

Heuristic Usability Evaluation of Websites

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Abstract - As the digital transformation grows at a rapid pace, more and more companies are embracing digital technology and getting accustomed to the new digital landscape. Under this circumstance manufacturing companies should try to expand their services to offer their customers a digital buying experience. As website evaluation tools have started infiltrating the market, the effectiveness of the tools has not reached the levels of pinpointing the usability issues within a website. This paper evaluates the usability of the Spac website as a case study by benchmarking against Spac's top two competitors Competitor 1[C1] and Competitor 2[C2] based on Nielsen's ten usability heuristics[12]. The analysis indicates that the website consists of some usability problems in seven heuristics such as lack of advanced searching for power users, improving existing error prevention mechanism, inability to inform users the waiting time, information not provided in a logical manner, some problems in producing consistent layout, lack of emergency exits within web pages and unsupportive error messages.

Key Words: Usability, Benchmarking, Heuristic evaluation

1. INTRODUCTION

As all industries present in all sectors are digitizing their infrastructure, automated systems are introduced into the workforce, the need to showcase their range of products and services has emerged in order to grab the attention of customers. The website is the best place to build the customer's trust and loyalty. The online presence is an effective way to increase the organization's credibility and establish the brand. Spac, a starch manufacturer, has started its digital transformation journey in 2018 and has a vision of automating most of its machinery by 2025. As part of its digital transformation Spac has a website featuring its product offerings. According to Spac's monthly website visitors statistics there were relatively few enquiries from their main website when compared to the ecommerce websites Spac has subscribed to. In order to understand the root cause of the problem this study is developed to evaluate the usability of the Spac website by benchmarking against two other competitors, based on the ten usability heuristics developed by Nielsen[12]. Based on those, further recommendations are provided to improve their website.

2. Literature Review

2.1 Websites and Design

The rapid growth of the internet has drastically changed the way how people communicate, behave, share and acquire information. Communicating via the internet has become more efficient, convenient and inexpensive. The results from several research suggests that a website's aesthetic, functional and symbolic attributes have a positive impact on the intent to use the website and also influences to have a positive word of mouth[1]. Visual appeal is an important factor for website user experience[2]. Companies which design with focus on trust have a competitive edge over competitors. The website design has a powerful impact on building user's trust over a website and especially the visual aspect plays a big role in capturing a user's first impression[3].

Design thinking is an effective way for designing websites, especially it is highly effective in revealing pain points and arriving at innovative solutions to address those problems[4]. Websites have become the center of communication for almost all businesses with usability being the main factor influencing customer behavior[5]. Purchasing of 2D websites is dramatically increasing and will surpass the brick-and-mortar shops in a few years. Though there is a steep increase in 2D websites, physical shops still have advantages which the websites find it hard to replicate[6].

2.2 Usability, Tools & Benchmarking

Usability is a very important aspect of user experience these days as it is linked to the satisfaction of the users. According to [8] usability is the extent to which a system can be used by users to achieve their goals with effectiveness, efficiency and satisfaction within a framework. Jakob Nielsen says that "learnability", "efficiency", "memorability", "errors" and "satisfaction" as the five attributes the user interface of the system should contain[9,10].

A lot of website evaluation tools are in existence but their effectiveness is questionable. The study conducted by [7] revealed that the tools inspected a lot of aspects including SEO, security, page size, accessibility and performance and further analysis showed that usability was ignored, contradictory scores by different tools over the same website, vague results and overlooking usability issues. Very

few tools have given some recommendations to improve the website. Thus, due to the ambiguity and inconsistency of the evaluation reports provided by website automation tools in previous studies it was decided to go with Nielsen's heuristics[12] for evaluation for this case study.

To perform a comprehensive analysis of the Spac website benchmarking is also used for evaluation along with Nielsen's ten heuristics[12]. Benchmarking is considered to be a managerial approach in order to improve an organization's performance by comparing with similar organizations in the same field to adopt best practices. Internal benchmarking, competitive benchmarking, industry benchmarking and generic benchmarking are the four types of benchmarking[11]. In this project competitive benchmarking is implemented as it is commonly used with competitors in the same industry. Due to the global presence and a long tradition leading starch manufacturers C1 and C2's websites are selected as the best references for the Spac website.

3. Analysis - Evaluation of the Spac website

The Spac website is evaluated by benchmarking against its competitors C1 and C2, according to the ten usability heuristics developed by Nielsen[12]. The findings are as follows:

3.1 Visibility of System Status

Nielsen suggests that users should always be informed by the system and receive proper feedback from the system within reasonable time[12]. The Spac website keep users informed. For example, in their website, "About us", "Products & Services", "Certification & License", "News & Events", "Bidding" and "Contact Us" are available for the users to select. Therefore, the users can know what services are provided and get to have an overall understanding about the company. Similar to the Spac website both C1 and C2 display the services provided by them and a little information about the company.

However, the C1 and C2's websites provide more services than the Spac's one. For instance, C1's website provides the French version for users who are not familiar with English and C2 provides a list of languages classified based on the regions like North America, South America, Asia Pacific and Europe, Middle East, Africa.

The C1 provides a search bar for its users to search for their desired products quickly with subtopics for further classification and C2 has an advanced search bar which brings results which is further classified under 3 subtopics namely "Content & Resources", "Ingredients" and "Technical & SDS Documents". These subtopics can be further classified according to the user's specifications. The search bar functionality cannot be found in the Spac's website.

Moreover, these three websites do not inform users of the waiting time. When loading a website, these three websites do not display a loading icon to let the users wait for a brief moment for all the data and pages to load. The loading icon gets the user's attention in unavoidable times and keeps them stay in the website long enough for the content to load.

3.2 Match between System and Real world

Rather than applying system-oriented terms Nielsen suggested that a system should use the language and concept of the users and follow real world conventions with information in a logical order[12]. The Spac website does quite well in implementing the user's language into the system. It uses plain wordings that users are familiar with such as "Products & Services" means the list of products which are manufactured and ready for shipping, "Bidding" means the space where the deals for the starch prices are fixed, "Call Us Now" means that they are available for direct enquiries through calls, "E-mail Us" means that they attend to enquiries by email and "Social Media" to look for the social presence of the company. The information on C1 and C2 are not quite clear as of Spac's website. For example, the "chat icon" near contact in C1 which may cause users to misunderstand that there is no service to speak to a real person and only chat is possible. The C2 website has a "chat icon" named as "We're away!" which is very close to the person's image which users might misinterpret as a message from the person on the image and skip the chat functionality entirely.

However, the Spac website does not provide all of its information in a logical way. When showing the products & services of the company the industries are ordered randomly. In contrast the websites of C1 and C2 are structured more logically. For instance, the ingredients of C2 are in ascending order and the manufacturing plants available at C1 are arranged in alphabetical order.

3.3 User Control and Freedom

Users often choose system functions by mistake. Nielsen recommends a clearly mentioned "emergency exit" to leave that state and also support users with undo and redo commands. In comparison with C1 and C2's website, Spac has a poor design[12]. For example, every webpage of the Spac website doesn't have the hyperlink enabled to go to the previous sub-category web page rather the hyperlink is enabled to go to the main category.

On the contrary both C1 and C2 websites have done better in user control and freedom. For instance, when the user is under "Fiber enrichment in pet food", the user has the option to go to the "Pet Food" category on the website of C1. Similar method has been provided to the users of C2 where they can go from "Animal Nutrition" to "Categories" by clicking on the hyperlink whereas the users of Spac cannot go back from

“Tapioca Residue” to the “Animal Nutrition” category, it does not provide “emergency exit” on every webpage.

The C1 website displays a home page icon on every webpage which allows the users to immediately exit the state of the website.

3.4 Consistency and Standards

Nielsen proposed to adhere to the industry standards and internal consistency[12]. To a certain extent the Spac website is able to produce consistent layout throughout the site. For example, all the text and icons have a consistent color scheme. However still some flaws can be seen in the Spac website. For example, the social media handles are expected to take users to the intended social media site, here even after multiple clicks the social media handles appear to be static. Users can be confused if the social media icons do not perform the intended action as expected. Moreover, the absence of an “emergency exit” in web pages as discussed in the previous sub section can also be classified as an inconsistency problem.

The same is true for the C1 and C2’s website, both have a consistent layout. Compared with Spac the C1 and C2 have a better design in producing consistent content. For example, different languages will not appear in the same webpage. The LinkedIn handle takes the users to the LinkedIn pages of both the companies.

3.5 Error Prevention

In order to prevent problems, the systems should have a careful design according to Nielsen[12]. The Spac website takes considerable effort in order to prevent input errors. For example, when the email address is incomplete in the enquiry form, a popup appears asking to enter a valid email address. The website of C1 and C2 has features of checking the valid email address format. They also have an additional feature where any accidental errors while typing the phone number, where a signifier in the form of text is displayed in red, which informs the user a mistake is committed. For example, here a random phone number was entered in the field with an alphabet at the end. The submit button was clicked in an attempt to send the details. Both the websites of C1 and C2 displayed signifiers stating, “ the phone number is invalid / only numbers can be used in this field” and hence couldn’t proceed with submitting the form.

The design of the form field has to be improved significantly in Spac’s website. The phone number field in the form was filled with only text, “My phone number” as an experiment. Surprisingly, there were no signifiers stating that the phone number is invalid. The attempt to submit the form was successful with an acknowledgement message stating, “Your inquiry was submitted and will be respond to as soon as possible. Thank you for contacting us”.

It is also noted all three websites lack the functionality where the entered email is checked against the list of active email addresses to avoid spam messages.

3.6 Recognition Rather than Recall

According to Nielsen, the system should make elements, actions and options clear so that the users need not remember the unnecessary information[12]. The Spac website does quite well in this part. For example, the icons of “Call Us Now”, “E-Mail Us” and “Social Media” are visible at the top of each web page. The functionality of the button is very clear and when hovered over, a shadow appears over the button which clearly indicates the selection of the intended button to be selected. The zoom icon in the map feature is big enough to catch users’ attention and use easily. Though there is an option of viewing the maps in the satellite imagery it is too small for the user to notice it for the first time.

Like the Spac website both C1 and C2’s website have good design in this aspect. In the website of C1 the icons of “Sign in”, “Contact”, “EN(language)”, “search icon” are visible at the top of the page. A direct link for the latest “press release” and “online store” is embedded in the carousel slider in the home page so that the users can access the functions quickly. As for the website of C2 the instructions are also very clear for the user. The details related to the company are neatly displayed at the bottom of the web page with hyperlinks enabled. C2 provides an Ingredient finder option where the users can filter the required ingredients category wise and also quick search functionality on the side to get the results faster.

3.7 Flexibility and Efficiency of use

Nielsen suggested that the systems should be designed in such a way that both novice and power users should be able to use the system in an efficient and flexible manner[12]. In comparison with the websites of C1 and C2, Spac website has an inferior design in this part. The Spac website does not offer a search bar for power users to search for their products quickly. Spac website does not provide advanced search functions for expert users: users have to manually go to every drop down and further navigate to their required product. On the other hand, C1 provides a list of advanced classifiers to select a product like filtering products based on “Applications”, “Functional properties”, “Product ranges”, “Brand”, “Number of items per page” and “Order by brand A-Z”. C2 has a similar feature for advanced users by filtering ingredients based on “Application”, “Type” and “Product Family”.

3.8 Aesthetic and Minimalist design

According to Nielsen the system should contain only the information which are relevant to the users and avoid displaying excessive and irrelevant information that will confuse users[12]. The three websites of Spac, C1 and C2

produce a simplistic design with relevant information and without unnecessary information which will distract the user. Simple wordings and easy to navigate classification are utilized in the design.

3.9 Recognize, Diagnose, and Recover from errors

The system should disclose the problems and present users with solutions[12]. Unfortunately, the Spac website is unsatisfactory in this aspect. When the “News & Events” button is clicked it doesn’t go anywhere. After multiple attempts it is understood that it is a static one and it doesn’t perform the intended function. In contrast no such static links were found to be present in the websites of C1 and C2. When a text is entered in the search field a “No Results Found” error message along with a solution, “There is no product found with that name. Please try rephrase your search or alternatively you can contact us” is displayed. The C2 search results brings an error message as “No Results Found”. The error messages in C2 are not supportive and doesn’t help users recover from errors.

3.10 Help and Documentation

According to Nielsen help and documents should be provided by systems which must be easy to search[12]. The Spac website takes effort to provide support to users who have problems. For instance, if users have any enquiries, they can contact Spac through email and phone. They also have the option to send the enquiry through the enquiry form provided. C1 has an enquiry form to support its users. Similarly, C2 has an enquiry form service and have also provided it’s contact details for support.

Table 1 summarizes the above findings.

4. Discussion

Based on the results of our comparative study, it was discovered that the Spac website has three good design features, three average features and four features need further improvement as evaluated based on the usability heuristics. The evaluated result is listed at Table 2.

First, the Spac website should provide an improvement on the factors affecting the visibility of system status, which has been evaluated as average. Spac should also improve its website by making it inform the users of the waiting time and also by displaying a loading icon. Second, the Spac website should match its design with the real world, i.e., to display information in a logical manner. The evaluation result depicts that the website of Spac only has an average standing in this aspect as well. The content will be more logical if the products & services of the company are presented in an ascending or descending order or listed in alphabetical order. This helps users to get a clear picture of the services offered. Third, the social media handles are expected to take users to the respective social media

platform. Thus, Spac has an average standing in maintaining the Consistency and standards aspect. It is better not to display the social media handles if the company is not active in social media rather than confusing the users with an unexpected consequence.

There are four more aspects of the Spac website that require serious attention. The first issue is related to its user control and freedom. The Spac website should pay attention to its user control and freedom. It was found that every webpage of the Spac website doesn’t have the hyperlink enabled to go to the previous web page rather the hyperlink is enabled to go to the main webpage. This will frustrate the user. Thus, by providing an “emergency exit” in the form of enabling hyperlinks the user senses the control and freedom being held with them. Second, the Spac website should improve its error prevention mechanism by checking the validity of the phone number and email address entered. This can further prevent the problem from occurring in the first place. Third, the Spac website should improve in its flexibility and efficiency of use such as offering a search bar for power users to search for their products quickly and by providing advanced search functions for expert users to navigate to the required product quick. Last, but not least, the Spac website should embrace a better approach to help users recognize, diagnose and recover from errors. In other words, the design should provide features that identify the problems faced by the users and provide appropriate solutions/suggestions to the user. At present the error messages can be improved further to help the users recognize and recover from the errors. Therefore, it is suggested to include features to help users recognize the errors without difficulty and provide the solutions. For example, it is a better approach to indicate via a signifier if a functionality is disabled temporarily.

In addition to the above suggestions which are developed based on the findings of the comparative study, it is suggested for Spac to consider further providing more services to its users by including an FAQ section and including images for personas. It is highly recommended to update the digital security certificates on time which increases the users’ trust on the website. Also including a document finder feature to list its various licenses obtained and providing a shopping cart feature where users can directly make payments via Spac’s website. Thus, Spac may consider expanding its services in their website by providing advanced search and enabling easy access to content.

5. Contributions and limitations

This study has significant contributions to both the academics and practitioners. For academics, this study can act as one of the first research studies on the usability evaluation of websites of large Starch manufacturers. This study can guide researchers on applying the usability heuristics framework in the context of evaluating the usability of Starch manufacturer’s websites. For

practitioners this study gives insight into designing better websites for a company which is in the manufacturing space.

Similar to other research, this study also has its limitations. The main limitation is that it is just a case study on Spac’s website and benchmarking against the top two competitors of Spac. Additionally, a single evaluator can find only 35% of the usability problems in an interface[10] and hence it is highly recommended to have three to five evaluators for the best possible results.

For future research direction it is planned to conduct the next phase of the project by using a survey method focusing on usability aspects. The feedback is going to be collected from the users and further look into the usability issues from the user perspective. Through this method the pain points of the users will be taken into consideration and a better designed website will be provided to the users.

Table -1: Summary of the comparison between the websites of the 3 Starch manufacturers studied

Usability heuristics	Spac	Competitor 1	Competitor C2
Visibility of system status	<ul style="list-style-type: none"> ❖ Displays the services being provided ❖ Does not inform users the waiting time 	<ul style="list-style-type: none"> ❖ Displays the services being provided ❖ Does not inform users the waiting time ❖ Provides more services than that of Spac 	<ul style="list-style-type: none"> ❖ Displays the services being provided ❖ Does not inform users the waiting time ❖ Provides more services than that of Spac
Match between system and the real world	<ul style="list-style-type: none"> ❖ Uses plain language that users are familiar with ❖ Does not provide information in a logical manner 	<ul style="list-style-type: none"> ❖ Displays “chat icon” near contact in C1 which makes users misunderstand ❖ Provides information in a logical manner 	<ul style="list-style-type: none"> ❖ Displays “We’re away!”, very close to the person on the image, makes users misinterpret ❖ Provides information in a logical manner
User control and freedom	<ul style="list-style-type: none"> ❖ Does not provide hyperlinks to go to previous web page ❖ Does not provide “emergency exit” on every webpage 	<ul style="list-style-type: none"> ❖ Provides hyperlinks to go to previous web page ❖ Displays homepage icon on every webpage ❖ Provides “emergency exit” on every webpage 	<ul style="list-style-type: none"> ❖ Provides hyperlinks to go to previous web page ❖ Provides “emergency exit” on every webpage
Consistency and standards	<ul style="list-style-type: none"> ❖ Produces consistent standards to an extent 	<ul style="list-style-type: none"> ❖ Produces consistent contents 	<ul style="list-style-type: none"> ❖ Produces consistent contents
Error prevention	<ul style="list-style-type: none"> ❖ Need to improve in designing forms 	<ul style="list-style-type: none"> ❖ Implemented advanced features to check validity of phone number 	<ul style="list-style-type: none"> ❖ Implemented advanced features to check validity of phone number
Recognition rather than recall	<ul style="list-style-type: none"> ❖ Elements, options and instructions are clearly visible 	<ul style="list-style-type: none"> ❖ Elements, options and instructions are clearly visible 	<ul style="list-style-type: none"> ❖ Elements, options and instructions are clearly visible
Flexibility and efficiency of use	<ul style="list-style-type: none"> ❖ Does not provide advanced searching for power users 	<ul style="list-style-type: none"> ❖ Provides advanced searching for power users 	<ul style="list-style-type: none"> ❖ Provides advanced searching for power users
Aesthetic and minimalist design	<ul style="list-style-type: none"> ❖ Produces a simple design with relevant information 	<ul style="list-style-type: none"> ❖ Produces a simple design with relevant information 	<ul style="list-style-type: none"> ❖ Produces a simple design with relevant information

Help users recognize, diagnose, and recover from errors	❖ Unable to indicate the problem and suggest solution	❖ Indicates the problem and suggest solution	❖ Unable to indicate the problem and suggest solution
Help and documentation	❖ Contact information is provided ❖ Enquiry form is available	❖ Provides enquiry form	❖ Contact information is provided ❖ Enquiry form is available

Table 2: Observation on Spac’s website

Good	Average	Need improvement
<ul style="list-style-type: none"> ❖ Recognition rather than recall ❖ Aesthetic and minimalist design ❖ Help and documentation 	<ul style="list-style-type: none"> ❖ Visibility of system status ❖ Match between system and the real world ❖ Consistency and standards 	<ul style="list-style-type: none"> ❖ User control and freedom ❖ Error prevention ❖ Flexibility and efficiency of use ❖ Help users recognize, diagnose, and recover from errors

6. Conclusion

Heuristic evaluation and benchmarking are the two methods implemented to evaluate the usability of the Spac website. The evaluation results shows that Spac’s website has good performance in three usability heuristics, including (i) recognition rather than recall, (ii) aesthetic and minimalist design and (iii) help and documentation. It is also noted that there is plenty of room for improvement for the following issues in the Spac website: (i) informing the users of the waiting time and introducing a loading icon, (ii) information should be displayed in a logical manner, (iii) producing more consistent content, (iv) providing “emergency exit” through hyperlinks, (v) validating form fields for error prevention, (vi) providing advanced search functions for expert users and (vii) provide more helpful error messages. As a result, some suggestions were recommended to enhance the usability of the website. Finally, the contributions and the practical implications of the study, the limitations and the future research directions of the study were discussed. The research will be continued to study user perceptions on these websites and collect their feedback.

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