

**THE ROLE OF WEB USABILITY EVALUATION: AN ILLUSTRATIVE CASE STUDY OF THE USER-CENTRED DEVELOPED WEB-PORTAL TO FACILITATE TANZANIA'S HIGHER LEARNING INSTITUTIONS STUDENTS' FIELD ATTACHMENT**

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**ABSTRACT**

*Field attachment is the major technique set to help narrowing the gap between skills needed in workplaces and the content of relevant courses covered in respective Tanzanian higher learning institutions. The process of coordinating and allocating students to relevant companies for field attachment is reported to face number of challenges. Challenges reported to face allocation and coordination process are lack of students' linkage to companies and cost in terms of time and resources as many manual processes are involved to get the work done. These challenges seem to increase with the gradual increase in enrolment of students in higher learning institutions. A web-based portal was developed to address the allocation and coordination of attachment of Tanzanian higher learning institution students to relevant companies for field practices. Collaborative user-centred design techniques were employed to come up with a portal. The portal was finally evaluated for usability to confirm the impact of involving users in the early stages of development. The usability evaluation method applied involved user testing and questionnaire. Real users' behaviour and their levels of satisfaction regarding different tasks were observed and analysed. This illustrative study assessed the role of usability evaluation in favour of the collaborative user-centred technique applied to develop the Field Attachment Management System (FAMS). The results confirmed an impact of user-driven development as the final portal passed with a high degree of acceptance and users were able to accomplish tasks correctly the first time. Results further indicate that regardless of user-centred approach applied to develop a portal, usability flaws and missed features were still realized during usability evaluation. Moreover, through this illustrative study the contribution of usability evaluation to the improvement of the final portal is identified.*

**Keywords:** Usability, User experience, User-centred design, User-driven development, Usability evaluation

**1. INTRODUCTION**

Field attachment is one of the techniques applied by Higher Learning Institutions (HLIs) to equip students with handy job skills. It is set to help narrowing the gap between skills needed in workplaces and the content of relevant courses covered in respective HLIs (Munyoro, Nyandoro, & Musekiwa, 2016). Higher Learning Institutions are obliged to take part in ensuring allocation of students to relevant companies and follow-up of their performances for quality outcomes. Unfortunately, the exponential increase in students' enrolment makes placement and monitoring field performance of students more challenging. Among the challenges faced in Field attachment process include lack of linkage to companies and cost in terms of time and resources as many manual processes are involved to get the work done. Thus, made us come up with a web-based portal referred to as Field Attachment Management System (FAMS) to address the challenges by integrating features for HLIs, students and companies.

FAMS is a web-based portal developed to allow companies to post requirements for field attachment, students to search and apply for relevant companies and HLIs to coordinate the process. The portal was designed to solve current allocation and coordination challenges by linking higher learning institutions with companies and reducing time and costs associated with facilitation of field attachment. It is well known that, even if the system has notable benefit in its application, users tend to reject if it has poor User Experience (UX) (Sikorski, 2008). To ensure portals' users acceptance, user-centred approach was employed in development of the portal.

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UX is a vital part to consider as the life of software much depends on (Harutyunyan & Riehle, 2019). The result of the study to measure tolerance of users towards poor UX show that 84% will not be willing to attempt to use a system with poor UX for the second time (Convertino & Frishberg, 2017). To make FAMS usable, the user-centred approach based on the Scrum framework was employed. Scrum framework ensures the involvement of users in testing starting from the early development stages to continuously improve the product (Kieffer, Ghouti, & Macq, 2017). Studies revealed that by involving users in the whole process of software development results to product with high usability level (Andrews et al., 2012). Furthermore, flaws that cause users not to be able to use systems effectively can be revealed through analysis of users' satisfaction level as they interact with the system (Matto, Ramadhani, & Mjema, 2020). The major concern of this paper is to provide the results of usability evaluation and insight on the contribution of collaborative user-centred design to the usability of a web-portal. Argumentation in favour of collaborative user-centred design is based on the results from the FAMS usability evaluation. The study further assessed the contribution of the usability evaluation to the user-driven developed web-portal.

## **2. LITERATURE REVIEW**

It is now well revealed from a variety of academic studies that, the collaborative user-centred design has a positive impact on the usability of web-based systems. Being a collaborative user-centred approach, software designed following Agile method has been proved to have better usability as compared to waterfall designed software (Sy, 2007). Moreover, study revealed that collaborative user-centred is a technique designed for the purpose of ensuring required systems' usability levels (Perdomo *et al.*, 2017). Furthermore, in the study to compare the usability of systems employed user-centred with those that followed the traditional design, (Luna *et al.*, 2017) found that user-centred design techniques generate more usable systems. The study by (Juárez-Ramírez, 2017) also reported on how optimum user-centred methodologies are to the end-users in the way they emphasize on usable software products. This is also complemented by the study done by (Myers & Stylos, 2016) which found that user-centred development facilitate earlier identification of design faults and results to better usability of a system. Not only that but also as an outcome of involving and considering users during designing and evaluation of systems' modules, collaborative user-centred design is reported to have fewer errors and greater usability (Maurya, Arai, Moriya, Arrighi, & Mougnot, 2019).

Studies reviewed confirm the fact that collaborative user-centred design improves the usability of a system. However, in the existing studies there is lack of information about the need and contribution of usability evaluation of user-driven developed systems. In this study, the web-portal that was developed following collaborative user-centred design techniques was evaluated for usability with the aim of identifying possible improvements and degree of acceptance in favour of user-driven development. This study also assesses the necessity and contribution that usability evaluation can bring to the developed system that employed collaborative design and development approach.

## **3. METHODOLOGY**

This study was conducted in Arusha and Kilimanjaro regions which are located in the northern part of Tanzania. The reason for selecting these two regions is that there are 10 higher learning institutions and several potential companies covering tourism, agriculture, Information Technology and production sectors located in the area. Multiple methods were employed in this study to allow optimum coverage of system's usability aspects (Paz & Pow-sang, 2016). User testing and questionnaire were applied to establish quantitative metrics regarding efficiency, effectiveness and satisfaction of evaluation participants. User testing was preferred in this study because it allows users to do a real work while their performance and satisfaction are recorded (Mvungi & Tossy, 2015).

The study on UX recommends 5 users as the standard samples size per each user type since it was revealed that all the insights regarding UX are gained with this number of users while 15 to 20 users is recommended to quantify UX metrics (Nielsen, 2012; Nielsen & Landauer, 1993). This study involved 4 types of users who are students, coordinators, supervisors and field attachment host companies. A total of 20 students were engaged to

allow quantitative analysis while for each of other three types of users, 5 users participated in the study to gain qualitative insights on the strength of usability. During the evaluation session, participants were observed as well as requested to respond on usability evaluation questionnaires. Usability metrics that were observed include time spent on a task, ability to do a task correctly the first time, whether a user can complete a goal and get a needed help in case of an error input. Three different types of questionnaires were also administered to the evaluation participants. The purpose and kind of information collected by each questionnaire are as follows:

**Pre-test questionnaire;** the purpose of this questionnaire was to study the background and experience of evaluation participants on similar systems. The motive behind pre-test questionnaire is the fact that background and experience of users involved in evaluation can significantly influence the results (Hussain, Mkpojiogu, & Hussain, 2015). Characteristics of evaluation participants that were studied include experience on using the computer, frequency on using computers, experience on online application portal and kind of device they normally use.

**Post-task questionnaire;** Users' opinions regarding each task scenario were collected using post-task questionnaire. Users responded by showing their satisfaction and experience to complete a given task using a developed portal.

**The post-test questionnaire;** This was used to assess the level of users' satisfaction with the complete system (Barnum, 2011). Evaluation participants responded on the questionnaire by marking their level of satisfaction with each of the specified usability statement.

## **4.0 FINDINGS AND DISCUSSIONS**

The pilot evaluation session to determine the possible time that participants might take to accomplish a task scenario revealed that participants were capable and happy to accomplish a task within 5 minutes. The time observed was used as a success factor in assessing the usability strengths and weaknesses of a developed portal. The evaluation findings are as explained in the subsequent subsections.

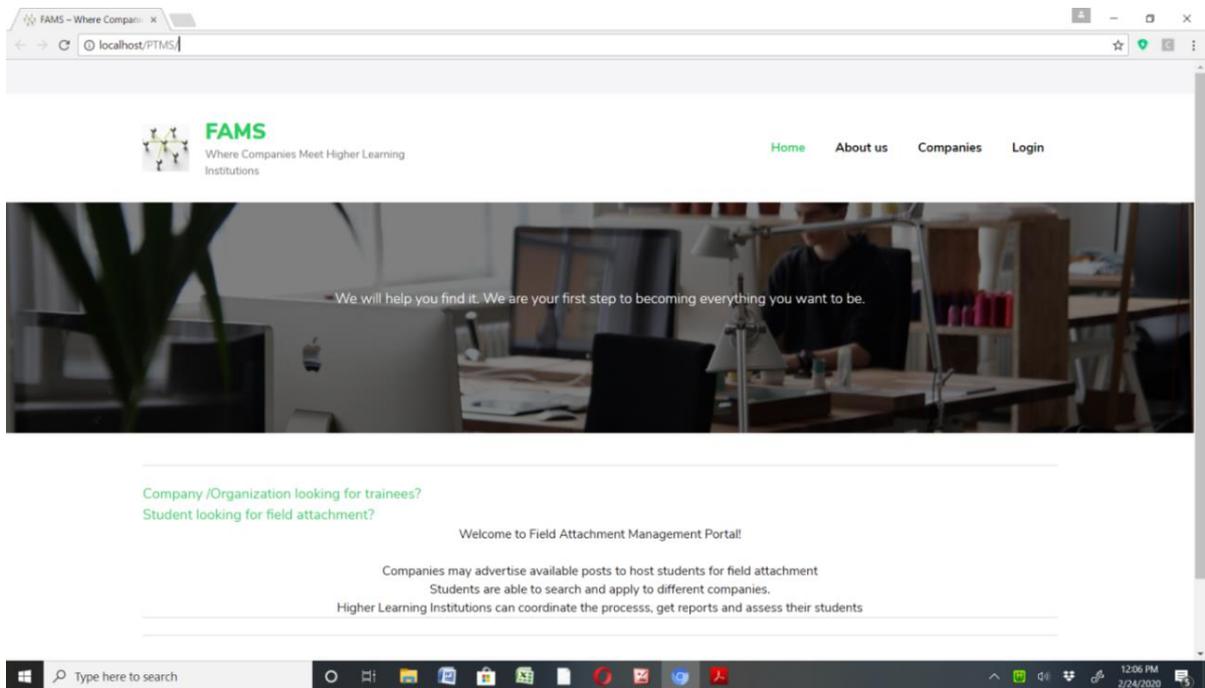
### **4.1 General Findings**

**Background and experience of evaluation participants:** The study of background and experience found that selected participants had enough experience on using computers. Participants who reported to have no experience on using any online application portal managed to use the developed portal at first place. This is the indication that the portal is easy to use and does not require a user to first be trained on how to use. Table 1 is a summary of findings categorized into individual groups of test participants.

**Table 1: Experience of Individual Groups of Test Participants**

S/No.	User character	Response	Users' Category							
			Students		Companies		Coordinators		Supervisors	
			Count	%	Count	%	Count	%	Count	%
1.	Experience on using computer	Less than a year	3	15%	-	-	-	-	-	-
		1 – 2 Years	4	20%	1	20%	-	-	-	-
		More than 2 years	13	65%	4	80%	5	100%	5	100%
2.	Frequency on using computer	Daily	16	80%	5	100%	5	100%	4	80%
		Weekly	2	10%	-	-	-	-	1	20%
		Monthly	2	10%	-	-	-	-	-	-
		Never	-	-	-	-	-	-	-	-
3.	Ever used any online application portal	Yes	17	85%	5	100%	5	100%	5	100%
		No	3	15%	-	-	-	-	-	-
4.	Device normally used (Multi response)	Smart phone	16	80%	5	100%	3	60%	3	60%
		Laptop	11	55%	4	80%	3	60%	3	60%
		Desktop computer	5	25%	1	20%	2	40%	1	20%

**Home page review:** Evaluation participants successful managed to figure out the purpose of the portal after opening the home page. They could get the overview of the system and realize that they must be registered based on their role to be able to accomplish other task scenarios. Home page review results indicated that participants could easily study the portal and do a task correctly the first time. Figure 1 shows the home page interface with portal’s goal information, login, new companies and students’ registration links.



**Figure 1: The home page of the developed portal**

**Users’ satisfaction:** An average of 98.70% of evaluation participants agreed on usability statements provided to assess their level of satisfaction. This implies that users were satisfied with the way the portal was designed to meet its goal. Figure 2 is the chart showing responses of evaluation participants on usability metrics of the entire system.

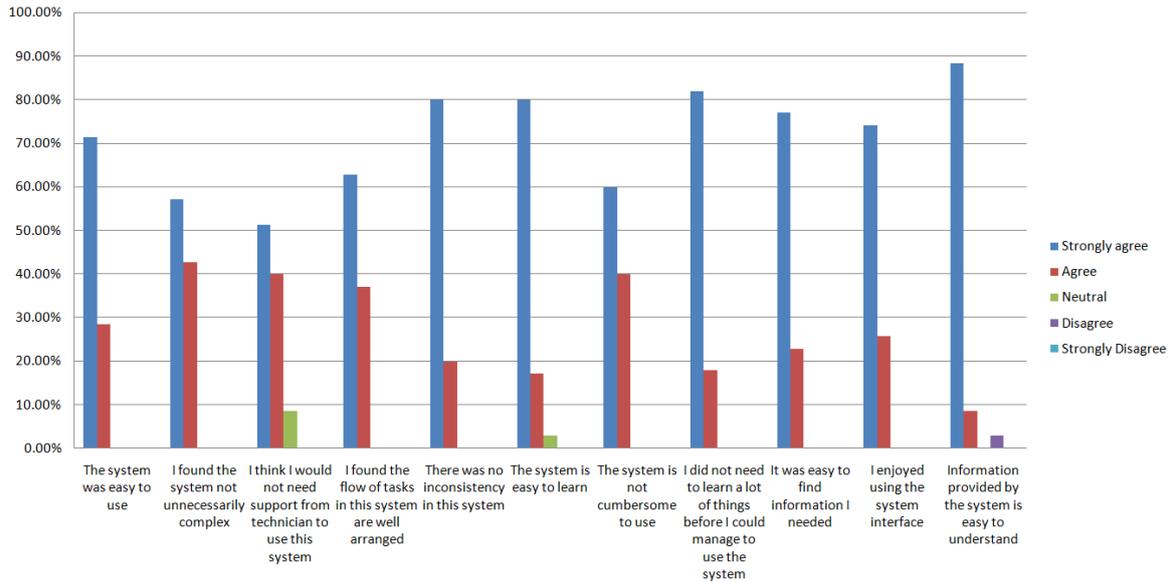


Figure 2: Participants' responses on usability metrics of the entire system

4.2 Positive Findings

**Sending field attachment applications:** The percentage amounting to 85 of participants from students group was able to send their applications successfully in less than 5 minutes. The result means that the tasks of searching for companies, processing and sending of applications are made easy by the developed portal.

**Follow-up of applications feedback:** Follow-up was reported to be one of the challenges with the current practice. The usability evaluation result shows that the challenge is greatly solved by the developed portal where 80% of participants managed to make follow-ups in less than 5 minutes as shown in Figure. 3.

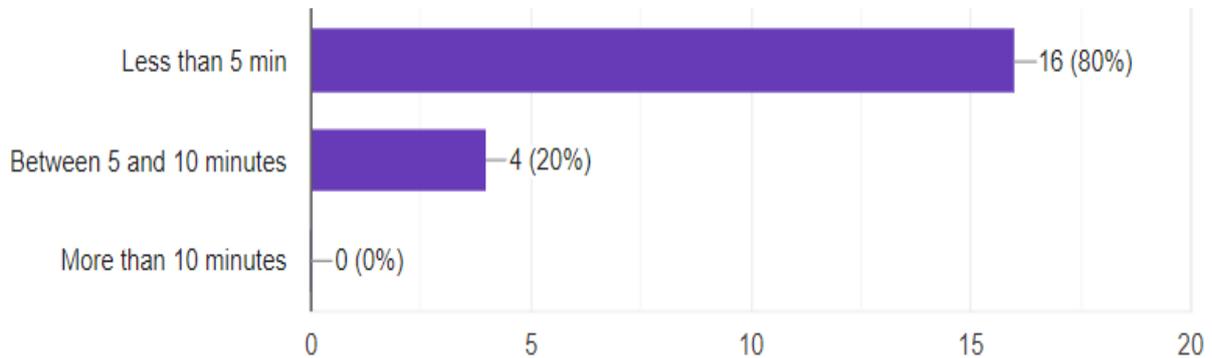


Figure 3: Time spent by evaluation participants to make a follow-up of their applications

**Advertising field attachment posts:** Results show that all participants from company category of users were able to successfully register their details and post field attachment in less than 5 minutes. The success was made possible by the good arrangement of companies' interface provided by the developed portal. It was easy for evaluation participants to get information about the type and format of details to be uploaded to the system.

**Field attachment coordination features:** The tasks of uploading lists of eligible students, registering new supervisors and downloading allocation reports were successfully completed by all participants from coordinators category. Coordinators could get help through the information available in the portal regarding type and compatible templates to be uploaded.

The study found that participants succeeded to accomplish given task scenarios by average of 89.52%. This implies that the developed portal meet usability requirements. It was also observed that tasks that were not

completed by all participants are related to submission of reports and assessment forms as their instructions were missing. This implies that the results of usability evaluation are important as they help to improve the system by identifying features that were overlooked during other stages of the Software Development Life Circle (SDLC).

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

This study intended to examine the role of usability evaluation of a web portal (FAMS) that was developed to facilitate Tanzanian higher learning students' field attachment. Furthermore, usability evaluation results were assessed to institute the contribution of user-centred design on the usability of a system. User testing and questionnaires were applied to determine the effectiveness, efficiency and satisfaction of users on using the developed portal.

Usability evaluation involved 35 users who participated in completing given task scenarios using a developed portal. Usability metrics that were observed during evaluation include time spent on a task, ability to do a task correctly the first time, whether a user can complete a goal and get a needed help in case of an error input. Opinions and improvement suggestions were also recorded during the evaluation sessions. Furthermore, participants rated different features to show their levels of satisfaction regarding usability. The portal passed with high degree of acceptance and high percentage of successfully completion of tasks as a result of collaborative design approach employed in the development of the portal. The importance of conducting usability evaluation was also realized as both usability flaws and missed features were revealed.

Regardless of the fact that FAMS employed a collaborative user-centred approach and found to pass with a high degree of acceptance, some tasks were found to have a low success rate and others took participants longer than expected time to succeed. The observed courses for the bad performance on such tasks were missing features as well as lack of proper instruction and clear error message. It is therefore recommended to conduct usability evaluation even for a system developed by following a collaborative user-centred approach; this is because not only usability flaws but also missed features can still be realized during usability evaluation.

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