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International Journal of Digital Information and Wireless Communications (IJDIWC) 5(1): 75-81
The Society of Digital Information and Wireless Communications, 2015 (ISSN: 2225-658X)

Design, Development and Usability Evaluation of an Online Web-based Lost and Found System

Emad Bataineh
College of Technological Innovation, Zayed University
Emad.Bataineh@zu.ac.ae

Bilal Bataineh
Huraymila College of Sceince and Humanties, Shaqra University
BBataineh@su.edu.sa

Shama Al Kindi
College of Information Technology, Zayed University
.aeShama.Alkindi@zu.ac

ABSTRACT

Losing your personal belongings can be a very frustrating experience. The main goal of this research paper is to address the lost and found issues by automating all the manual steps involved in the current practice and procedures at educational institutions. An online web-based lost and found system was planned, designed, implemented, and evaluated. The researcher used several technology tools to develop the new system. In addition, an eye tracking-based usability study was planned, designed and conducted on the new system to assess its effectiveness, efficiency, usefulness, and usability aspects. The eye tracking data were recorded, collected and analyzed. The findings from the usability study indicate that students were very satisfied with the functionality, effectiveness and efficiency of the system as well as pleased with the quality of its user experience. So, having such a new system deployed on campus will be of great beneficiary for students at higher education institutions.

KEYWORDS

Web-based system, System implementation, Usability evaluation, Eye tracking methodology, User experience.

1 INTRODUCTION

Losing your personal belongings can be a very frustrating experience. But, with an effective lost and found system, all your important items like keys, mobile phones, digital cameras, laptops, wallets, i-pods, briefcases, handbags and others, will find their way safely back to you. Therefore, as group of undergraduate students at the College of Information Technology, have decided as capstone project to design and develop a new Web-based Lost and Found System to be used by Zayed University community members, so they can report their lost and found items in an easy and efficient manner.

Lost and found system is one of the useful system that helps many companies, banks, airports, and educational institutions. At Zayed University there is a pressing need for an an effective lost and found system due to the large number of lost item incidents taken place on campus. So, the new system will benefit all members of Zayed University including students, faculty, staffs and administrators. In addition, the system will make the task easier for the security personnel and the staffs in the lost and found office by saving their time and effort. Some students in the university do not know where to find their lost items, so the lost and found system will assist them to find lost items in a quick and simple way.

The main purpose of this research paper is to address the lost and found issues on campus by automating all the steps involved in the current practice and procedure. The research methodology

included, literature review (study and explore related systems), survey design, examine the existing paper-based system, design and implement the new system, and finally conduct an eye tracking-based testing evaluation. As a result an online web-based lost and found system was planned, designed, implemented, and evaluated. The main system components and architecture are also provided.

A fully functional prototype of the system was developed to provide the users with an opportunity to experience using its main features and functions. The system is designed to be simple and easy to use and learn, and it can be accessed online by all university students, faculty, and administrators from anywhere on campus and off campus. The researcher used several technology tools to develop the new system such as XAMPP, Dreamweaver, Adobe PhotoShop, Adobe Image Ready, Tobii Studio, HTML, MSQL, PHP and JavaScript. The reason for choosing these tools is that the researcher is comfortable and proficient in using them.

A complete eye tracking-based usability evaluation study was planned, designed and conducted on the new system to measure its effectiveness, efficiency, usefulness, and usability aspects. An eye tracking data were recorded and collected from observing participants (students and staff) and later analyzed. The results from the usability study indicate that users were very satisfied with the functionality of the system as well as pleased with the quality of its user interface design. So, having such a new system deployed in place will be great addition for Zayed University community.

The research paper consists of several sections, including literature review of related systems, survey design, study the existing paper-based system, design the new system, system implementation, and eye tracking-based testing evaluation and finally a section for results and findings followed by a conclusion.

2 RELATED SYSTEMS

An extensive literature review study was conducted to provide a handy guidlines to understand the major functions and features of an existing lost and found systems. Nowadays, lost and found systems are deployed in many work and study places, such as schools, colleges, airports, hospitals, amusement and parks, shopping malls, hotels, and transportation services. The researchers came across several similar systems which were found and already depoloyed in various educational institutions, such as James Madison University and Clarkson University, USA, Ngee Ann Polytechnic University Singapore and Sydney University, Australia. To the best of our knowledge no such system has been found in any of the universities in the Arabian Gulf region.[4], [5], [6], [7], [8], [9]

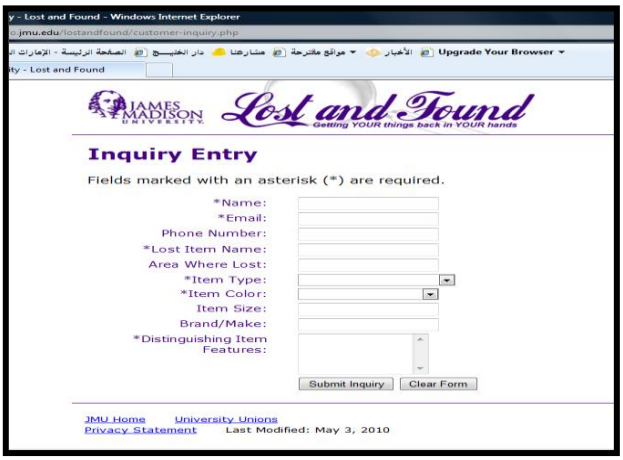
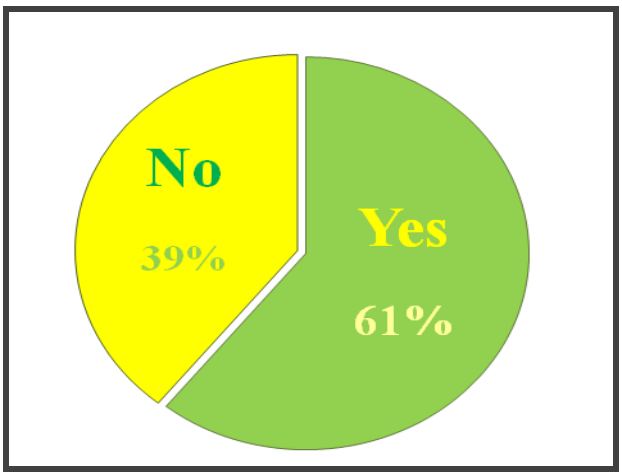


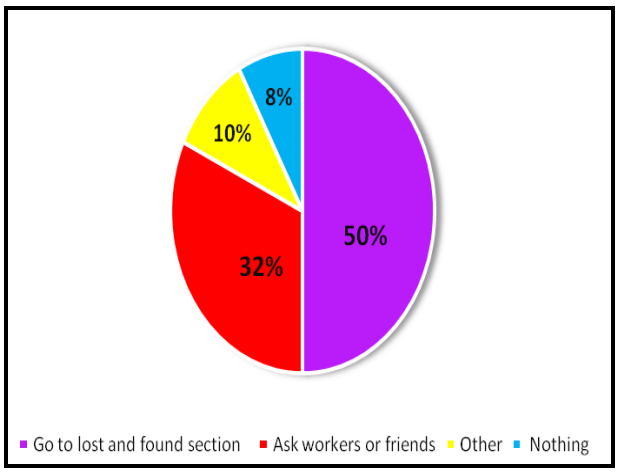
Figure 1. James Madison Lost & Found sample screen [6]

3 SYSTEM DESIGN AND ORGANIZATION

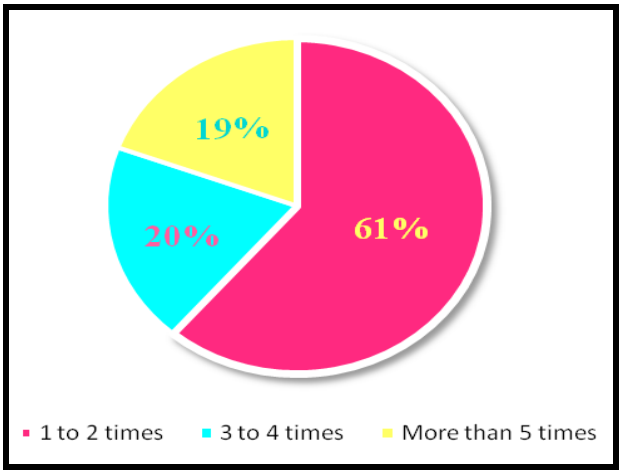
A survey was planned, designed and conducted on campus to help researchers understand the current manual practice to report and retrieve lost items and all its associated issues and concerns as it is viewed by members of the educational institution. The survey has also helped to determine and identify the expected main functions and features of the new proposed system. The survey consists of 12 questions. Each question covers different aspect of the study. The survey was conducted before the design and implementation of the new system. Samples of results for some of the interesting survey questions are listed below:



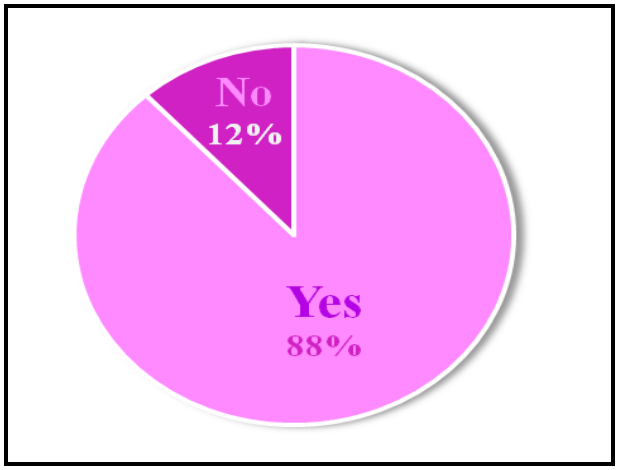
Q1: Have you ever lost an item



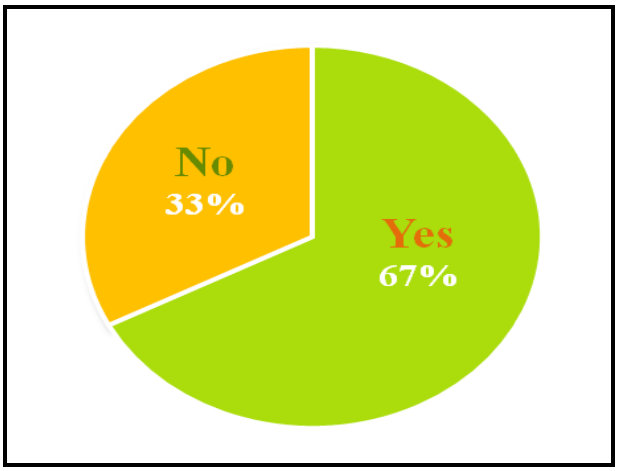
Q4: Do you know what to do when losing an item



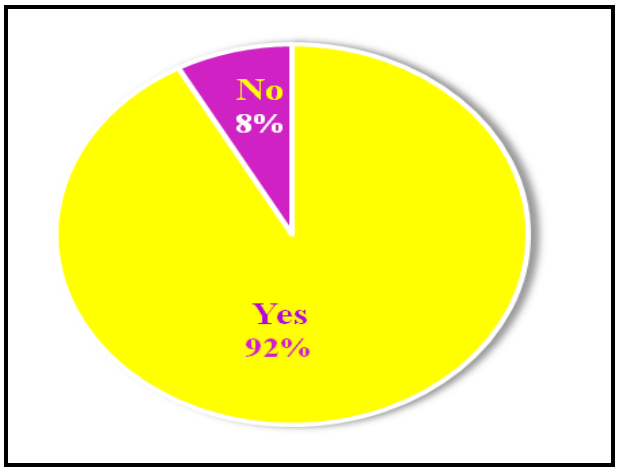
Q2: How often you lost items on campus



Q5: Would you like to have an online lost and found system on campus



Q3: Do you retrieve the items you lost



Q6: Do you think having such system would ease the lost and found process

The main system components and architecture are provided in figure 2, the web server receives a request from the user, and then it passes it to the PHP engine, which normally runs as a module within the server. Depending on the code and type of request, the PHP engine queries the database if necessary, and then builds the HTML output code to send back to the browser for display.

The code in the page controls the content depending on the request it receives from the browser.

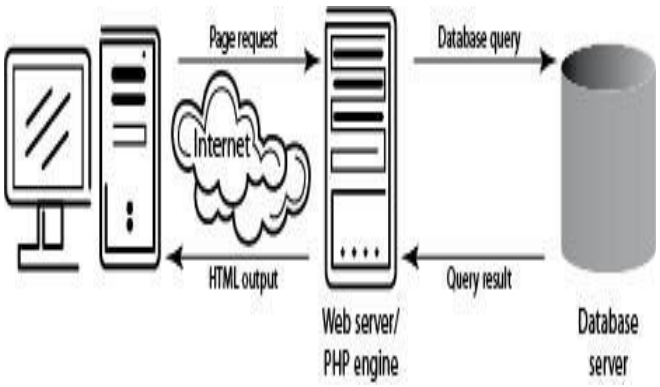


Figure 2. The architecture of the new proposed system

Figure 3, outlines the class diagram of lost and found system. It includes nine classes that interact and participate in the system. These classes are ZU lost and found office, Dubai Police - Lost and Found Department, ZU community, item report, lost, found, student, staff, and faculty. The diagram have two N to M relationship between the ZU office and Dubai Police - Lost and Found Department and relationship between ZU lost and Found Office and item report is N to M, where it means the system can have many requests for claim lost items and report found items.. The item report class is a lost and found items, and ZU community class is a student, stuff, and faculty. The relationship between ZU community and the item report is 0 to N, which means the report might claimed many or not claimed. SWOT analysis was conducted for the new system to determine the "strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats" [11], [12].

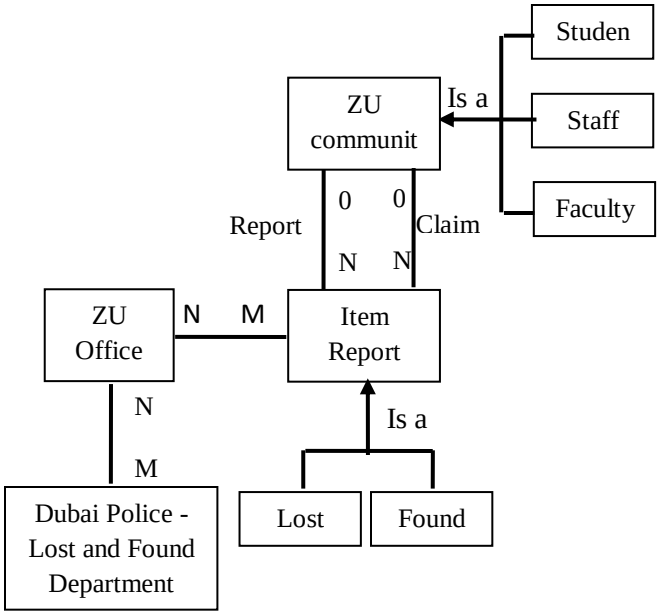


Figure 3. System Class

3.1 System Features and Benefits

The online lost and found system integrates an internet-based database to keep track of lost and found items for the entire campus [10]. It generates a dynamic list of found and lost items, where it can be viewed and searched online by the users. The database is managed, maintained and updated by the lost and found officer. Therefore, the educational community will gain a lot of benefits by having such an online lost and found system. A selected list of benefits gained by the new system is: the system is accessible online by all university students, faculty, administrators and staff. The system automates all the steps involved in the process of reporting lost and found items on campus. The system is simple and easy to use and learn user interface. The system can be accessed from anywhere on campus and off campus. Another benefit is that this system is automated unlike the manual procedure where the person should put the extra physical effort to visit the lost and found office to search for their lost item. Having this system will reduce the amount of stress on the staff that is responsible for managing lost and found office.

4 SYSTEM IMPLEMENTATION

There are several technology tools were used to develop and implement the online web-based lost and found system which includes XAMPP, Dreamweaver, Adobe Photoshop, Adobe Image Ready, HTML, MSQL, PHP and JavaScript [1], [14]. The implementation by designing the template for the homepage of the system using Adobe Photoshop and Adobe Image Ready. The implementation process went through various phases which include, installing XAMPP software that contains PhpMyAdmin, MSQL, and Apache server, defining a PHP site in Dreamweaver CS5, building the databases, linking to databases, creating administration pages, creating Normal user pages, and add more features and functions to administration and normal users [2]. Selected screenshots from the actual system are depicted in figures 4, 5, 6, and 7.

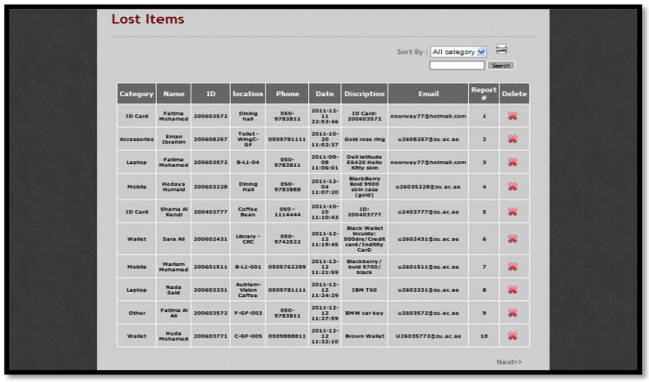


Figure 4. Lost items generated report screen

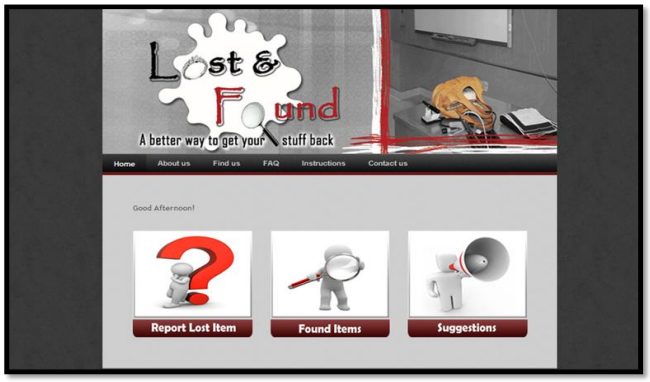


Figure 5. System homepage screen

Figure 6. Report found item screen

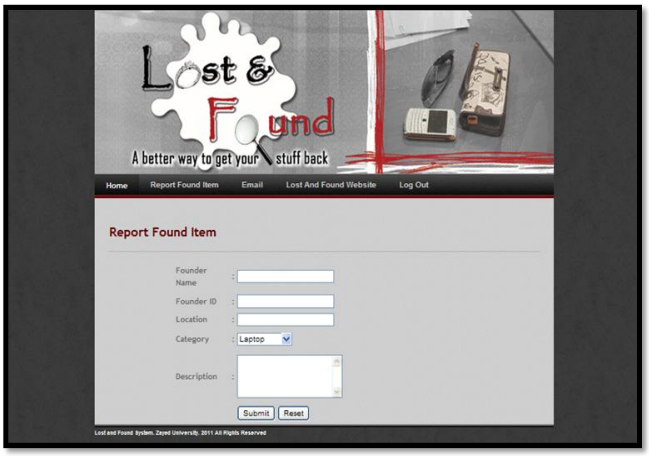


Figure 7. System log-in screen

5 SYSTEM USABILITY AND EVALUATION

A full eye tracking-based usability study was planned, designed and conducted on the new system to measure its effectiveness, efficiency, usefulness, and usability aspects. Eye tracking methodology has been used in much usability evaluation for many years. Eye tracking is an advanced usability testing technique that uses high precision technology to measure exactly where a user is looking and for how long [3]. Eye tracking is used to study the relationships between eye movement data and cognitive activity of the user. Eye fixations are considered the most relevant indicator for evaluating information acquisition and processing in online visualization environment

The eye tracker usability lab at ZU was reserved for one user at the time. An unobtrusive eye tracking technology, the Tobii 120, was used in this study. The eye tracker looks much like a standard monitor.

20 undergraduate female students at Zayed University participated in this study [13]. Participants are active students enrolled in different academic majors, for the purpose of this study five tasks were identified to be performed by the participants. The tasks vary in their difficulty and content. Each participant had to perform the same set of tasks. The experiment took 2 weeks to complete. The eye tracking data for each participant was recorded, collected and analyzed. Some images from eye tracking usability test will be included. Usability metrics refers to user performance measured against specific performance goals necessary to meet a set of predefined usability requirements.

For the purpose of this study the researchers used visualization analysis tools such as heat map and gaze plot to demonstrate user's visual behavior on system's main screens. Samples of heat maps and gaze plots images produced from the Eye tracker for all users (test participants) are shown in figures 8 and 9. Visual data in figure 8 is presented in colors to show the level of user's interest in screen content, red indicates areas where there was a heavy visual activity, yellow shows moderate visual activity, green shows low activity, and white and black show no visual activity. Visual data presented in figure 9, shows the order in which individual user look at items on the screen. Each numbered circle represents a point that the user's eyes fixated on. The larger the circle, the longer the fixation. A series of erratic eye movements in a gaze plot suggests that the user was confused by a disorganized layout. On the other hand, a series of orderly and controlled eye movements in a gaze plot suggests that the user was reading and the density of these movements demonstrate the level of user concentration and comprehension.

Figure 8. Aggregate heat map of main menu

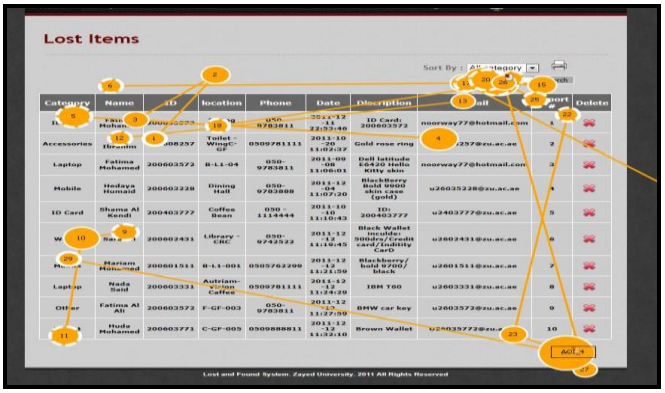


Figure 9. Gaze plot map for lost items report

6 CONCLUSIONS

In conclusion, losing your personal belongings can be a very frustrating experience. It can be a normal indecent with the deployment of an effective and efficient lost and found system, where all your lost items will find their way safely back to you. This research aims to address the lost and found issues on educational campuses by automating all the manual steps involved in the process. As a result an online web-based lost and found system was planned, designed, implemented, and evaluated. The main system components and architecture were also provided.

The benefits gained by the new system are: the system is accessible online by all university students, faculty, administrators and staff. The system automates all the steps involved in the process of reporting lost and found items on campus. The system is simple and easy to use and

learn user interface. The system can be accessed from anywhere on campus and off campus. Another benefit is that this system is automated unlike the manual procedure where the person should put the extra physical effort to visit the lost and found office to search for their lost item.

A complete eye tracking-based usability evaluation study was planned, designed and conducted on the new system to measure its effectiveness, efficiency, usefulness, and usability aspects. An eye tracking data were recorded and collected from observing participants and later analyzed by the student group. The results from the usability study indicate that users were very satisfied with the functionality of the system as well as pleased with the quality of its user interface design. So, having such a new system deployed in place will be great addition for educational community.

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