is usually buried or not provided at all on the

website. More problems are found in cases where a website has multiple query screens in which a customer can search for destinations; the two screens being, a simple screen and a link to an advanced screen. This link in most cases is not visible to the customer leading to the customer's inability to perform advanced searches. The last identified problem comes when search results are displayed. It is common that they can be overwhelming because of the amount of information that bombards the user all at once.

Chariton and Choi [5] went on to propose a number of guidelines that would help in eliminating these problems. The first involves providing the customer with the same information they would get if they had used an agent. Another guideline was for the designers to refrain from using industry specific terms as well as location codes. If industry specific language is to be used, it should be defined. They also specified that designers should provide all search fields on one screen, or provide a very distinct and intuitive link to the advanced search page as well as provide information or results in a concise manner. In a follow up study that focuses on mobile, Burmistrov [3] says functionality should be cut to an absolute minimum because of mobile use in e-ticket bookings.

2.6.2 Similar Websites

Gabriel [9] identifies two dimensions that users use to purchase travel packages online in a modern online market. The first is "Reliability and Information" and the second is "Ease of Use and Reassurance". When looking at websites that are in the same genre, they usually lack one or both of these dimensions.

Websites such as TripAdvisor, lastminute.com, booking.com and expedia have the closest functionality to Travelex. There are a few of problems with these sites' designs, the main one being the amount of clutter on the landing pages as well as the scrolling required on the home page to get to all the information. All the above websites provide a range of features for example, lastminute.com offers a range of different search selections that can be accessed via various tabs as seen in figure 1.

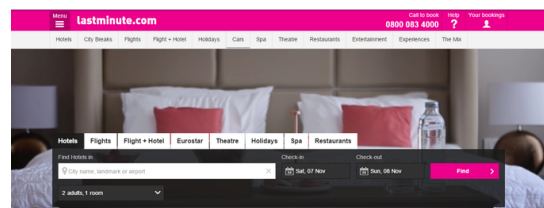


Figure 1: lastminute.com home page

Expedia and TripAdvisor follow the same format for the services they offer. Booking.com on the other hand do not follow this format and instead provide an input bar in which users can type in destination name, hotel name or landmark name. It then returns available accommodation in that area.

Travelex will be following a similar format to that of booking.com with a slight difference in functionality as Travelex will only be focusing on flights for now. On close in-

spection the flight tabs for lastminute.com, Expedia and TripAdvisor are extremely similar. In table 1 are the features of lastminute.com’s flight booking tab and booking.com’s search homepage.

| Website | Features |
|-------------------------------------|---|
| lastminute | 2 bars for departure and destination. |
| | 2 button for “one-way” or “return”. |
| | Drop down for number of travelers. |
| | Checkbox for flight date flexibility. |
| | Button for more options. |
| Booking.com | Drop down for choice of class. |
| | Bar to enter city, hotel or landmark. |
| | 2 separate drop downs for month and date of departure and return dates. |
| | Checkbox to remove dates. |
| | 2 checkboxes for work or leisure travels. |
| Drop down for number of travellers. | |

Table 1: lastminute.com and Booking.com’s flight booking page features

2.6.3 Travelstart current website

Travelstart’s current website like the others has a lot of clutter on the landing/home page as seen below. A home page is always important as it is the first page a customer sees and as such it is important that they at no point get annoyed or confused. Figure 2 shows Travelstart’s current website.

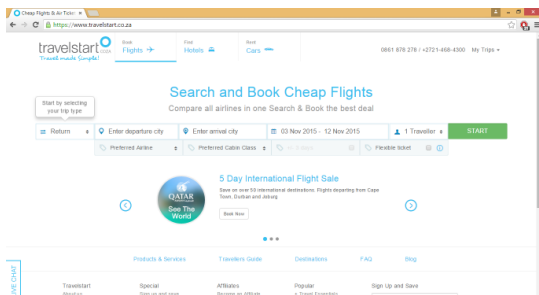


Figure 2: Travelstart current website

Like the others travelstart’s current website offers 3 separate tabs where users can search for flights, cars rental services or hotels. Table 2 lists all the features found under the flight booking tab.

| Website | Features |
|-------------|--|
| TravelStart | 2 bars for departure and destination. |
| | Drop down for “one-way” or “return”. |
| | Drop down for number of travelers. |
| | Drop down for preferred airline. |
| | Drop down for cabin class. |
| | Checkbox for flight date flexibility.. |

Table 2: Travelstart current interface features

3. METHODS AND MATERIAL

3.1 Project dynamics

Travelsearch project was split into 4 sections; Faceted database creation which is done by Dylan Henderson, query formulation and expansion done by Shuaib Parker, ranking and sorting of search results done by Luqmaan Salie, and User interface design which this paper is on.

This project was programmed using jade, CSS, Javascript and JQuery. The “back-end” of the project being done by the aforementioned team members was programmed in node.js and mongodb. We used jade for the “front-end” of this project instead of HTML because jade works well with node.js. We used node.js instead of other language like PHP because of its “component based programming” [10]. Google Analytics and Google Tag Manager were used in the later testing phases of the project.

3.2 Approach

In this component of the project, Agile methodology was implemented with an emphasis on interactive development. This is due to the nature of the project as it has four separate components. The agile methodology would be able to help this project component cope with quick changes in the event of a group member dropping out of the Honours program, a group member failing to do certain sections of the project or the project sponsors having changes they would like implemented. The agile methodology facilitates for effective development in terms of time and documentation but also allows for some flexibility [12].

For the overall design of the interface, an iterative approach was utilised. More specifically, we used the design cycle specified by Lewis and Riemann [20] which meant working through a series of steps. The sequence of steps starts with choosing users, followed by select tasks, then the reuse ideas from good designs, make a rough design so that output is fast, think about the design, prototype the design, evaluate the design, iterate through the cycle, build the design, track the design and finally change the design.

For the testing of iterations the qualitative methodology was followed, specifically in-depth one-on-one interviews. Qualitative methods aim to understand people’s experiences and attitudes and therefore work well. With qualitative research there are two ethical issues of confidentiality and consent that must be observed [2]. As such all participants that took part in all stages of the project signed a consent form that also detailed the confidentiality of their participation in the project.

The main reason for using this iterative approach was due to its ability to facilitate for user centered design. Working in iterations allowed for the creation of quick and dirty prototypes, find out what users appreciated early in design and make changes based on this feedback. A rigid design approach would not allow for quick and simple design changes.

3.3 Methodology

First step is the creation of personae so as to establish a base of potential users and what their different requirements of the system may be. This is important as it helps the designer gain knowledge of the different types of users. The next step is to decide on the tasks that would be per-

formed by users on the website. These are then analyzed and documented. Followed by taking a look at similar existing designs in order to reuse the components that we think worked well in the past and may work well for us. This leads to the beginning of the iterative process as shown in figure 2 that shows this project’s entire iterative cycle.

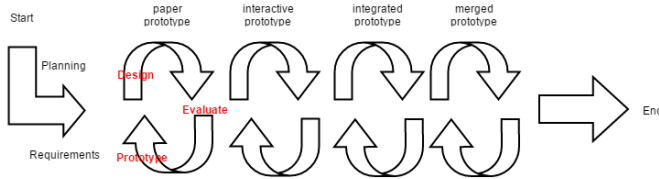


Figure 3: Project iterations

The first iteration consists of two paper prototype designs that are used to create 1 overall paper prototype that takes all the good aspects of the 2 paper prototype designs. Heuristic evaluations are used in the evaluation process, mainly due to their informal nature [22].

The second iteration consists of three interactive prototypes. These are three "skeleton" prototypes of different designs. Evaluations for the interactive prototypes are done via cognitive walkthroughs because of the detail they provide about the user’s interaction with the system [22]. The three interactive prototypes are to pave the way for the fourth iteration which is the integrated prototype. The integrated prototype was a creative combination all the good aspects of the three interactive prototypes as uncovered by the evaluations.

The fifth and final iteration is the merged prototype, which is the integrated prototype merged with all the other parts of the overall Travelsearch project. This is to be evaluated using Google analytics. This will help us monitor user behavior on the users, specifically their clicking patterns.

3.4 Persona

Persona are descriptions of a fictitious people. In design guessing is not enough, the persona must be created on the back of some data [26]. We built our persona off data from a study done on tourist activity in a Spanish holiday destination [18].

| Age group | Frequency(%) |
|-------------|--------------|
| 15-24 | 14.2 |
| 25-34 | 7.3 |
| 35-44 | 13.2 |
| 45-54 | 21.0 |
| 55 or older | 44.3 |

Table 3: Frequency of travelers by age

From table 3 we can see that the older age groups are the ones that travel the most. We have defined four persona of frequent and infrequent fliers based on this data.

3.4.1 Frequent fliers

For this project we have defined frequent fliers as anyone that books their flight tickets online more than once in a two

year period.

Name: Sam Builder

Budget: R60000

Biography: Sam Builder is a company executive with an older family. They travel once or twice every two years on holiday. He has a wife and two children in university. He needs to find a destination that offers activities that they will all enjoy.

Requirements: Sam would want a very uncomplicated system that is very easy to use. The system would have to be clear and to the point with feedback.

3.4.2 Infrequent fliers

For this project we have defined infrequent fliers as anyone that books their flight tickets online less than once in a two year period.

Name: Amanda Whitehouse

Budget: R12000

Biography: Amanda Whitehouse is a study abroad student and would like to visit as many places as possible, and experience new things before heading back home. She enjoys the beach and outdoor activities.

Requirements: Amanda would look for a very colourful and visually appealing website full of innovation and technology. The website should provide her with available student specials.

3.5 Task analysis

Shown in figure 4 are the interactions and tasks that a user would go through to book a flight using this system.

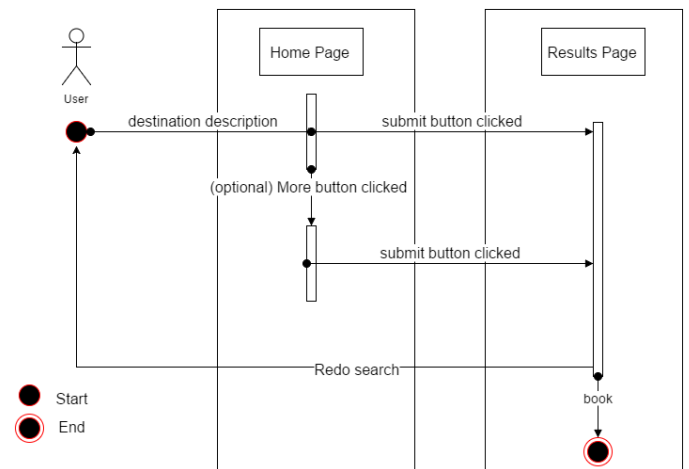


Figure 4: User interactions with the system

3.5.1 Task1: Book flight using the search bar only

1. Type in a descriptive word of the type of holiday in the search bar.
2. Choose a departure city.
3. Booking a ticket or return to home.

3.5.2 Task2: Book flight using the search bar and extra details

1. Type in a descriptive word of the type of holiday in the search bar.
2. Choose a departure city.
3. Click on the "more" button (reveal more options).
4. Choose departure dates and returning date (optional).
5. Choose min price and max price (optional).
6. Booking a ticket or return to home.

4. INTERFACE DESIGN

4.1 Design Requirements

For the user-interface there were no set requirements that came out of our meetings with Travelstart except that the user-interface should be innovative and provide users with a new experience. From the full system requirements, we managed to write up user-interface requirements that consisted of an input bar where users can input their descriptions of destinations and optionally, departure and return date as well as minimum and maximum fare. Later in the project we also found that we needed a departure city drop down that had 3 options, namely Durban, Johannesburg and Cape Town.

Compared to the other holiday websites we looked at, our features are similar. Like booking.com we have an input bar. The difference between theirs and ours is the fact that ours takes in a descriptive word or phrase and theirs takes names of cities, hotels or landmarks. Also compulsory on our website, is the user's departure city. This is different to all 4 holiday websites we looked at as they all have at least 4 compulsory fields.

The non compulsory options are accessed via the click of a clearly marked and visible button. Expedia, TripAdvisor and lastminute.com all have a link to get more options, but as stated by Chariton and Choi [5], they are very small and not easily seen or noticeable. After clicking more options on the 3 websites mentioned above, they reveal a drop down to choose your flight class whereas Travelsearch has dates and fares revealed by the more button.

4.2 Design principles

A goal of the design was to include as many of Ben Schneidermans *Eight Golden Rules of Interface Design* as possible. It is not always possible to implement all eight as some of them are contradictory and may conflict. Neilsens *10 Usability Heuristics for User Interface Design* were a big consideration in the design of the interface. For this particular interface design there were a few Heuristics we paid particular attention to.

Consistency and standards was one we paid particular attention to. Users should never wonder whether a certain action does a the same thing [23]. This can be seen in how the website keeps its consistency throughout all of the pages. All the same colors were used for the page background, theme and links.

Helping users recognize and recover from errors, whilst having a tasteful and minimalist design were the other heuristics we focussed on as well as making sure users never have to recall anything but instead recognize elements that perform actions were all focuses in design [23]. Some examples of this on the website include, the intuitive nature of but-

tons as buttons as clickable items and compulsory fields are marked with asterisks. To assist with error prevention, the system provides the user with a calendar to choose their selected dates from. This prevents the user from entering a date that is in the incorrect format.

Whilst we tried to stick to Nielsen's Heuristics as much as possible, we also tried to avoid Nielsens *Top 10 Mistakes in Web Design* as much as possible. Whilst most did not contextually fit into this design the ones that did included long pages that include a lot of scrolling, non-standard link colors and lack of navigational support [27].

In an effort to keep the website constant and inline with modern design practices, we also looked at Guos four elements of user experience that were given some coverage by Maguire [21]. The four elements state that at every turn the website must be useful, easy to use, fun and engaging toward the user and the website must be easy to use [21].

4.3 Design rationale

Law and Ngai [19] say whenever a consumer uses something new, they always compare it to their perception of how the service should perform based on the last similar service they used. This was kept in mind throughout design and helped a lot of design decisions.

4.3.1 Paper Prototypes

Paper prototypes are not used for "need finding" but are effective as basic speculative designs [33]. In all three paper prototypes, the goal was simplicity. The rationale behind this was, simple interactions make for a pleasant user experience as well as keep them attentive. The paper prototype designs was driven by necessity.

4.3.2 Interactive prototypes

Three interactive prototypes were build for the next design iteration. Horowitz et al [14] says simple interface design grasps people's attention more than very busy designs. For this reason they project stuck to very simple designs. A sky background was used for all prototypes. All three interactive prototypes can be found in the appendix. All three had the similarities of functionality but the designs were inherently different.

4.3.3 Merged prototype

Possibly the most important prototype as it is the result of all the interactive prototypes. This prototypes design came from different aspects of the 3 interactive prototypes after close analysis of the user evaluations. The homepage came from the positive aspects of the interactive prototypes, most of which was from prototype2 as seen on figure 18 in the appendix. The results page on the other hand came from prototype3 as seen on figure 23 in the appendix.

4.3.4 Integrated prototype

Since this project was split into 3 additional sections, after interface design, they was a need for integration of the sections. None of the integration of parts resulted in the disorientation of the user interface. The only difference comes in the results page as the number of flights returned can differs.

5. EVALUATION

For all the user evaluations the users were provided with a descriptions of TravelSearch as a project, what the project was about and what it was trying to accomplish.

5.1 Paper prototypes

5.1.1 Testing

Informal interviews was the main form of testing done during the paper prototyping iteration. The evaluation method implemented during this iteration's evaluations were cognitive walkthroughs. Cognitive walkthroughs were chosen because they are generally easy, quick and working prototypes are not required to execute them. Furthermore they help designers have the user's perspective which helps identify potential problems with the user interactions [30].

Figure 5 is the home screen. The home screen contains a search bar that takes a descriptive word as input. It also has departure and return date fields as well as minimum and maximum price fields. Last is the search button at the bottom of all the input bars.

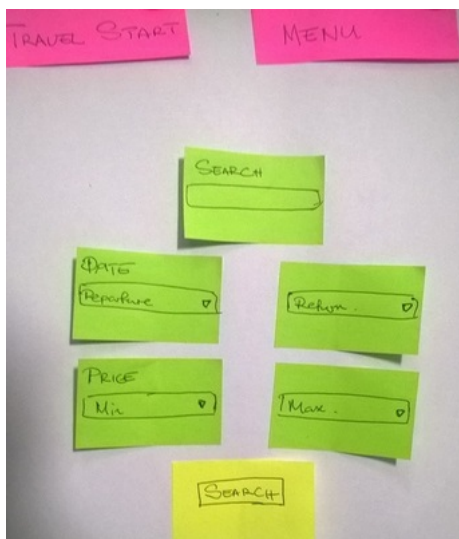


Figure 5: First "screen" of paper prototype

Figure 6 is the results page and this shows all the results of flights. It has two buttons beside every destination, book and details. Book simply books the flight and details takes the user to a details page where details for the particular destination can be found.

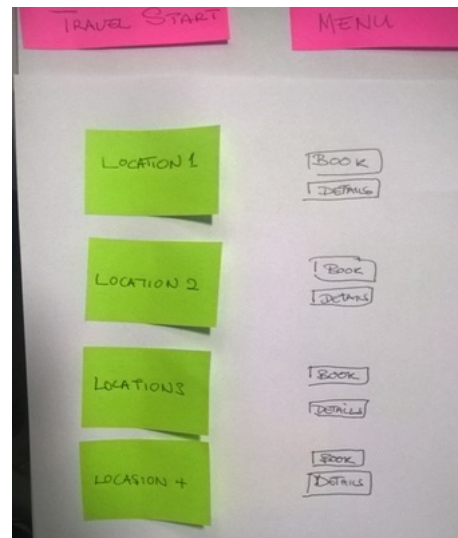


Figure 6: Results "screen" of paper prototype

Figure 7 shows the details page which displays details of a particular destination.

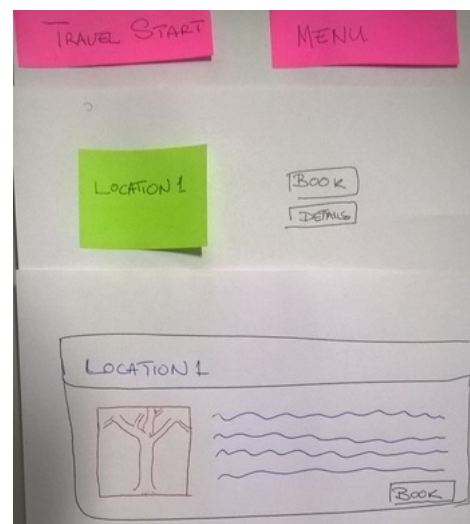


Figure 7: Details "screen" of paper prototype

The users were asked to perform a set of tasks and asked give feedback if the action they performed produced the desired results. Users were asked to:

1. Search for a destination.
2. View details of a particular destination.
3. Book a flight.

5.1.2 Results

In testing 6 users volunteered to participate in the testing of the paper prototypes and the results of their interactions are shown in table 2.

| Users | Search | Details | Book |
|-------|--------|---------|------|
| User1 | ✓ | ✓ | ✓ |
| User2 | X | ✓ | ✓ |
| User3 | X | ✓ | ✓ |
| User4 | ✓ | ✓ | ✓ |
| User5 | ✓ | ✓ | ✓ |
| User6 | ✓ | ✓ | ✓ |

Table 4: User actions

Table 4 shows users' interactions on the paper prototype from the first iteration. The initial two prototypes were not evaluated by users but were simply used as a starting point to get ideas for this paper prototype.

Users got most of the interactions with the system correct from the paper prototype. One problem that did crop up and was noticed from the very start of the testing, was that users did not know what kind of search terms they could use. Some users were still using names of places instead of descriptive words.

| Users | Search | Details |
|-------|--------|---------|
| User1 | ✓ | ✓ |
| User2 | ✓ | ✓ |
| User3 | ✓ | ✓ |
| User4 | ✓ | ✓ |
| User5 | ✓ | ✓ |
| User6 | ✓ | ✓ |

Table 5: User expectations

Table 5 shows whether user expectations and the actual results of the paper prototype were the same. These results were obtained directly from participants by asking them at the end of their interactions with the system.

5.2 Interactive prototypes

5.2.1 Testing

Three interactive prototypes were developed after the testing and evaluations of the paper prototypes. For testing purposes, one-on-one, in-depth interviews were utilized. Users were given a set of tasks to complete while we look over the shoulder and watch.

Some of the things noticed during the interviews were that users struggled with knowing what was meant to be entered in the search bar. Users also found it difficult to bring up details of destinations in the prototypes that used a link instead of the ones with a button.

After the users had done the tasks, they were asked a series of questions for each prototype. The questions they were asked were:

1. What did you appreciate about the website?
2. What was not intuitive about the website?
3. What would you say was missing from the website?
4. What should be excluded from the website that is or currently isn't in the website?
5. Traditional holiday finding vs our implementation?

6. Rate the prototype out of 10?
7. Additional comments??

5.2.2 Results

Tables 6, 7 and 8 show responses given by users after the prototype testing. Table 6 shows responses specific to prototype 1. During the course of evaluations one user noticed that the prototypes did not have a departure city field.

| Response | Frequency |
|---|-----------|
| Results page worked well as a drop down as shown in the appendix of this paper. | 40% |
| Viewing of results was not very intuitive. | 50% |

Table 6: Prprototype1 responses to evaluations

Table 7 shows responses specific to prototype3. Table 8, on the other hand shows responses that are specific to all 3 prototypes.

| Response | Frequency |
|---|-----------|
| Results page looked good mainly because it looked different to conventional results pages from search websites. | 50% |
| Home page had a small search bar in the center that was not easy to see | 80% |

Table 7: Prprototype3 responses to evaluations

| Response | Frequency |
|---|-----------|
| Did not know what type of queries were required in the input bar. | 80% |
| Very uncomplicated and easy to use. | 70% |
| Looked conventional and therefore gave a sense of familiarity. | 50% |
| Prototypes required more images and were too bare. | 90% |
| Not clear what the "more" button does. | 60% |
| should be able to press enter to submit their search queries | 30% |
| No indication of which fields were compulsory and which fields weren't. | 90% |

Table 8: Responses that were similar for all prototypes

5.3 Merged prototype

5.3.1 Testing

The testing for this iteration was exactly the same as that of the interactive prototypes. Users were given tasks and monitored while doing the tasks.

5.3.2 Addressing problems

There were a number of problems from the interactive prototype that needed addressing in the merged prototype. To address the problem of users not knowing what to do, a tool-tip was added next to the search bar as seen in figure 8.

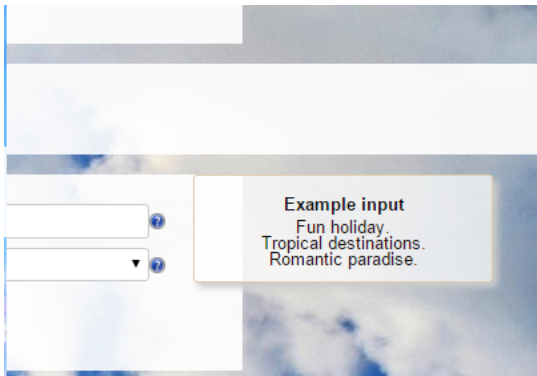


Figure 8: Help tooltip

When a user hovers over the icon tool-tip appears that gives them examples of input text. The same technique has been used for the more button. Due to users not wanting to have to click submit every time they enter a query, users are now also able to submit queries via the enter button.

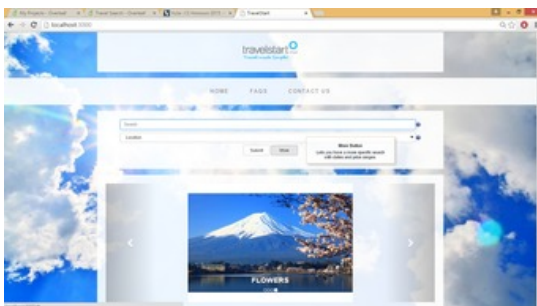


Figure 9: Home screen

As seen in figure 9, a departure city bar drop down was added. Every field that only appear after the "more" button is clicked are optional and these fields can be seen in figure 11. It is not possible to search without the compulsory fields as the search button stays greyed. The lack of images in the interactive prototypes was tackled via a carousel that displays images of exotic destinations. The images slide from right to left accompanied by a caption which acts as a secondary helper for users to get more examples of possible search terms.

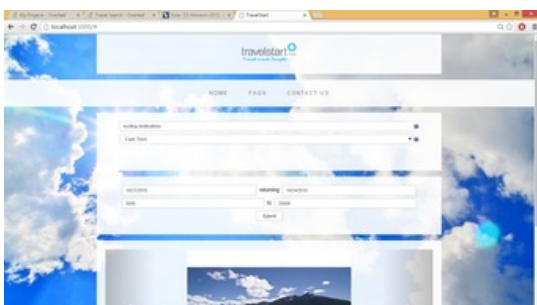


Figure 10: Optional flight details

For the viewing of results in the merged prototype, we used the most popular results page according to user evaluations in the interactive prototype iterations. Figure 11 shows the results page of the merged prototype.



Figure 11: Results page

Due to the "back-end" requirement for ranking results, after the user clicks book, a pop-up banner that covers the entire page appears as shown in figure 12. The banner asks them to rate the relevance of the result out of 5 and enter a phrase that best suits the destination. The user has the option to just skip this.

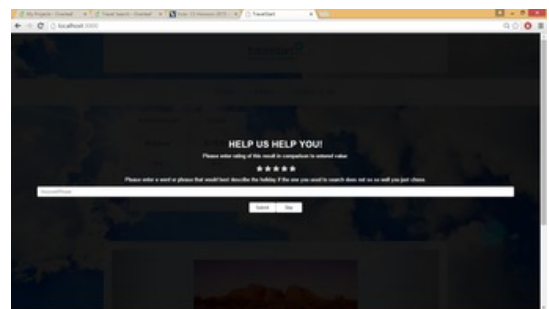


Figure 12: Rating page

5.3.3 Results

Table 9 shows user responses after the testing. Most responses were very positive towards the merged prototype.

| Response | Frequency |
|---|-----------|
| Ease of use of the website was good. | 40% |
| Clean design and does not have adverts. | 30% |
| Pop up for feedback can be annoying. | 30% |
| Reload the page or click on home to go back to the home page. | 40% |

Table 9: Merged prprototype responses to evaluations

5.4 Integrated prototype

5.4.1 Testing

The integrated prototype is the merged prototype with the "back-end" components connected. To test this section we utilized Google Analytics so that we could monitor click

events and general user behavior in the site.

Users were asked to complete a number of tasks and monitored their clicks from start to end. We asked them to:

- Book a flight without using added parameters.
- Book a flight using added parameters.

10 users were asked to navigate the site off these two tasks and Google Tag Manager was used to track clicks which were then recorded for analysis in Google Analytics.

5.4.2 Results

Table 10 shows the path users took to get to booking a flight without using any added parameters such as departure and return date or min and max price. These added parameters are only accessed via the "more" button. Table 11 on the other hand shows results of clicks when users were asked to use the added parameters.

Table 10 shows that non of the users clicked for more parameters by mistake possibly due to the tooltip on the more button that tells them what the button does. Table 10 also shows us that all the users booked successfully and sent feedback to help the developers update the database.

Table 11 shows that people lean towards skipping the feedback pop up than providing feedback. It also shows that fewer people still needed to use the help to get ideas of possible descriptive words.

| Users | Help | Submit | More | Book | Send | Skip |
|-------|------|--------|------|------|------|------|
| U1 | ✓ | ✓ | X | ✓ | ✓ | X |
| U2 | X | ✓ | X | ✓ | ✓ | X |
| U3 | ✓ | ✓ | X | ✓ | ✓ | X |
| U4 | ✓ | ✓ | X | ✓ | ✓ | X |
| U5 | ✓ | ✓ | X | ✓ | ✓ | X |
| U6 | ✓ | ✓ | X | ✓ | ✓ | X |
| U7 | X | ✓ | X | ✓ | X | ✓ |
| U8 | ✓ | ✓ | X | ✓ | ✓ | X |
| U9 | ✓ | ✓ | X | ✓ | ✓ | X |
| U10 | ✓ | ✓ | X | ✓ | X | ✓ |

Table 10: Click events without parameters

| Users | Help | Submit | More | Book | Send | Skip |
|-------|------|--------|------|------|------|------|
| U1 | ✓ | ✓ | ✓ | ✓ | X | ✓ |
| U2 | X | ✓ | ✓ | ✓ | X | ✓ |
| U3 | X | ✓ | ✓ | ✓ | X | ✓ |
| U4 | X | ✓ | ✓ | ✓ | X | ✓ |
| U5 | X | ✓ | ✓ | ✓ | ✓ | X |
| U6 | ✓ | ✓ | ✓ | ✓ | X | ✓ |
| U7 | X | ✓ | ✓ | ✓ | X | ✓ |
| U8 | ✓ | ✓ | ✓ | ✓ | X | ✓ |
| U9 | X | ✓ | ✓ | ✓ | X | ✓ |
| U10 | X | ✓ | ✓ | ✓ | X | ✓ |

Table 11: Click events with parameters

6. DISCUSSION

During the course of this project our main contact at Travelstart was changed a few times. This put strain on the project and led to a testing iteration of the user interface not being done. The goals was to have the website live on the Travelstart website on a trial basis but unfortunately this could not be done.

In this project we saw the effects of iterative development on problem solving. This was very interesting as we saw that the first prototypes had numerous problems according to users. As the iterations more iterations were done, the problems exponentially decreased.

In comparing this user interface to the other holiday planning websites such as TripAdvisor we see that Travelsearch has some similarities to the other websites. There are some differences in functionality, mainly the input bar that takes a descriptive word or phrase as input. A very minimalistic user interface was implemented that users could use very easily with little learning required.

We found that paper prototypes were effective in laying out initial design and clearing up some confusion but very ineffective in sourcing out potential problems with the system. This is as a result of users doing very well with the paper prototypes but in the next iteration, the users did not do particularly well as numerous problems surfaced.

All the user interface requirements were met. An input bar was made and under it a drop down with departure cities. Also implemented were the optional departure and return date as well as the minimum and maximum price bars. Innovation and new user experience were met partially through the results page as the presentation of results is unlike that of other holiday websites.

During the interactive prototypes we saw a very low rate of people getting to book a flight whereas by the last iteration, we saw a 100% booking rate. It also saw 55% of users using the help tooltip.

7. CONCLUSIONS

The Travelsearch website is an easy to use and light website. This is evident in the merged prototype results. We saw user's ability to complete tasks rise to 100% by the end of the project and this shows that the iterative process has to some extent worked.

There are quite a few things that could be done in addition to this project. The first is making the website live and monitoring the performance. Another is making the website fully responsive. This will help with mobile friendliness of the website. Adding hotel finding using the same method would enhance the appeal of the website as a complete holiday planning website. This will also put it in a better position than websites such as TripAdvisor.

8. ACKNOWLEDGMENTS

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APPENDIX

More persona

Name: Susan Zwane

Budget: R50000

Biography: Susan is recently retired and feels it’s now time to see the world after a long career. Susan enjoys relaxing outdoors and reading. She wants to travel to quiet places conjusive for relaxing.

Requirements: Susan would like the system to be clear as to what the next step of the system is. The system must be visually light and clear. Colours must be contrasting to make reading easier.

Name: John and Jane Van Doe

Budget: R20000

Biography: John and Jane are a recently married couple. Their main focus in life currently is paying off their mortgage and setting up their lives. Even though they are saving, they would still like to find a cheap getaway where they can have an exciting holiday.

Requirements: They would like a fun easy to use system that is in line with modern technology. The system must be colourful and full of pictures.

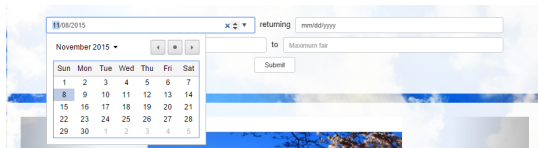


Figure 13: Date selection via calender drop down

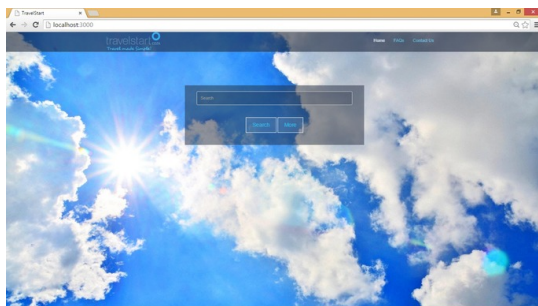


Figure 14: Prototype1: Home screen

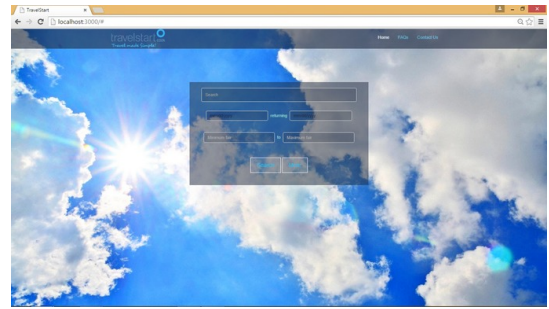


Figure 15: Prototype1: "More"

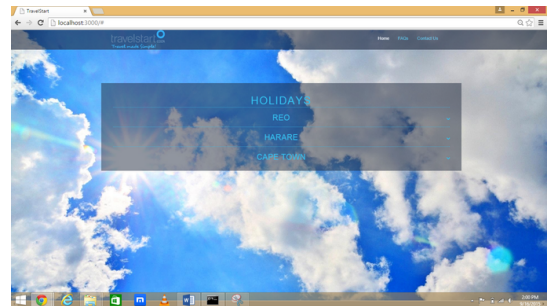


Figure 16: Prototype1: Results page

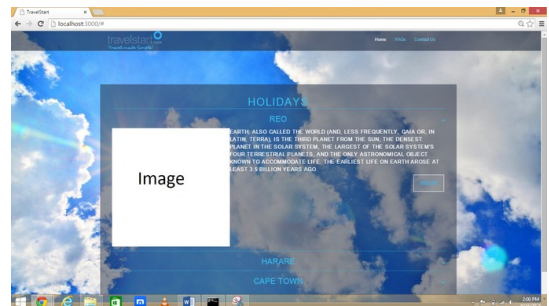


Figure 17: Prototype1: Details

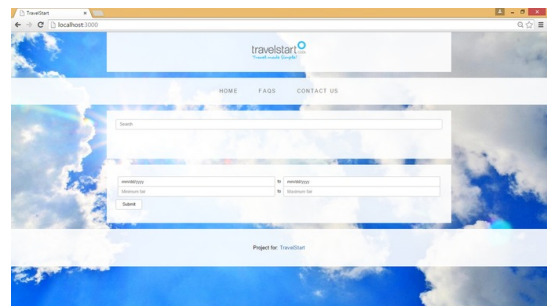
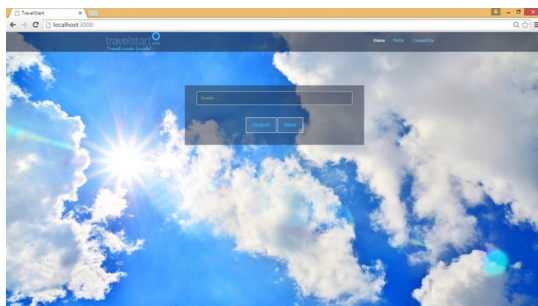


Figure 18: Prototype2: Home screen

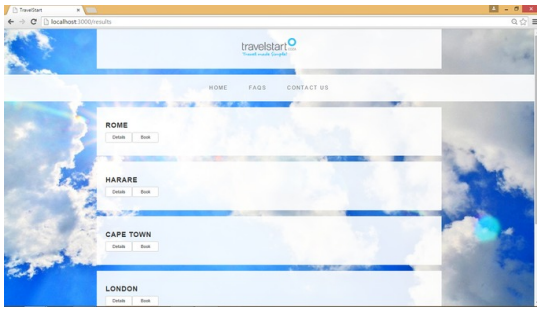


Figure 19: Prototype2: Results page

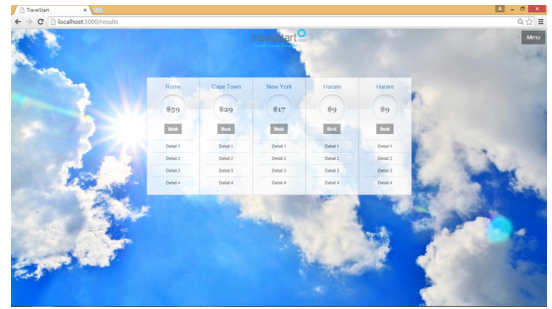


Figure 23: Prototype3: Results page

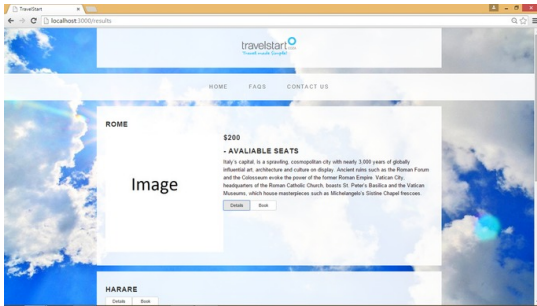


Figure 20: Prototype2: Details



Figure 24: Prototype3: Details

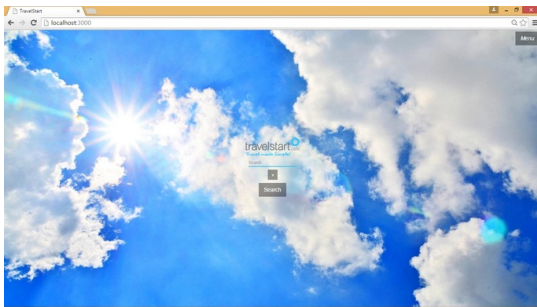


Figure 21: Prototype3: Home screen

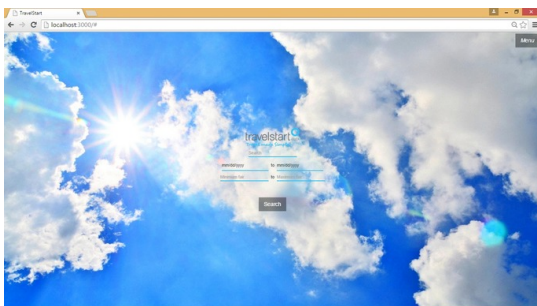


Figure 22: Prototype3: "More"