ONLINE MULTI-FUNCTION HEIS TRACKING SYSTEM

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Abstract

The study aimed to develop the Online Multi-function HEIs Tracking System for Carlos Hilado Memorial State College CHMSC) four (4) campuses. The system is an online campus-wide document tracking dissemination that covers storing, viewing, retrieving, archiving, and maintaining information security. The technical features of the system include document management, document protection, sender-receiver notification, user's credential management, system audit logs, and automatic data backup. A developmental research approach using Rapid Application Development (RAD) was applied to design and create the system. A sender-receiver email notification was applied using the MUA and MTA secured connection. The system has user credential management for usernames and passwords, system audit logs for the system's credibility, and an automatic data backup to protect data loss and future recovery. The system was evaluated using the ISO/IEC 25010:2011, Systems and software Quality Requirements and Evaluation (SQuaRE). The usability of the system was rated very high by thirty (30) respondents composed of the document controllers, faculty, ICT personnel, and the Record office staff of CHMSC. The study contributes to the management of documents in the four campuses of CHMSC with secured electronic data storage through the VPN method. It hastens the transactions and services and improves the operational efficiency of CHMSC Record's Office. The other neighboring institution may adopt the developed software to enhance transactions and services of their records management office. The Online Multi-Function HEIs Tracking System is the next logical step for the institution to improve efficiency in records management.

Keywords: *Online Multi-Function HEIs Tracking System, systems and software quality requirements and evaluation, rapid application development, Philippines*

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Introduction

It is a liability to the organization if the bulk of paperwork is unmanaged; hence, wasting time and legal trouble could be a consequence. The hard copies of the documents may accumulate every year and lead to document loss, problems in tracing and managing documents. It may take time to search specific records (Dizon et al., 2017). On the other hand, controlling a document in the network requires a secure transmission which is essential for many users. According to Allardycs (2014), encryption is considered a method to measure document security of data transmission over the network. It was also attested by Ching, Fabio, and Celis (2018) that it is important to protect the data or records. The Republic Act 10173, known as an Act for Data Protection in the Philippines, serves as a guide for organizations processing personal data.

The Records Management Office (RMO) of Carlos Hilado Memorial State College (CHMSC) encountered common issues. The staff may not immediately locate the documents needed. Thus, it takes time to sort a particular copy of records from a pile of paper documents. Also, the institution had insufficient workforce and storage space to manage the incoming and outgoing documents. In this manner, the online system may help store existing electronic files and made electronic copies of printed documents for indexed. With this, easy management of records could be possible. The online system promises productivity and performance surges by applying new technology to documents and document processing. The four (4) campuses of CHMSC intend to use the designed online system. The campus-wide online document tracking dissemination covers storing, viewing, retrieving, archiving documents, and maintaining information security. The system protects the official records, archives electronic documents, and organizes documents for easy retrieval and future references.

Generally, this study developed an Online Multi-function HEIs Tracking System for the four (4) campuses of Carlos Hilado Memorial State College. The technical features of the Online Multi-function HEIs Tracking System are document management, document protection, sender-receiver notification, user credential management, system audit logs, and automatic data backup. The system's acceptability was evaluated in terms of functionality suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability.

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Methods

Research Design

The study used a developmental research approach and the Rapid Application Development Model in creating the system. RAD was a form of Prototyping Software Development that emphasizes working software and user feedback. The requirements and the specification of the system were defined and collected from the end-users. There was an analysis of the data gathered during brainstorming activities from the end-users during the requirement analysis phase.

In the second phase, requirements design was the actual document tracking of the receiver's internal and external documents and the implemented features of functional and non-functional requirements. The prototype gives the end-user a new feel to the outcomes of developing software. After prototype presentation to end-users, there were plans out of the prototype's refinement and development completion. The process cycles repeated over again until the development presented a potentially working version of the system. The RMO was the primary department managed by the system administration and created users for the system as proponents. The sender viewed the document and document status. The receiver likewise viewed the document and recorded the document event status. The department head had the authority to confirm the document delivered to someone in the department.

The testing phase covered the respondents' use of alpha and beta testing methods. The method examined the system to ensure that the system was free of work-around bugs and would not cause any anomalies during the actual usage processor in the production process.

The implementation phase included training on the use of the system. Observation of the system was carried out from bugs and errors in the production stage and optimizing the system for future usage.

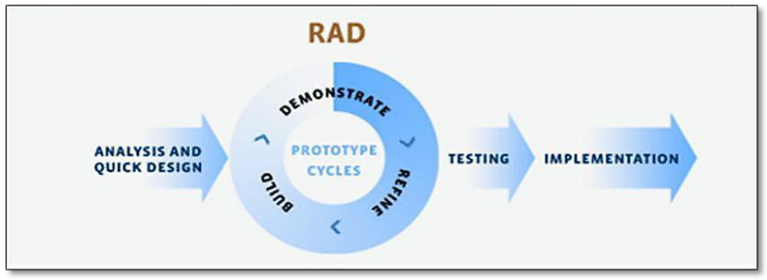

Figure 1.0 *Rapid Application Development Methodology*

A descriptive research approach was applied in the evaluation of the system.

Parameters of the Application

The Online Multi-function HEIs Tracking System covered information organization by keeping track of records of the institution. The software was intended for the four campuses of Carlos Hilado Memorial State College. It was an online campus-wide document tracking dissemination. It covers storing, viewing, retrieving,archiving documents, andmaintaining the security ofinformation. The software was an online portal of all the published documents to all offices concerned,secured official documents and digital archiving methods, organize documents by department, office,and campuses, and a portal that publishes all official documents for retrieval and references.

The software was capable of uploading and viewing attachments from letters and adding department information, adding a user to the system, and changing user credentials. The software was efficient in maintaining, searching, storing, and archiving records such as special Order, CHED memorandum, office order, Civil Service Memos, Joint circulars from Department of Budget and Management, administrative orders, and executive orders.The software involved various data such as user credentials, user information, departments, employee information, document information,document attachment, document type, letter sender, receiver, and attention. The data inputs were securely processed and stored in the system to manage andpresent records that help track documents and improve service.

The system outputs were the essential parts that helped the general look of the Online Multifunction HEIs Tracking System data. A daily report indicates the total number of documents recorded and

processed on the four campuses of CHMSC.

The monthly document senders indicate the number of document senders and receivers from such departments. The external senders and receivers indicate the number of external document senders and receivers.

Furthermore, the monthly archive reports are a list of letters uploaded to the system. The records office-in-charge could view the entire document archive and check each document status if the recipients open their emails or not. It can likewise prompt the sent document report to notify the sender written on the “From” area on the letter.

Attached to the notification is a soft copy of the document's attachment and some document information appended with the current document status.

The document notification was sent to the user who could view the document directly. As such, the document tracking report logs the activities in the sending, confirmation, and receiving of a specific record from the sender, department head, and the receiver of a document. Moreover, it showed a progression of a letter as it passed through the proponents and external entities. The report signifies a particular document appended with the time of the activity that the record had done. The software is the answer to reduce the hard and long- procedure of accessing files and documents which the institution encounters.

Respondents of the Study

The respondents of the study were selected using the purposive sampling technique. The thirty (30) respondents were composed of ICT personnel, document controllers,faculty, and RMO staff.

Research Instrument

The system was evaluated using a standard questionnaire from ISO/IEC 25010:2011. The questionnaire employed a five-point scale, where five was the highest, and one was the lowest score. The respondents were briefed to be fully aware of their functions and support to the evaluation of their developed system.

Data Analysis

The gathered data from the questionnaire were tabulated and analyzed using the mean.

Results and Discussions

The first specific objective of this study was to design and develop an Online Multi-function HEIs Tracking System with the following technical features: document management, document protection, sender-receiver notification, user's credential management, system audit logs, and automatic data backup. This design and development used RAD or Prototyping. Since RAD was to deliver the software more quickly, it involved the user more in the system requirements engineering process until the user was satisfied with the demonstration of the software prototype. As a result, the document management feature stores, manages, and tracks electronic documents. The electronic documents were converted to digital images through the use of a document scanner. This process increased productivity, efficiency, costs reduction, and organization data. The digital documents were stored in the server for easy access and delivery and secured storing. Serbinis et al. (2003) pointed out that document management in an internet-based system requires an internet-accessible server for easy access to the documents. The server was configured to support document storing, service document retrieval, the electronic delivery system of the documents, distribution service of the document, and workflow services.

Subsequently, document protection provides security to the important documents stored, processed, backed up, delivered, and disposed. The system security of the software used a Virtual Private Network (VPN) that ensured a unique assigned IP address to each campus. The current finding confirms the previous study of Singh et al.(2016), stating that the VPN technique enhances the security of the user in the communication network.

Moreover, the feature of a sender-receiver notification refers to the link being sent to the receiver to view the attached documents. The file document is sent through their respective institutional official electronic mail address. The sender uses a Mail User Agent (MUA) to compose outgoing messages as the designed e-mail architecture. The MUA refers to a sender Mail Transfer Agent (MTA) server as Sender Mail Transfer Agent (SMTA) and a receiver MTA server as Receiver Mail Transfer Agent (RMTA). Therefore, the MUA may provide a call-by-reference interface to senders that efficiently managed outgoing mail messages. The mail message is considered not a mail spam. Singh, Kumar, and Singh (2019) stated the advantage of MTA and MUA in the electronic mail system as a secured connection method

used for message sending in the email that engaged encryption.

Furthermore, the user's credential management feature includes how the document controller and document custodians' access change the respective username and password. Credentials were the verification of users' identity for authentication that confirms users' identity in relation to a network address or other system ID.

Additionally, a system audit log records the events or actions performed by the user in the system. The recorded logs could not be deleted nor overwritten. The audit log entries include destination and source addresses, a timestamp, and user login information. The audit log content contains sensitive information of the system user and should therefore be protected. Setayeshfar et al. (2019) stressed that system audit logging serves as the rich source of insights on malicious user activities. Subsequently, the automatic data backup is featured in the system that copies the data from the database to the file backup server to recover and protect data. The study of Herz and Fear (2015) considers automatic data backup as the preservation of digitized data for convenience and protection.

Table 1.0

Evaluation of Respondents on the Online Multi-function HEIs Tracking System

Areas	Mean	Verbal Interpretation
Functional Suitability	4.42	Very High
Performance Efficiency	4.44	Very High
Compatibility	4.52	Very High
Usability	4.48	Very High
Reliability	4.43	Very High
Security	4.54	Very High
Maintainability	4.54	Very High
Portability	4.44	Very High
Overall Mean	**4.48**	**Very High**

The table above shows that the system's overall quality was rated very high (M=4.48). The security and maintainability were rated the highest (M=4.54), interpreted as very high among the eight characteristics of the ISO/IEC 25010:2011. Security was measured very high because of the VPN architecture applied in the system, where every CHMSC campus had its own unique assigned IP address to receive and send data. The respondents found a useful mechanism to

guarantee the transmission of data packets tothe desired destination. Sun et al. (2010) attested that virtual private network security efficiency depends on the systematic analysis and method of how the data was moved and accessed over the network. This means that the system could be modified, improved, or corrected as it adapts to the requirements of changes in the environment. The system iscomposed of modules designed for minimalimpact on other components in case one component changes inthe program. Chaumun, Kabaili, Keller, and Lustman (2002) proved that the maintainability effect relies on the design level of theapplication environment, or the software can be modified, enriched,and improved to meet the user needs.

Additionally, compatibility was rated very high (M=4.52). The system exists in the environment of sharing resources to other products and could operate efficiently. Yoon et al. (2007) study emphasized that software compatibility is the proper execution of the software that can operate in a different environment.

Also, the usability of the system was earned a mean of 4.48 interpreted as very high. The respondents found the product useful in the achievement of the Online Multi-function HEIs Tracking System. Also, the system was considered appropriate to the needs of the institutions, especially the document controllers. El Khoury (2013) attested that the usability ofthe software was beneficial to theusers in terms of functionalities or design interfaces.

The performance efficiency and portability were also rated very high, with a mean of 4.44. The system performance in responding to any condition during processing time meets the requirements. Borjesson et al. (2005) proved that efficiency in using software or in a digital environment was a probable approach to optimize data processing and minimize errors in the collection and processing of data requirements. As such, the portability of the system was efficient and effective since the system was online, and there was no need to install it on the user's computer. The users could access the system from their specified computer where a unique IP address was assigned for securitypurposes. It was then concluded in the study of Yuhana et al. (2015) that the portability of the software system was based on the use of a method for easy installation.

Subsequently, the reliability characteristic was rated as very high (M=4.43). The availability of the system to use was designed through an online approach, where the convenience ofthe user was considered during the design of the system. The system was recoverable in terms of failures or interruptions occur since the system

was hosted in a server with automatic data backup. Moumane et al. (2016) claimed in their previous study that reliability was adversely influenced by frequent disconnection, limited bandwidth, and inadequate energy autonomy.

Moreover, the functional suitability was rated with a mean of 4.42 or very high. It implied that the system was functional according to its specified tasks. The functionalities of the system were according to the needs of the users and how to improve the management and tracking of records in the institution. The study of Grozdanovic and Janackovic (2018) emphasized that functional suitability was associated with the user's specified task needed to enhance productivity management. Lastly, the overall evaluation of the Online Multi-function HEIs Tracking System was very high, with an overall mean of 4.48. The system was capable of securely managing records of the institution and reliably handling data for further use.

Conclusions

Based on the analyzed and interpreted results, the following conclusions were derived:

1. The system is capable of securely storing the data and efficiently managing the document. The documents are converted into a digital image and are protected in the internet-based server for secured access and delivery. The server can support document storing, service document retrieval, the electronic delivery system of the documents, distribution service of the document, and workflow services. Document protection provides security to the important documents stored, processed, backed up, delivered, and disposed. The document protection utilizes a VPN method to ensure that the documents could only be accessed through assigned IP addresses. Each security parameter, such as encryption, decryption, and authentication, is significant to accepting and transmitting VPN packets. A sender-receiver notification applies a secured connection method in email, using MUA and MTA. The user's credential management for safe use of the system using a username and password can be enforced. The feature of a sender-receiver notification sends a link to the receiver to view the attached documents. The file document is sent through their respective institutional official electronic mail address. The user's credential management feature includes how the document controller and document custodians access and

change respective usernames and passwords. Credentials provide for the verification of user identity for authentication that confirms the user's identity. A system audit log is designed to ensure a system's credibility. The audit log content contains sensitive information of the system user and should be protected. The automatic data back-up can protect data from loss and for future recovery. Therefore, the software can address the stated objectives in relation to the software features required in this study and the user needs. The software is easy to use and reliable in tracking document records. The system usability and performance efficiency can speed up transactions in the four campuses of CHMSC.

2. The features of the software are capable of securely handling and efficiently managing the institution's document records. The software can contribute to the efficiency of services of the records management office of the institution.

Recommendations

Based on the findings and conclusions derived from the study the following recommendations are presented:

1. Carlos Hilado Memorial State College, may consider using the developed software for the improvement of operational efficiency transactions and services in the Record Office.

2. The other neighboring institutions may adopt the developed software to enhance transactions and services offered in their organization. The user training may be conducted to assist the end-user on how to use the system properly and efficiently.

3. The College may continue to update the information in the system, which may help to maximize its potential and functionalities.

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