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Table of Contents

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.....	
Table of Contents.....	
Abstract.....	1
Introduction	1
Part I: Analytical and Empirical Methods for Usability Evaluation	2
Usability Concept	2
Evaluating Usability.....	2

[HUMAN- COMPUTER] [INTERACTION]



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Analytical approach	2
Empirical Approach	3
Choosing Among Methods	3
Usability Testing	4
Strengths.....	4
Weaknesses.....	6
Heuristic Evaluation	7
Strengths.....	8
Weaknesses.....	10
Part II: Heuristic Evaluation of the Usability of a Website	12
Findings.....	12
Selected Heuristics.....	13
Problems description	13
Problem severity, non conformed heuristic and reason for nonconformity	16
Conclusion.....	18
References	18
Appendix	18
Applied Heuristics	18
Snap shots of web site	21

Abstract

Usability is becoming a weighting factor that determines the quality of finished software products (Abran et al., 2003). The increasing number of websites flooding the internet has created the awareness for usability of web applications. According to (Bevan, n.d), an organization only meets its needs when a website meets the needs of its intended users. However, designers most often than not take the end users for granted and assume a software product is easy to use so long as they and their colleagues can use it which is never likely so. (Sharp et al., 2007) identify that, users want interactive products that are effective, efficient, safe, satisfying to use and easy to learn. This is why it is imperative for designers to perform usability evaluation to ensure that software products developed are usable by their intended users and meets their needs.

Introduction

The objective of this paper is achieved with the completion of two main tasks. The first task oversees a brief introduction to the concept of usability. Afterwards, the process of evaluating the usability of software products is discussed and its main approaches are identified. Each approach is then examined together with the criteria for selecting methods. Furthermore, the advantages and disadvantages for one evaluation method from each of the approaches is selected elaborated upon.

The second task involves performing a heuristic usability evaluation on an interactive website using Jakob Nielsen's heuristics. The process identifies usability problems on the website based on the heuristics that are not conformed to. An analysis of the results is then provided and a conclusion is drawn about the overall usability of the website with regards to the perceived severity of the problem identified.

Part I: Analytical and Empirical Methods for Usability Evaluation

Usability Concept

Usability can be defined as the degree of satisfaction, efficiency and effectiveness to attain specified goals by designated users for having used a product in a particular context (ISO, in (Te'eni et al., 2007)). In effect, ISO portrays usability as a means of measuring how easy it is for product interfaces to be used. From Jakob Nielsen's point of view, usability is a quality attribute that is defined by five components namely; learnability, efficiency, memorability, errors and satisfaction (Nielsen, n.d). Nielsen's elaboration informs that, the ease of using a product can be judged by assessing the product based on these five components. The entire process of assessing the product for ease of use is what is referred to as usability evaluation. According to (Te'eni et al., 2007) the foremost criteria evaluators look out for during usability evaluation is whether the product meets the user's needs. Then comes the check for simplicity and how pleased the users of the product are. This exercise helps the developers know where they are faulty so as to fix their faults before products are released and in other situations, to identify areas of improvement.

Evaluating Usability

Considering the role of usability in today's software development process, several methods have been developed to assist its evaluation. These methods can be categorized under two approaches though other authors such as (Baecker et al., 1995) summarizes them into four groups namely; field strategies, experimental strategies, theoretical strategies and responsive strategies. (Baecker et al., 1995)'s classifications however, can be narrowed down into two main approaches as identified by (Faulkner, 1998) to be analytical and empirical approach.

Analytical approach

Analytical approach is an umbrella classification for a collection of evaluation methods that are performed by experts who formally evaluate the tasks and goals of a software product (Sharp et al., 2007). Heuristic evaluation, usability inspection such as cognitive walkthrough, pluralistic walkthrough etc. and predictive models such as Task Semantic-Syntactic-Lexical (TSSL) model

and user model-based analysis are among the many examples of analytical approach (Te'eni et al., 2007).

Empirical Approach

Empirical Approach describes a collection of evaluation methods that require user's participation during the evaluation process. It consists of analyzing user performance through the collection of data and facts while the user interacts with the system (Te'eni et al., 2007). Data collected from such methods are either quantitative in the case of surveys and questionnaires or qualitative as in lab experiments and field studies. Examples include; usability testing, experimental testing, field studies etc.

Choosing Among Methods

There are a number of factors that influence the choice of usability evaluation methods. According to (Dillon, 2001, Arh and Blazic, 2008), the expected information and the stage in products lifecycle when evaluation occurs, play a leading role in the selection of the method. For example; the type of evaluation method chosen when evaluating the usability of the prototype of a product before it is released will be different from that used when evaluating usability after release for upgrade purposes. This is because when evaluating a prototype, the evaluators who may also be part of the design team, look to identify if user requirements have been correctly interpreted and infused into the design. On the other hand where the product is to be upgraded, only specific parts such as navigation attracts focus and hence its lesser scope compared to the case of evaluating a new product. According to (Sharp et al., 2007) the examples above are classified as formative evaluation which is aimed at ascertaining that the product continues to meet users' requirements.

There is however the capability of combining methods to achieve different perspectives. This according to (Sharp et al., 2007) gives a broader picture of how well a products design meets the usability needs and user experience goals that were identified. As specified by (Te'eni et al., 2007), evaluation is a continuous process since products need to be evaluated throughout their lifecycle. There is therefore the need for careful consideration when it comes to choosing a method for usability evaluation. The pros and cons of each desired method has to be weighed against resources available so as to enable the selection of a method or methods that will provide the truest estimate and yet suitable for the evaluators standards and resources (Dillon, 2001). The

following paragraph covers the selection of one method from each of the two approaches stated and weighs out their advantages and disadvantages.

Usability Testing

Usability testing is a method of evaluating the usability of a product by testing it on the intended users (Faulkner, 1998). The most reliable way to estimate applications usability is to measure users' performance on a set of pre-defined tasks (Mitchell, 2005). This allows for the examination of how adequate, the product supports the intended users in their work. (Sharp et al., 2007) also identified that, using this method at the concluding stages of design ensures consistency in navigation structure, use of terms and how the system responds to the user. Usability testing can be broken down in to two basic approaches; *comparative usability testing* which involves testing a systems design or performance by comparing it to an existing similar system and *absolute or Explorative usability testing* where a new product is tested in isolation usually before release (Faulkner, 1998). The process of usability testing is usually carried out in a laboratory where users are isolated from all forms of external interruptions such as phone calls, talking to colleagues, etc (Mitchell, 2005). The users are then asked to perform a set of tasks with the system being evaluated. Records of the number and kind of errors made are recorded including the speed of completion. The entire process may be recorded on video and deductions made thereafter. Besides fulfilling the tasks, users are also interviewed or presented with a satisfaction questionnaire to gather their views of the system. In some cases as stated by (Dillon, 2001), users are asked to view the recorded video and evaluate their own performance, describing their perceptions and actions in more detail.

Ideally, a usability testing evaluation may involve large number of users with the intention to uncover all defects but this is a likely waste of resource as identified by (Nielsen, 2000). Nielsen however recommends no more than 5 users at a go during a usability testing process. Based on his study (Nielsen, 2000), tests would uncover and fix more errors when run in small samples iteratively. (Turner et al., 2006) adds to Nielsen's study by arguing that, how much sample size is enough vehemently depends on the type of errors to be uncovered and its likely rate of occurrence. However, (Sauro, 2010) sums up their findings and with further studies, concludes that the 5 users rule for testing only applies to discovering problems and thus isn't suitable for comparing interfaces or estimating a task completion time or completion rate. Applying usability testing on a product through its lifecycle can be of many advantages, some of which are identified below

Strengths

1. Generates accurate feedback of problems

The quality of the finished product depends on those who are going to use it. Once it satisfies their usability needs, you can be rest assured your job is well done. The involvement of users in usability testing is the source its richness in feedback. It allows the evaluators to gather insightful feedback on the spot. Evaluators are adequately informed of what the actual problems users will encounter when using the product. Hence, usability testing is a trusted technique for gathering quality feedback that help evaluators improve users' interactive experience (Blast, n.d).

2. Estimates usability in a more realistic manner

Unlike other evaluation methods that adopt expert based methods to identify usability issues, usability testing is a real life scenario of users actually using the product. This estimates usability in a more realistic sense instead of experts who assume user roles. The reality nature of this technique measures users' behavior thereby enabling evaluators to understand and better support users motivation and goals (Blast, n.d).

3. Can be modified to fit other types of testing

Usability testing does not only look out for interface design issues as usually perceived. As Nielsen's defines it, a usable system must be easy to learn, work productively with minimum resource wasted, easy to memorize, free from errors and satisfying to users at an acceptable level (Nielsen, n.d). Applying usability testing to evaluate ease of use of a product does not only measure its interface structure, it is capable of being modified to test functions, system integration, unit testing, smoke testing etc. the objective of usability testing is however kept in mind to ensure that every aspect of usability is evaluated (Parekh, n.d).

4. Easy to apply since it reveals what real tasks the users embark upon.

Usability testing does not require experts to test the product though expert testers would produce outstanding results besides not just identifying problems but solutions as well. Selecting users for usability testing does not require any intrinsic task since any user that falls within the mass of intended users, qualify. This widens the choice of users for evaluation without compromising quality as well as making the method

very easy to apply. The capability to choose normal testers as compared to expert testers can prove to be cost effective.

5. Capable of highlighting difficulties in real life usage.

Developers are not perfect. It is not likely that a product can be developed without difficulties the first time which why there is the need to test and be certain. Usability testing with users' involvement is capable of uncovering potential bugs and product fallacies which have escaped developers (Parekh, n.d). For example what developers may consider to be a flashy design or creativity might turn out to be a problem for users.

Weaknesses

Despite having numerous advantages there are few disadvantages that can be noted with this method, some of which include:

1. Testing does not fully comply with real life scenarios

For example the environmental factors that would be present in the testing lab may not be the same as that of what the users may have at their comfort. As McGregor puts it, a mother will not have her two children running around like she would have at home (McGregor, 2008). Furthermore the test procedure may not cover all types of user groups.

2. Costly

Usability testing is carried out in laboratories. Embarking on a usability testing session requires a preparation of environment. The cost involved in setting up the environment can be considerably enormous. Though very effective, it is rated as one of the most expensive methods of usability evaluation (Kern, 2008). A study which involved the comparison of two evaluation methods against several system found that, the usability testing method is more costly as compared to heuristic evaluation (Milszus, 1999).

3. The presence of observers may affect the users behavior

Unless users are expert testers, the presence of evaluators that observe users while they test the product is likely to spark some edginess within users which

consequently affects user behavior. For example users are likely to commit errors when rushing to complete tasks with the intention of impressing the evaluators. Such inconsistent user behavior is likely to affect data collected.

4. Usually require a prototype when performed on a new product

Unlike heuristic evaluation that can be employed throughout the development lifecycle of a new product, usability testing can only be carried out with the existence of a working prototype. For example evaluating the analysis and design of a product at the elaboration phase of a product lifecycle with usability testing requires a working prototype to be developed whereas an expert with a heuristic evaluation method can identify usability flaws without the need for a prototype.

5. Time consuming

One of the factors that influence the choice of evaluation methods is how long it takes for results to be gathered. The laboratory nature of usability testing requires testing to be done one after the other. The sequential form of evaluation takes a long time to complete. Results gathered from the evaluation need to be analyzed afterwards adding more time to the duration of the total evaluation process. A comparison of methods by (Jeffries et al., 1991), in (Dumas and Redish, 1999) pointed out that, a heuristic evaluation session that consisted of four experts took 20 hours to complete whereas that with usability testing on the same system took 200 hours. Wolfgang Milszus also stresses this point in his research as it is seen that an evaluation session that took 19 days with heuristic method lasted 56 days with usability testing method (Milszus, 1999). Beyond all reasonable doubts it can be ascertained that usability testing is more time consuming as compared to other methods

Heuristic Evaluation

It is sometimes difficult finding users fit for usability testing nonetheless the cost and time involved. In such cases, experts are the best available option adopted to produce feedback on the usability of a product. Experts are people who have strong background experience in HCI (Sharp et al., 2007). These experts perform inspections on interactive systems based on a set of guide lines they are provided with and identify problems users would have when using the system. They sometimes play the role of the users to achieve this task. The method of performing inspections

on the system is referred to as heuristic evaluation and the guidelines used there in are the *heuristics* (Sharp et al., 2007, Mitchell, 2005)

According to (Te'eni et al., 2007), heuristic evaluation has become the widely accepted usability inspection method owing to its ease of application, low cost, applicability in early stages of development process and generation of effective evaluation without need for professional evaluators. The technique covers evaluation of user interface elements such as dialog boxes, menus, navigation structure, etc. When conducting the evaluation, a set of heuristics are adopted with relevance to the product being evaluated. The experts are then briefed on what to do having been provided with prepared scripts as a guide. During evaluation, the expert spends time inspecting the product according to the heuristics provided. Several experts take turns evaluating the system and sometimes have to assume users' role depending on the product and stage in development process (Te'eni et al., 2007). A debriefing session is then conducted in which experts discuss problems discovered, prioritize them and come up with solutions. There are varieties of heuristics to choose from, for example; Nielsen's ten usability heuristics (Nielsen, 1994b), Norman's rules from Design of Everyday Things (Norman, 1998), Tognazzini's sixteen principles (Tognazzini, 1992), Shneiderman's eight golden rules (Shneiderman and Hochheiser, 2001) etc. The choice of heuristics selected varies among products however, most of these heuristics share similar views but are different in the organization of the way they operate (Miller, 2010). Jakob Nielsen and his colleagues were the pioneers of the heuristic evaluation method which was first developed in 1990 (Sharp et al., 2007). A revised version of this heuristic list can be found at the Useit.com website (Nielsen, 2005).

According to (Sharp et al., 2007), an evaluation session using this method should involve about three to five evaluators as one evaluator is certainly not likely to identify all problems. Adequate evidence provided by (Nielsen, 1994b) proves that, five evaluators are enough to determine 75 percent of usability problems (Te'eni et al., 2007, Sharp et al., 2007). Some advantages of heuristic evaluation are listed below.

Strengths

1. Very flexible

One of the prime advantages of heuristic evaluation is its capability of being applied at early stages in the design of a product lifecycle. According to (Nielsen and Molich, 1990), heuristic usability evaluation can be used at the specification stages of a product lifecycle to help determine the choice of design approaches to adopt.

Evaluation may occur any stage of a products life cycle e.g. mock-up, prototype, and final product. Applying heuristic evaluations as the first of a two face usability effort can greatly complement the subsequent usability testing, by uncovering obvious errors allowing the later to dig out more intricate usability problems hence yielding effective results (Blandford et al., 2008).

2. Does not require expert evaluators

A study conducted by (Nielsen and Molich, 1990) that involved four experiments with some non-expert evaluators found out that some evaluators performed better than others. This according to Nielsen could lead to concluding that expert evaluators outperformed non-experts. However, results from the study showed that, non-expert evaluators were capable of finding hard problems where as experts in some cases overlooked easy problems (Nielsen and Molich, 1990). This asserts the fact that heuristic evaluation does not require formal usability training of evaluators.

3. More Cost Efficient

Unlike usability testing, heuristic evaluation does not require a lab setting nor is there the need for users thereby saving the cost acquiring those resources. According to Nielsen, the cost-benefit analysis of heuristic evaluation can be assessed from two dimensions. First, the cost involved in terms of time spent conducting the evaluation and second, the benefits in terms of less development cost for redesign (Nielsen, 1994a). (Dumas and Redish, 1999) also revealed that the calculation of the cost benefit analysis of four methods found heuristic evaluation to yield the most payoffs. Heuristic evaluation being so efficient at gathering evaluation results as compared to other evaluation methods makes it a better choice when time and resources are lacking (Kantner and Rosenbaum, 1997)

4. More Time Efficient

According to (Kantner and Rosenbaum, 1997), heuristic evaluation turns out to be of more value when there is no time to spare. The process involved in performing heuristic evaluation is what complements its time efficiency. Unlike usability testing where each user has to be monitored while testing the system and afterwards the collective data analyzed, heuristic evaluation only requires experts to review and analyze the system at once, without having to add any additional tasks. Given the

number of users that need to be evaluated, each at a time while using the system, as compared to the single expert that assumes users role, heuristic evaluation is by far the most time efficient, compared to usability testing and other evaluation methods (Mack and Nielsen, 1994).

5. Identifies More Problems

Experts who conduct heuristic evaluation follow a set of accepted heuristics to assess the usability of the software product. These evaluators have gained substantial knowledge and experiences from other usability studies and are capable of assuming the role of users in the identification of problems as well as recommend solutions. A study by (Jeffries et al., 1991) which compared the effectiveness of several evaluation methods found heuristic evaluation to be the most effective at uncovering problems having identified 105 problems compared to walkthrough and usability testing that dug out 35 and 31 problems respectively (Dumas and Redish, 1999).

Weaknesses

1. Lacks actual user feedback

The criticizing nature of heuristic evaluation that follows the set guidelines provided for evaluating the product produces results that lack actual user responses. This is due to the lack of real users since evaluators rather assume the role of the real user. This however results in the identification of problems that can hardly be identified as usability problems.

2. Likely to report false problems

Owing to the lack of actual users undertaking the evaluation, problems identified have the likelihood of being falsely presented as usability issues. This is because what the expert might consider a flaw may not relate to the tasks users carry out in actuality when using the system.

3. Lacks direct suggestions to solving problems

Usability experts may not be able to provide direct solutions to usability problems identified since lack of users involvement in the evaluation omits their behavioral traits that help at fashioning the solution.

4. Suggested solutions may not cover usability issues

Even though evaluators may suggest solutions to some usability problems, these solution may rarely solve usability issues. This explains the fact that evaluators cannot explicitly assume the role of users in highlighting solutions to the problems.

5. Non-experts may not identify as much problems as will expert evaluators

Even though heuristic evaluation does not require any formal usability training of evaluators, the use of non-experts is demeaning to the quality of faults identified. Lack of experience and substantial knowledge by non-experts is likely to lead to only a partial evaluation since some of the problems may not be identified.

Part II: Heuristic Evaluation of the Usability of a Website

Case Study: ghanaairports.com.gh

Ghanaairports.com.gh is a knowledge base website that offers its users an enriched source of information about all flight related services in Ghana airports. It serves as an information base where users can interact with the system to enable them access travel and airline information, flight schedules, hotel, cargo and ground services ranging from dining areas and shopping centers. Their service is targeted at tourists that look to discover Ghana in its many forms.

This study evaluates the usability of the ghanaairports.com.gh website using the heuristic evaluation method presented earlier on in this paper. The evaluation is carried out by following set of steps and guidelines that model the evaluation procedure and keeps it on track. These steps are outlined below:

1. The heuristics for evaluating the website is first identified and adapted to fit the scenario.
2. The evaluator according to his experience assesses the website and identifies functions and features of the website that violates the criteria of the set heuristics.
3. The functions and features that violate the heuristics are recorded and grouped under problem elements.
4. Each problem is given a brief description in terms of severity, the particular heuristic that the problem violates and a brief explanation as to why it does not comply with the heuristic.
5. Finally, problems identified are summarized into an evaluation outcome and the overall usability of the website is discussed with respect to perceived severity of the problems reported.

Findings

The evaluation of the Ghana airports website using Nielsen's heuristics produced some fascinating results. Problems identified were classified according to severity in that, a severe problem is likely to make users leave the website and not want to return whereas less severe

problems depicted issues that users could put up with. The findings from the evaluation are elaborated in the tables below.

Selected Heuristics

The heuristics applied are adopted from Jakob Nielsen's ten usability heuristics retrieved from useit.com, accessed November 2010. A summary of the applied heuristics is presented in the appendix.

Problems description

No	Brief Description	Difficulty caused to user
<i>Interface Design</i>		
1	The home page is particularly cluttered with graphics and flash animation. Flashing images at the header of the page also adds to page load time when subsequent pages are being loaded. Refer to figure 1 in the appendix.	An analysis of the website with GTMetrix software showed a total page load time of 20.02 seconds. Long page load times results in user frustration and the tendency that users will leave the site since the accepted wait time is rated between 5-8 seconds (WebSiteOptimization, 2008). Flash items on the page also lead to distractions among users which might result in errors in completion of tasks.
2	The website has bad color combinations of white, pale blue and grey. Items on the page are compact nature of the website has led to substantial reduction in the size of text, making text appear very small and difficult to read. The combination of both problems might prove very challenging to users who are color blind and have eye defects.	The color combinations were great at displaying a bright and colorful interface. However, the use of grey text which almost blends with the background makes it difficulties for users to read text.
3	The navigation buttons on the left column of the website is noticed to have all buttons appearing in the same size	Improper identification of navigation items frustrates users and makes it difficult

	<p>and color. However some buttons do not load any page. These buttons supposedly are headings to the subsequent buttons. This indication is not clear enough and may have users clicking on the heading buttons expecting some page to load. Some buttons are left blank and some pictures displayed below them. Callouts labeled 3 and 5 of figure 2 in the appendix elaborates further</p>	<p>for them to figure out where they can go from the homepage and how to get back to the home page (Walker, 2009).</p>
Navigation		
4	<p>The navigation buttons that appear on the left hand side of the website appear very tiny. Besides, there is no color change when clicking among buttons. Though there is a heading that identifies which page users are on, however, there is no indication in the navigation column to support the available information. Callout labeled 4 in figure 2 of the appendix explains further.</p>	<p>Users find it difficult knowing their whereabouts on the website. That is they can't figure out where they are and in turn get frustrated (Wheeler, 2008). They may also end up leaving the website as a result of frustration.</p>
5	<p>The website follows a convention of highlighting text in orange color and underlying it to represent a link to important information. It is however noticeable that some text that appear in this convention are not hyperlinked. Moving the mouse over them displays an insertion point figure. There is a dead link in the travel information page this link that is supposed to provide additional information to users displays "This webpage is not available" when clicked. Callout labeled 6 in figure 2 of the appendix explains further.</p>	<p>Nonresponsive links or links that display page cannot be displayed frustrates users and encourage them to leave the website (Meyers, n.d)</p>
6	<p>The "Flight Schedule [Live]" navigation button leads to an entirely different page without informing users before the action is carried out. Users are also not provided with any exit option to return to the previous page.</p>	<p>An informative website is supposed to inform users when a link they click will lead to a different page all together. This according to (Nielsen and Molich, 1990) helps in the prevention of user frustration due to error should in case the user is in</p>

		the middle of a task.
Information Architecture		
7	Too much information is packed on the homepage and in very small bits. Users would have to pay close attention and look carefully to identify what they want. The font in which the information is displayed is also too small which could make it difficult to view.	Congestion of information on the homepage lacks direction and guidance for users. Users may find it difficult finding information on the page and can easily lose focus.
8	Important information that remains hidden on the website is the contact information that appears at the top of the page close to “About Us”. When the homepage is loaded, it is noticed that the link “Contact Us” is displayed. However when users navigate to other pages, the link disappears. Callout labeled 2 in figure 2 of the appendix explains in more detail.	Inaccessible feature of the website frustrates users and may lead to them leaving the website.
Functionality		
9	Considering the informative nature of the website, the unavailability of a search function throughout the website poses as a problem to users who wish to find information or help in context. Likewise lack of search function, there is no help and FAQ function to assist users in finding help when they encounter any problem.	Users find it difficult searching for items, looking for help and accessing information In the FAQ column. This difficulty may lead to them leaving the website.
Language		
10	The language used throughout the website is clear, consistent and without jargons. However, some information portrayed may sound confusing to users. For example: the “airport selection” displayed at the top right corner of the page sounds ambiguous. The phrase “Select an airport” or “selected airport” would be much meaningful and doubtless. Callout labeled 1 in figure 2 of the appendix explains in more detail.	Users find it difficult understanding what is being portrayed on the website. This results in them guessing and performing wrong actions which in turn cause frustration.

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Problem severity, non conformed heuristic and reason for nonconformity

The severity of each problem is classified as being High, Medium or Low. A high severity depicts that the associate problem seriously impairs usability of the website. Medium severity means that problem causes annoyance in usability of the website whereas low severity depicts minor issues such as coloring, layouts etc. The heuristic that the problem pertains to is identified and rated in terms of severity. A reason why the problem is judged not to conformance with the heuristic is also provided.

Problem No	Severity	Heuristic not conformed to	Reason for nonconformity
<i>Interface Design</i>			
1	High	Flexibility and efficiency of use	The long time it takes for the webpage to load renders it inefficient. This according to Nielsen's heuristics is a bad design practice.
2	Low	Consistency and standards	The use of grey text which almost blends with the webpage background makes it difficult for users to read text. This is considered a typographical flaw and certainly does not correspond with Nielsen's heuristic of consistency and standards (Boulton, 2005).
3	Medium	Visibility of system status	The webpage lacks proper identification of navigation. This in effect fails to inform users about what is going on in the system and as such violates Nielsen's heuristic that requires a system to provide appropriate feedback within reasonable time.
<i>Navigation</i>			
4	Medium	Visibility of system status	Due to difficulty encountered by users locating their whereabouts with the system, the system is considered to have flawed Nielsen's heuristic of

Human-Computer interaction

			visibility of system status.
5	Low	Consistency and standards	The webpage is noted to contain some dead or nonresponsive links which leaves users wondering. This violates Nielsen's heuristics of consistency and standards rendering the website less easy to use.
	Low	Help users recognize, diagnose, and recover from errors	The website fails at helping users recover from a page load error. No meaningful message is displayed that neither indicates the error nor provide a solution.
6	Medium	Error prevention	The website fails at informing users before redirecting them to external websites. This shows that the system does not prevent a problem from occurring in the first place and is in violation of Nielsen's error prevention heuristics.
	Medium	User control and freedom	Regardless that users are not informed before page redirection, there should be a clearly marked exit according to Nielsen's heuristic to help users leave the page. This website however does not comply with this heuristic since no clearly marked exit is provided.
Information Architecture			
7	Medium	Aesthetic and minimalist design	The highly congested nature of graphics and information on the homepage lacking direction and guidance for users violates aesthetic and minimalist design heuristics. The extra units of information provided masks the relative visibility of relevant information.
8	High	Visibility of system status	The unavailability of the "Contact us" link on all pages besides the homepage keeps vital information from users and as such does not comply with Nielsen's heuristic of visibility of

			system status.
Functionality			
9	Low	Recognition rather than recall	The systems lack of an FAQ, help and search function displays its lack of instructions for users that can easily be accessed.
	Medium	Help and documentation	The systems lack of an FAQ, help and search function displays its defectiveness in terms of providing help and documentation to users.
Language			
10	Low	Match between system and real world	Failure of the system to provide information in understandable terms for the user in the case of the “airport selection” violates the heuristics that requires a match between system and real world.

Conclusion

The evaluation of the ghanaairports.com.gh website using usability heuristic evaluation method found that, very few problems were of major concern whereas an unacceptable lot were of minor issues. It can therefore be concluded that the overall usability of the general website is of average quality. The implementation of standard layouts with navigation menu on the left, organization’s information at the top and content in the middle makes the website easy to navigate and access information. The use of short wave length colors such as blue and green also makes the website appealing though masking text in some cases. However, this cannot be a resting ground for too long as the number of minor issues detected depicts lot of room for improvement. Issues that ranked high severity though very little but have the tendency of making users leave the website and not return. It is advised that high ranking issues be dealt with as soon as possible to prevent loss of traffic to the website.

References

Appendix

Applied Heuristics

The applied heuristics adopted and summarized from Jakob Nielsen's heuristics.

1. Visibility of system status:

Inform users through appropriate feedback as to what is happening and within reasonable time.

2. Match between system and real world:

Provide information in natural and logical order with simple language that users are familiar with and can understand.

3. User control and freedom:

Provide users with a clearly marked option to leave any unwanted state without further complications.

4. Consistency and standards:

Use words, situations, or actions that are not ambiguous, leaving users wondering or guessing. Website should follow standard conventions.

5. Error prevention:

Present users with a confirmation option before they commit to any action. Errors should be prevented by checking users' actions to prevent a problem before it occurs. In an event of an error, users should be informed through good error messages.

6. Recognition rather than recall:

Make actions, options and objects visible to reduce users' memory load. Instructions for using features should be visible or easy to retrieve when needed.

7. Flexibility and efficiency of use:

Be flexible enough to support activities of the experienced user and the novice user. It should be efficient at supporting the experienced user with accelerators and allow users to customize frequent actions.

8. Aesthetic and minimalist design:

Ensure every aspect of information provided in dialogues is relevant in that particular context.

9. Help users recognize, diagnose, and recover from errors:

Ensure error messages are precise at indicating problem, displayed in plain language rather than codes and suggest a solution that is useful and purposeful.

10. Help and documentation:

Ensure the website provides some sort of help and documentation which should be easy to find and be precise at providing steps towards users.

Snap shots of web site



Figure 1: Ghana Airports Homepage retrieve from (<http://www.ghanaairports.com.gh/>) on November 20

The image shows a screenshot of the Ghana Airports website with six callouts highlighting usability issues:

- 1:** Statement not meaningful and leaves users perplexed about what is being portrayed.
- 2:** "Contact Us" link does not appear on subsequent pages except the home page.
- 3:** This button supposedly represents a heading for the buttons below. However, there is no difference between the heading button and the subsequent buttons.
- 4:** There is no indication on the navigation menu to alert users as to which page they are on or is opened.
- 5:** Button has no label and pictures displayed below it have no indications as to what they can be used for.
- 6:** Dead link embedded on page. Clicking this link displays an error page. See Fig 3

The website content includes a navigation menu with items like "Travel Information", "Airline Information", "Flight Schedules[Live]", "Ground Services", "Cargo Services", "Hotel Services", "Dining & Shopping", and "Discover Ghana". A central "Travel Information [Security]" section discusses baggage safety and lists rules for passengers. A sidebar on the right features "Travel Highlights" and "Safety Awareness" information. A footer contains copyright information for Ghana Airports Company Limited, 2007.

Figure 2: Snapshot of Ghana airlines page with problems identified

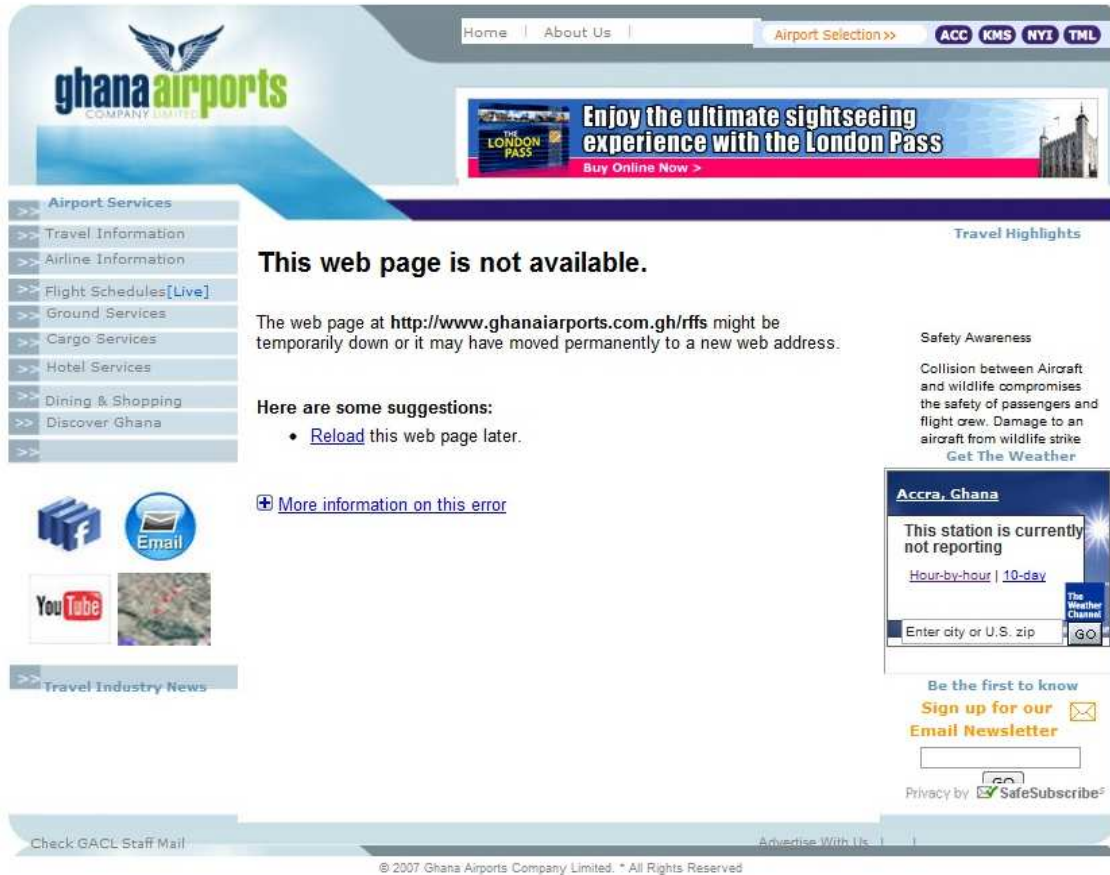


Figure 3: Error page on Ghana airways website



Figure 4: Snapshot of results from GTmetrix's analysis of Ghana airways page load time retrieved from <http://gtmetrix.com/reports/www.ghanaiairports.com.gh/hHaygsMq> on November 20.

