Development and usability testing of Smart Record Management Solution in Higher Education Institutions in Sindh, Pakistan

Khuda Bux Brohi
Lecturer, Department of Development Studies, HANDS Institute of Development Studies, Karachi, Pakistan
Kbbrohi29f@gmail.com

Mehrin Haq
Staff officer-cum-Lecturer, Department of Business Administration, HANDS Institute of Development Studies, Karachi, Pakistan
mehrinfarhan@gmail.com

Khalid Hussain Shaikh
Dean, Faculty of Management & Development Sciences, HANDS Institute of Development Studies, Karachi, Pakistan
khshaikh@rocketmail.com

Ambreen Ramzan
Lecturer, College of Nursing, HANDS Institute of Development Studies, Karachi, Pakistan
amby.vaswani@gmail.com

Umair Hussain
Scholar, Quaid Awam University of Engineering, Science & Technology, Nawabshah, Pakistan
umairhm100@gmail.com

Abstract

In this modern technological world, approximately everything has been electronic. Manual documentation is not a safe way; it might result in the loss of employees' important information. Managing huge amounts of data manually means organizations need much more human resources for handling paperwork. On the other hand, cost, time, and efficiency are also needed. This is the fact that fully automated systems are beneficial over manual and semi-computerized systems. However, it is also a question that how much fully automated systems are beneficial over manual or semi-computerized systems. Because, the usability of the application could be a barrier between such types of solutions to switching from manual or semi-computerized systems to fully automated systems, whose answers were tried to find out in this study. For this, a web-based Smart Record Management Solution (SRMS) was developed and evaluated in three universities in Sindh, Pakistan, so that, the usability of the app can be measured. The Application was evaluated by 60 employees distributed in three groups (Administrative head, clerical staff and General employees) in district Shaheed Benazirabad, Sindh, Pakistan. The data was collected through a questionnaire from the participants to measure the usability of SRMS. According to the results, the majority of the participants reported that the app was easy to use and participants were equally satisfied with the application. The results are promising; in the future, an experiment will be conducted for the successful implementation of Smart Record Management Solution and to find out the proper deployment of such systems.

Keywords: *Smart Record Management Solutions, SRMS, Record Management, Digital Data Management, Implementation issue of SRMS.*

Introduction

Document management is a big issue for government institutions nowadays (Huang & Li, 2021; Tunç & Külcü, 2020), because keeping the employees' huge amount of data in manual form is a big problem (Huang & Li, 2021), much more human resource, time, efficiency and space is required to handle the manual records (Akor et al., 2018), on other hand paperwork is not a safe way to keep such records (Omboti et al., 2019). In this modern technological world approximately everything has been electronic (Pathirana & Wickramaarachchi, 2019). Manual document management is not a safe way, it may be results the loss of employees' important information (Huang & Li, 2021; Teke & Tarhan, 2019). Digital record management system is a well-known solution for such problems which are fully automated and can manage huge amount of data easily (Ibrahim, 2019). Fully automated system has so many advantages, like, these systems are fast in information sharing, once information is updated into the system, it will be automatically visible to concerned authorities. Whereas, manual record keeping is totally wastage of time and resources. Semi-automated systems are slow in information sharing (Pinho et al., 2018). Transparency in such systems is the key advantage, the information is visible to all concerned authorities as their administrative powers in such systems, and no one can insert, update or delete any of information illegally. Users can see their related information, status of their documents, other concerned information and also users can see who is delaying for the particular work (Casadesús de Mingo & Cerrillo-i-Martínez, 2018; Joseph et al., 2020). In manual and semi-automated system information is not visible, so, people can remove some information (Lucero et al., 2019). The users can access their required information with few clicks in fully automated systems (Joseph et al., 2020). There is no need to travel and spend time for information gathering (Brundin-Mather et al., 2018). The amount of space reserve by the manual document keeping is a biggest downfall. No doubt, manual paper work is easy way but in manual paper work searching, sorting and storage is a big issue (Tse et al., 2020), when organizations start grow up then it needs to find another way to store information, otherwise it might reserve rooms to adjust hard documents (Gregory, 2020). This is fact that fully automated systems are beneficial over manual and semi-computerized systems (Jordan, 2020). Whereas it is also a question that how much fully automated system are beneficial over a manual or semi-computerized systems? (Chofreh et al., 2020). The usability issue could be a barrier between successfully switching from manual and semi-computerized systems to fully automated systems (Kirakowski & Corbett, 2006; Vehko et al., 2019), whose

answer is tried to be found out in this study. To achieve this goal, a smart record management system (SRMS) was developed and evaluated from three groups through questionnaire (Kirakowski & Corbett, 2006; Valeryanovna Dobudko et al., 2019). Inside SRMS three roles were added to access the system. (1) Registrar (2) Clerks (3) General Employees. The Smart Record Management System was designed according to the needs of the employees of higher education institutions of Pakistan and functions which were added in SRMS were according administrative process of records management. In other part of the study, the application was evaluated from the employees. After doing qualitative study some guidelines were suggested for updating user from manual and semi-computerized to fully automated system. There are many studies already have been done by the different researchers on record management, enterprise resource planning (ERP), digital record management System (DRMS) (Abad-Segura et al., 2020; Gholamzadeh Chofreh et al., 2018) etc, however our research study focuses on usability satisfaction of Smart Record Management System and to draw guidelines to overcome these issues and switching from manual and semi-automated system to fully automated Systems to help the employees of higher education institution of Pakistan to improve their record management way smoothly and efficiently. Results of usability analyzed through statistical tools and also applied ANOVA test through SPSS software.

Literature Review

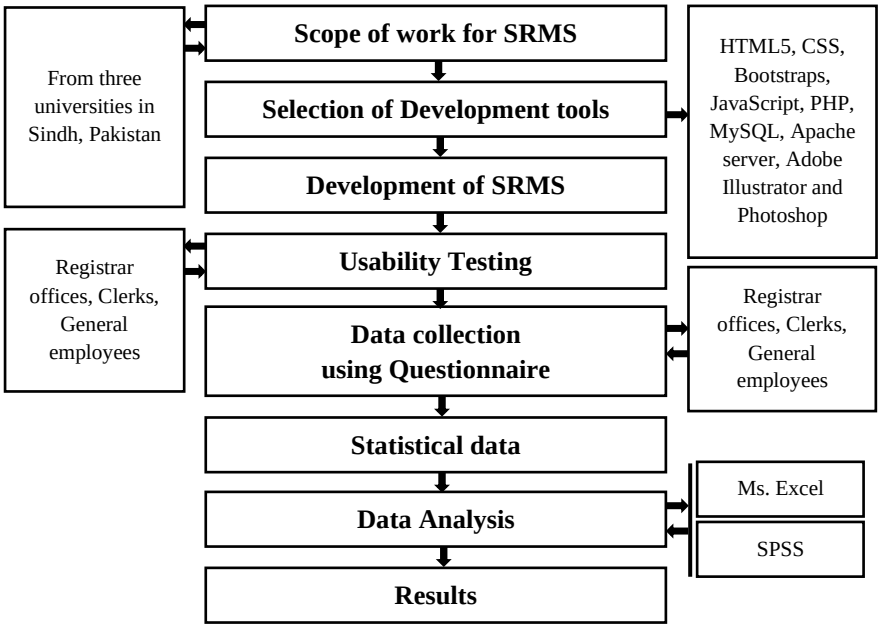
A fully-automated system has many advantages, these systems are fast in information processing, and once information is updated into the system, it will be visible to concerned role. Whereas, manual record keeping is totally wastage of time and resources. Semi-automated systems are slow in information sharing (Pinho et al., 2018). The key advantage of the record management system is Transparency, the information is visible to all concerned authorities as their administrative roles are defined, and no one can insert, update or delete any information illegally. It enables the users to access their required data at any time, the status of their documents, and other important notifications. Furthermore, the higher management can understand who is delaying the particular work (Casadesús de Mingo & Cerrillo-i-Martínez, 2018; Joseph et al., 2020). Record management software are advantageous over manual and semi-computerized systems, Manual document management is not a safe way, loss of employees' important information is at highest risk (Jordan, 2020). Along with deployment of the record management software, the usability issue could be a barrier between successfully implementation and switching from manual and semi-

computerized systems to fully automated systems (Kirakowski & Corbett, 2006; Vehko et al., 2019). Manual record keeping needs huge space and resources to manage the data with the growth of organization. The amount of space reserve by the manual document keeping is a biggest downfall. No doubt, manual paper work is easy way but in a paper work searching, sorting and storage is also a big issue (Tse et al., 2020). Digital record management system is a well-known solution for such problems which are fully automated and can manage huge amount of data easily. The users can access their required information with few clicks using such software, So, there is no need to travel and spend time on information gathering. When organizations start grow up then they needs to find such alternatives, otherwise it might reserve rooms to adjust hard documents (Ibrahim, 2019).

Research Methodology

To conduct any research, it is very important to construct a clear and concrete organization of the research. Figure 1 showing the overall methodology used in this research work which is shown step by step through diagram.

Figure 1
Research Methodology



In Figure 1, the overall work is defined from the first to the last step and the diagram shows all phases in a flow. All tools and techniques which are shown in the above diagram are defined as below.

Scope of work for SRMS

Selection of development tools

To develop the Smart Record Management application, we used HTML5, CSS, Bootstraps, JavaScript, PHP and MySQL for the development of app, Adobe Photoshop & Illustrator were used to design icons and other designs, Apache server was used to testing the application on local system.

Development of Smart Record Management System

HTML5 was used for the initial structure of the application and then CSS used to decorate and make the application interactive. To make the application more interactive and responsive Bootstraps was used as the application can run on number of devices e.g; desktop Computers, laptops, tablets and smart phones. PHP was used to make application dynamic and MySQL for Database. The application has three roles (1) Registrar (2) Clerks (3) General Employees, where, every role has their accessibility powers as per designations. Complete interface of the application was designed user friendly which is quite easy for record keepers and general employees who are less technology literate. The icons and the images were used in the Application are designed using the Adobe Illustrator and Photoshop.

Usability testing

The application was evaluated by the 60 employees of 03 Higher Education Institutions, (1) Quaid Awam University of Engineering, Science and technology (2) Shaheed Benazir Bhutto University, Shaheed Benazirabad (3) People's University of Medical, Health and Sciences for Women. The participants were divided into 3 groups (1) Registrar office Assistants (2) Departmental Clerks (3) General Employees. As per the availability of time space, 20 participants from each university participated in this study.

Data collection

The quality feedback for app was collected from the participants through a reliable questionnaire "Software Usability Measurement Inventory (SUMI). The Software Usability Measurement Inventory is a carefully verified and proven process to measure the quality of software according to user feedback. The questionnaire was consisting of fifteen statements having three rating scales Agree, Neutral, Disagree. The questionnaires were distributed among participants for gathering their output for usability satisfaction for SRMS from all three groups.

Statistical data

The collected data was converted into Microsoft excel for graphical representation of data and SPSS was been used for applying ANOVA testing for knowing the satisfaction of users.

Data Analysis

The data was analyzed through Microsoft excel and presented in the shape of graphs as shown in quality assessment. The ANOVA test was been applied using SPSS tool for testing the level of satisfaction of users of SRMS.

Results

A new web based application named Smart Record Management Solution developed using modern trends and techniques for the higher education institutions. So, the quality of application evaluated by the System usability measurement inventory (SUMI) questionnaire which is a reliable scaling method used to rate the applications. So, this study was consisting of two related part, one was the development of Smart Record Management Solution and second, the assessment of the application by the employees of selected Higher Education Institutions.

The newly developed application (SRMS)

The newly developed application Smart Record Management Solution (SRMS) has been developed for the record keeping. The application was developed using HTML5, CSS, Bootstrap, JavaScript, PHP and MySQL. The SRMS has facility to manage employee's records and facilitate the users. The login screen of SRMS was secured to enter in any account, so, the users must have their authentic user name and password to login and perform related operation. The SRMS developed as responsive using CSS and Bootstrap classes which helps the users to run it on multiple device which was auto adjustable according to the device, screen size and resolution.

Figure 2

Responsive application (SRMS)

Quality assessment of Smart Record Management Solution

The quality of the SRMS was assessed using the System Usability Measurement Inventory (SUMI). The Application quality rating of the application was measured using 15 statements having 3 point Likert scale (1. Agree, 2. Neutral, 3. Disagree). The perceived impact of the Application on the record management was measured using the perceived impact sub scale of SUMI.

Figure 3.
Participant's response regarding Application GUI

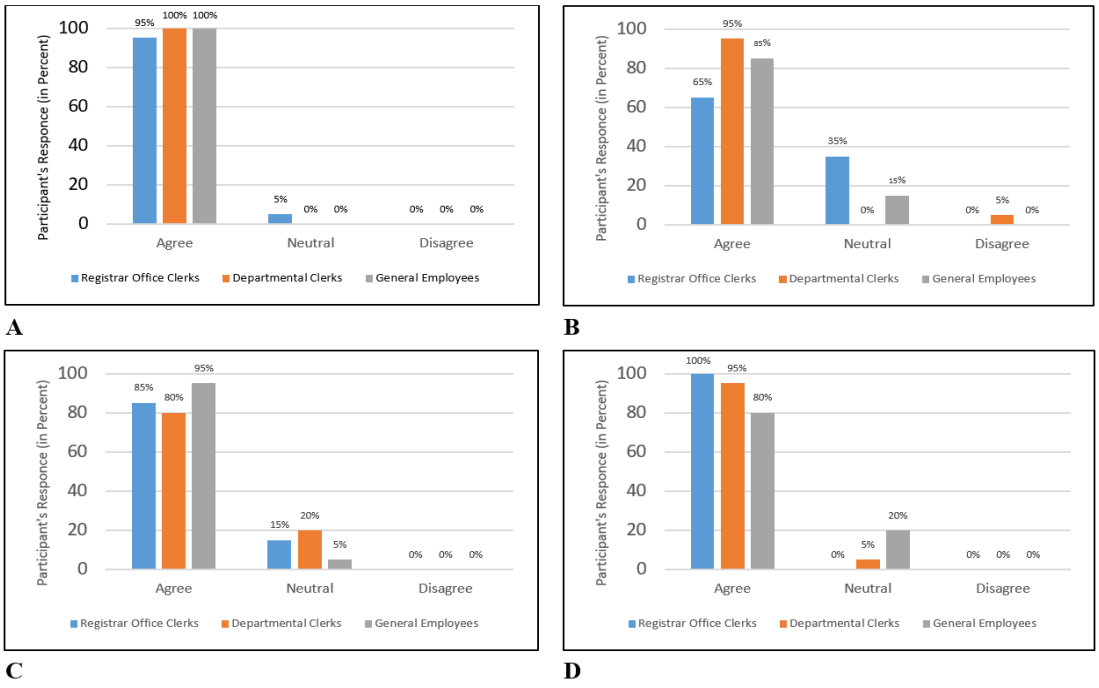
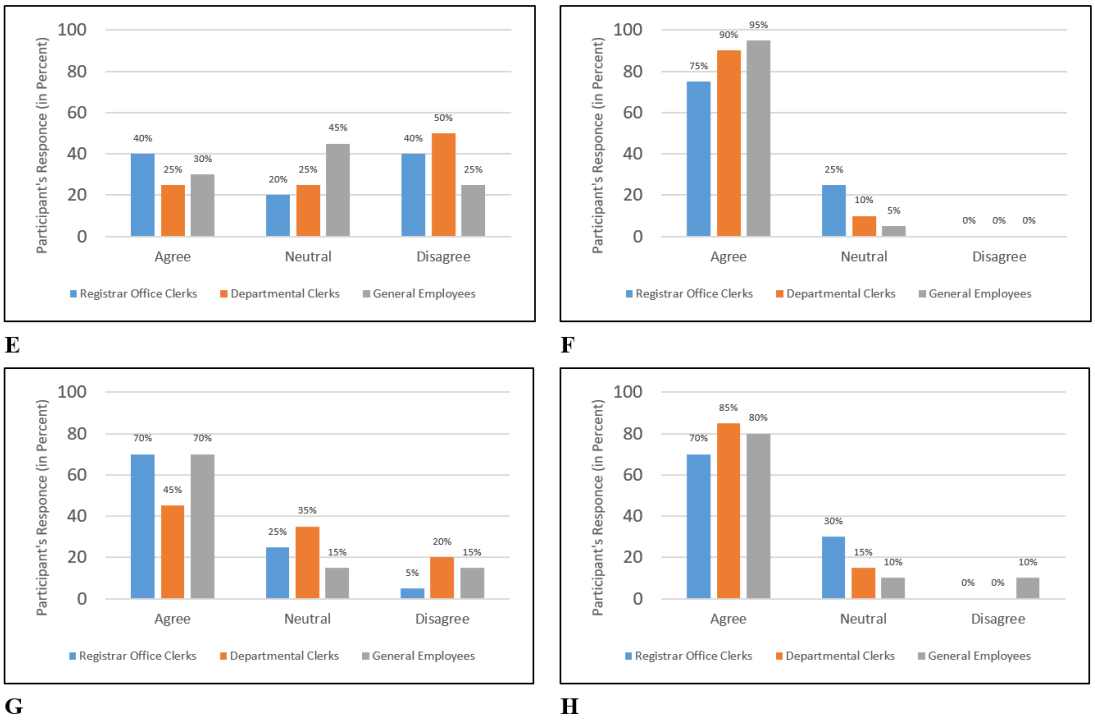


Figure 3-A Shows the response of participants regarding graphical user interface of SRMS where 95% of registrar office clerks, 100% of departmental clerks and 100% of general employees agreed. 5% of registrar office clerks responded as Neutral. According to the graph 3-B, 65% of registrar office clerks, 95% of departmental clerks and 85% of general employees agreed. 35% of registrar office clerks, 0% of departmental clerks and 15% of general employees responded as Neutral, while 5% from departmental clerks disagreed against the statement 2. Results showing in graph 3-C, 85% of registrar office clerks, 80% of departmental clerks and 95% of general employees shown their interest as agreed, while 15% of registrar office clerks, 20% of departmental clerks and 5% of general employees became Neutral against the given statement and no one was disagreed. As per graph 3-D, 100% of registrar office clerks, 95% of

departmental clerks and 80% of general employees were agreed, 5% of departmental clerks and 20% of general employees responded as Neutral.

Figure 4
Participant's response regarding working of SRMS



In figure 4-E, response of participants regarding ease of use and working of SRMS is rated as 40% of registrar office clerks, 25% of departmental clerks and 30% of general employees agreed. 20% of registrar office clerks, 25% of departmental clerks and 45% of general employees rated as Neutral. While, 40% of registrar office clerks, 50% of departmental clerks and 25% of general employees rated as Neutral. Figure 4-F shows that 75% of registrar office clerks, 90% of departmental clerks and 95% of general employees rated as agreed. 25% of registrar office clerks, 10% of departmental clerks and 5% of general employees rated as Neutral. In figure 4-G, 70% of registrar office clerks, 45% of departmental clerks and 70% of general employees given their input as agreed. 25% of registrar office clerks, 35% of departmental clerks and 15% of general employees rated as Neutral. While, 5% of registrar office clerks, 20% of departmental clerks and 15% of general employees were disagreed. In figure 4-H, 70% of registrar office clerks, 85% of departmental clerks and 80% of general employees given their input as agreed. 30% of registrar office clerks, 15% of departmental

clerks and 10% of general employees were Neutral. Only 10% of general employees were observed as Disagree.

Figure 5
Participant's response regarding the performance of SRMS

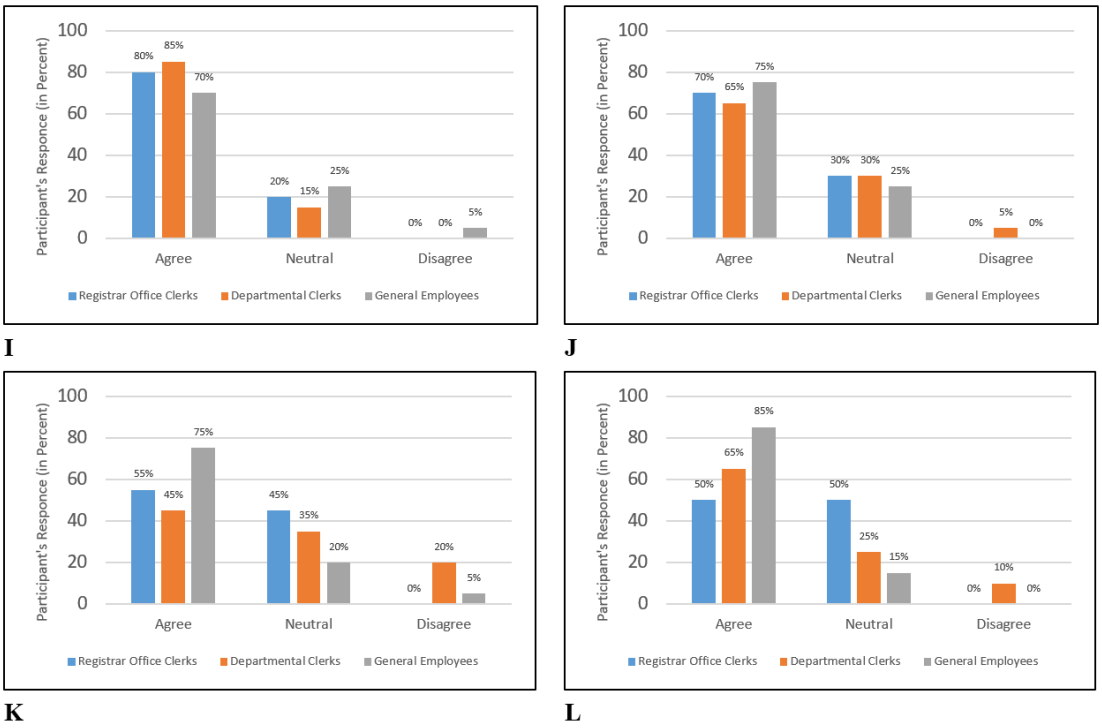
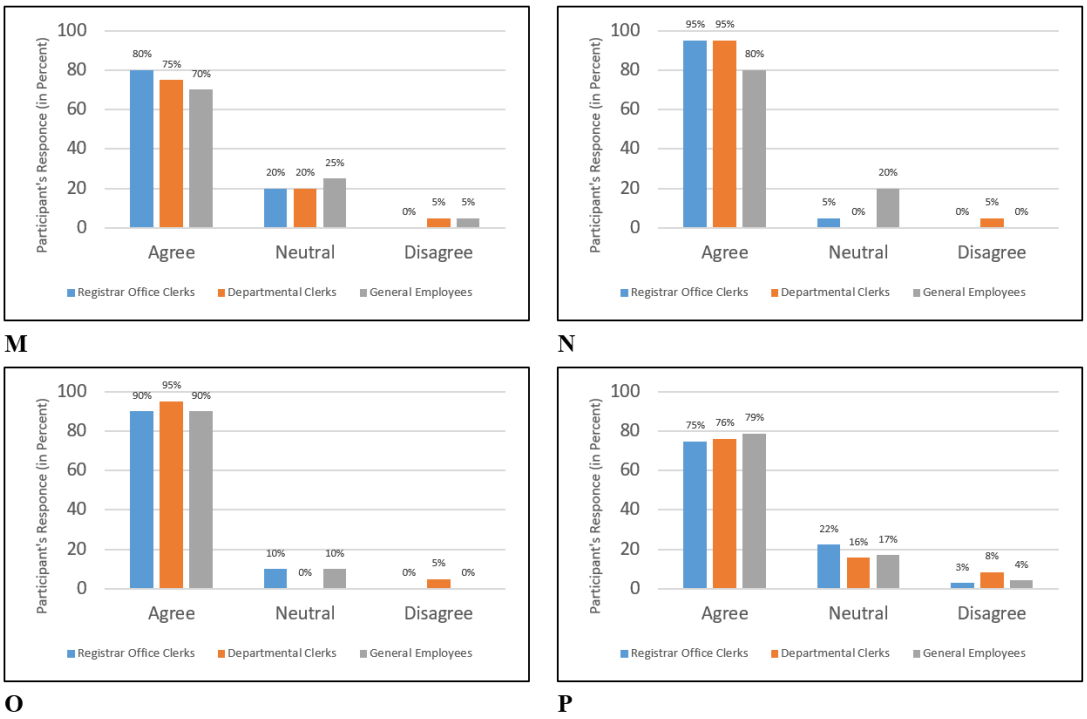


Figure 5-I shows that 80% of registrar office clerks, 85% of departmental clerks and 70% of general employees rated as agreed. 20% of registrar office clerks, 15% of departmental clerks and 25% of general employees rated as Neutral. While, only 5% of general employees rated as disagree. In figure 5-J, 70% of registrar office clerks, 65% of departmental clerks and 75% of general employees were agreed. 30% of registrar office clerks, 30% of departmental clerks and 25% of general employees rated as Neutral. While, 5% of Departmental clerks rated as disagree. Figure 5-K shows the response of participant's where, 55% of registrar office clerks, 45% of departmental clerks and 75% of general employees rated as agreed. 45% of registrar office clerks, 35% of departmental clerks and 20% of general employees were Neutral against this statement. While, 20% of departmental clerks and 5% of general employees rated as disagree. In light of figure 5-L, 50% of registrar office clerks, 65% of departmental clerks and 85% of general employees rated as agreed. 50% of registrar office clerks, 25% of departmental clerks and 15% of general employees responded as Neutral and only 10% of Departmental clerks rated as Disagree.

Figure 6.

Participant's response regarding organization of the menus of SRMS



M **N**

O **P**

Figure 6-M shows that 80% of registrar office clerks, 75% of departmental clerks and 70% of general employees rated as agreed. 20% of registrar office clerks, 20% of departmental clerks and 25% of general employees rated as Neutral. While, 5% of departmental clerks and 5% of general employees rated as disagree. In figure 6-N, 95% of registrar office clerks, 95% of departmental clerks and 80% of general employees were agreed. 5% of registrar office clerks and 20% of general employees rated as Neutral. Only 5% of Departmental clerks rated as Disagree. Figure 6-O shows the participant's response in which, 90% of registrar office clerks, 95% of departmental clerks and 90% of general employees rated as agreed. 10% of registrar office clerks and 10% of general employees were Neutral for given statement. While, 5% of departmental clerks responded as disagree. In light of figure 6-P, which shows the quality rating and overall responses of the participants regarding the usability of SRMS. 75% of registrar office clerks, 76% of departmental clerks and 79% of general employees rated as agreed. 22% of registrar office clerks, 16% of departmental clerks and 17% of general employees responded as Neutral. While, 3% of registrar office clerks, 8% of departmental clerks and 4% of general employees responded as disagree.

ANOVA Statistical Method has been applied on the three groups of respondents (i.e., Registrar office clerks, Departmental clerks, General employees). According to results,

[F(2,57)= 0.690, p=0.506] shows that there is no significant change among the participants of all groups. All the participants have reported that the app is easy to use, all the participants were equally satisfied with the application as shown in Table 1, there is no significant difference among all the groups.

Table 1

ANOVA test results for the SRMS satisfaction

ANOVA					
	Sum of Square	**Df**	**Mean Square**	**F**	**Sig**
Between Groups	.045	2	.023	.690	.506
Within Groups	1.862	57	.033		
Total	1.907	59			

Dicsussion and Conclusion

Discussion

As per the requirement of record management, record keepers need fully automated systems for managing a huge amount of important data. So, a web-based application named Smart Record Management Solution was developed using modern trends and techniques for the higher education institutions in Sindh. It is essential to validate the software reliability and validity using approved research instruments as per the standards of software engineering. therefore, the quality of application evaluated by the System usability measurement inventory (SUMI) questionnaire which is a reliable scaling method used to rate the applications. So, this study was consisting of two related part, one was the development of SRMS software, and the assessment of the application through the employees of selected Higher Education Institutions in Sindh, Pakistan. Initially, the scope of work for software was collected from three selected universities in district Shaheed Benazirabad, Sindh for the development of a fully-automated record management software. In view of scope of work and the requirements of record keeping, the development tools were selected by keeping the future problems and bugs in mind, so that, in the process of ERMS development, each section and page was developed by removing possible error and fixes. After completions of successful development and final testing of software, it was installed in multiple computers in three selected universities where demo was given to the participants in their universities. The participants of all three universities were divided into three groups as mentioned above as per their roles. In the next step, employees had used the ERMS and performed some related tasks, where they found very happy and easy to interact with software during performing tasks of

filling forms, searching a particular record, update the record, deletion, printing, sorting and much more. Furthermore, they filled the questionnaire and highlighted their experience using such software. This study finds amazing results in the overall responses of the participants in usability testing of SRMS. According to the satisfaction level of employees, this is a great achievement and a green signal for developers and researchers to develop and launch such systems for transparent record keeping is the need of the time. The results demonstrate that there is no significant difference across the groups of participants. As indicated in Table 1, all participants highlighted that the SRMS is very simple and easy to use and all of them indicated they were equally satisfied with it. There was no significant difference between the all three groups. The employees who were using manual and semi-computerized systems for record keeping, they demanded that such software should be initiated in organizations for efficient results of work.

Conclusion

A web based Application has been developed for the record management. The Application has a good usability ratings and very easy to use. The overall perceived impact of the app was excellent, because most of the employees' responded as agree which shows that the app has increased the awareness and knowledge of the record keepers and also the general employees. It is also perceived that the app has positively changed their record keeping method and the employees were impressed using the app. 65% from the Registrar office, 95% from Departmental Clerks and 85% for the General Employees responded that they will recommend the app to others. The app has got a very good rating. 75% from the Registrar office, 76% from Departmental Clerks and 79% for the General Employees have given the app 4.5 out of 5 and the remaining 25% from the Registrar office, 24% from Departmental Clerks and 21% from the General Employees have given 3 out of 5. They perceived that this is one of the best apps that they have ever used.

Recommendation

According to the usability and satisfaction perspective it is recommended that the ERMS should have features that engage the users. Its design should be aesthetic and it should provide proper and reliable information about the Record Management. The results of this study shows that there is an improvement in the Record Keeping behavior of record keepers after using the app, so it is recommended that the Record keeping employees should use this app continuously. As the Record Managing Apps are directly related to the important data of the Employees', so, the Scope of work for Apps should be collected from reliable and well

known source or by discussing with record keeping experts. The app should support the long-term changes in behaviors of the users, it has to focus the current behaviors as well as the possible future behaviors of the users. It can be achieved by incorporating the techniques that can handle the possible behavior changes e.g., features, contents and technologies that worry, irritate, burden or distresses users.

Conflict of interest

None declared

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