
Document E-Tracker: A Panacea for Efficient Internal Document Management System in Kaduna Polytechnic

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ABSTRACT

We design an electronic document tracking system tagged "Kadpoly Document e-track System (KaDeS) to assist in monitoring the movement of manual files across the five academic colleges of Kaduna Polytechnic. Proprietary software design was considered because of the peculiar structural organization of the institution which makes any consideration to implement an off-the-shelf application a daunting task. Design Science Research Process (DSRP) methodology was adopted to aid the problem and objective identification, design, demonstration, evaluation of the systems and communication of the research process. Open source tools such as PHP, MySQL, JavaScript and Ajax were used to develop both the server-side and client-side Web based application. The evaluation was done by taking response from trained users exposed to test the system's usability based on effectiveness, efficiency and satisfaction. The users satisfactorily voted that KaDeS meet their expectations.

Keywords: E-tracker, Document Management, Paperless Office

INTRODUCTION

The use of computer has spread widely and the number of documents being handled has clearly increased. Traditionally, moving documents by people between two locations were done manually and despite the significant advancement in Information Communication Technology (ICT) that has improved the way documents are processed, many institutions (Luki i & Sruck, 2009) and many organizations still relied heavily on this manual movement (Konishi & Ikeda, 2007). Marginal carelessness and incompetence during the handling of high-priority documents could be tragic to the organizations. Problems get noticed when there are

missing documents where officers have to spend long productive hours to search for files. For example, a misplacement of academic transcripts or packaged examination documents can be very threatening and disturbing to academic institution. In a law firm, a careless handling of a legitimate exhibit or misfiling of documents can require re-scheduling of court dates because everything comes to a halt, if that missing file couldn't be found (Motorola, 2012).

In order to solve this problem it is pertinent to look at a way of monitoring and tracking the files with a view to providing adequate information about their position at any given point in time. A

document tracker is a system, mostly electronics, which facilitates monitoring and improving movement of document within a defined setup (Daud, Yahya, & AbdHamid, 2009). Electronic tracking systems (E-trackers) have been in use mostly by multinational postal agencies to manage and monitor parcels or goods for the benefit of their customers. A study carried out by Zhu reported that many express service companies are available nowadays playing important roles in the field of mail service that applies information network systems. The most well-known groups, including UPS, FedEx, DHL and EMS, are known for quick and accurate delivery. To publish the service's price, providing tracking service and computer news, the express service companies have their own website server that is in connection with the main server (Zhu, 2010). E-trackers are also being used to track electronic documents in paperless offices.

Kaduna Polytechnic as an academic institution with a large student and staff population scaled over five different campuses within Kaduna metropolis still kept and manage files manually. The need for effective monitoring of document in the institution cannot be overstressed. However, due to unique structure of this academic institution and its none encouraging investment in ICT infrastructure to facilitate electronic filing system, the existing e-trackers cannot not easily be adopted. This study, therefore, designs and develops a proprietary document tracker (Kadpoly Document e-track Systems, KaDeS) prototype to monitor the movement of files and documents within the academic colleges of Kaduna Polytechnic. The prototype system is subjected to test and evaluation by the officers involved in document registrations

and movement within the institution (Kaduna Polytechnic) and their response is analyzed statistically to ascertain the efficiency or otherwise of the proposed E-track system.

Several works have so far been done in this area ranging from modeling, prototyping, to full application that are either been implemented or yet to. In order to develop our model that will meet the need of our case studies some of these previous works are reviewed.

DHL is one of the earlier mail service outfits that offer several tracking method for the convenience of their customers. They introduced a kind of shipment that uses the Waybill or Shipment number for a tracking and monitoring that is proactive from pick up to delivery. The Waybill is an address and information label which is used in identifying the shipment of customers, and it contains tracking number that is unique which the customers can use in monitoring the shipment's progress (Express, 2012). Flight movements monitoring, enables DHL to proactively notify customers in case of flight delay or cancellations. Its monitoring system also has a feature that is unique which tracks all shipments pro-actively along the process of delivery (Express, 2012). Though the DHL system has a number of encouraging tracking features, the design is not suitable for an office model that our system intends to achieve.

A study carried out by (Abiodun, 2007), proposed AMIEDoT (Annotation Model for Information Exchange and Document Tracking). This annotation model helps in document tracking and recommendation service. The model used an annotation of three parameters. The parameters are: the person that introduces the document

parameters, time and the creator of annotation. The model employs an annotation process that determines who uses the document, when the document was used and what a document was used for. Notably, this model is useful for purpose other than tracking especially in information sharing. AMIEDoT model cannot be adopted for our system because of security issues noticeable in all information sharing systems which the model did not address.

Demong, Hassan, Besar, & Zulkifli (2009) developed Electronic Document Tracking System (EDTS) as a solution for tracking the movement of documents in and out of Faculty of Office Management and Technology (FOMT) in University Technology MARA, Malaysia. EDTS was developed within windows environment using Open Source tools. The application which relies on TCP/IP and internet to support server and client communication was developed by using Object Modeling Technique (OMT) methodology (Demong, Hassan, Besar, & Zulkifli, 2009). EDT is closely related to our system but the methodology adopted does not provide opportunity for evaluation and feedbacks from the user.

OpenDocMan is a free, web-based, open source document management system (DMS) written in PHP designed to comply with ISO 17025 and D1E standard for document management. It was developed under the open source GPL license hence available for free use and modification. Document management software and document management in general is based around a concept of centralized document storage, limited access, and change tracking. These are the fundamental tripod stand of OpenDocMan. It is a secured system that support

PHP5/ MySQL5 as well as APACHE/IIS as web servers (OpenDocMan™, 2015). However, this design target electronic document management system which is on a different page to our design that seek to monitor manual documents electronically through Intranet of an Institution

KRYSTAL(tm) Document Management System Software is simple, affordable and feature rich enterprise class, multi-user, browser based Document Management System Software with integrated Workflow Solution that enables organizations to securely store, manage, retrieve and distribute critical business documents using any device any time anywhere. This software is targeted to organizations that want to manage, control and secure business critical documents while pursuing the concept of paperless office (KRYSTAL, 2014). The seamless implementation of this application, like OpenDocMan, would have made it a preferred solution for us but the target is paperless office which is in defiance to our target.

Document Management and Records Tracking System (DMARTS) is an Enterprise Content Management (ECM) system that was developed by the US Federal Emergency Management Agency (FEMA), a component of the Department of Homeland Security (DHS). DMART was developed to collect personally identifiable information (PII) from claimants to carry out its mission of assisting individuals who apply for disaster assistance benefits. DMARTS will move paper files to an electronic repository. Competing technologies were assessed and compared for their ability to achieve system goals. For the primary system goals of document management and records management, several commercial-off-the-shelf packages as well

as a proprietary package already in use at FEMA were considered in its development. Among the components application picked off the shelf are EMC Documentum® for content management, EMC Captiva® was selected for the Document Privacy Impact Assessment, and Captaris RightFax® was selected as the FAX capture tool. The system requires a relational database system for the underlying data repository and Oracle Database Enterprise edition was used with RedHat Linux the preferred Operating System for the Linux version. Microsoft Windows 2003 Server is used for none Linux versions (US Department of Homeland security, 2008). The bottom line is that this system is an amalgam of a pool of already in use applications in FEMA with touches to serve as document E-tracker for their activities.

Zhou & Zhu (2012) introduced an electronic document tracking method based on Ant Colony algorithm. Through the abstract analysis method, electronic document is abstracted as ants, key host is abstracted as path point, through associate the path and the trajectory, the problem of electronic document tracking is described as combinatorial optimization problem. The model is simulated to determine its effectiveness. The researches based their work on an algorithm for tracking an electronic documents and full application to implement the algorithm in a known office situation was not achieved by the research.

Despite efforts and several designs for document tracking most of the approaches are tailored for electronic documents (Zhou & Zhu, 2012; KRYSTAL, 2014; OpenDocMan™, 2015). Others are either too vague to be implemented for our case study

(Abiodun, 2007) or too open for office document handling (Express, 2012).

Our approach is to develop propriety software for electronically tracking manual documents within Kaduna Polytechnic taking into accounts the peculiar nature of the institution. Design Science Research Process (DSRP) is adopted in the methodology for this work where the six phases ranging from Problem identification, Objective specifications, Designs, Demonstration, and Evaluation to Communications serve as guides. This approach enables the real study of the structural and administrative setup of Kaduna Polytechnic and identify the constraints therein that limits the adoption of all the previous systems reviewed earlier. The demonstration and evaluation stages allowed the developed system to be tested by the users and get their feelings regarding the system's effectiveness known. The analysis of the responses provide answers to the main objective of this research which is to design, develop and evaluate e-tracking system to manage document movement within the academic colleges of Kaduna Polytechnic.

After the Introduction part, the rest part of this report is organized into Methodology, Result and Discussion, Conclusion, and Future work. The introduction established the background of the research with literatures of previous work on e-tracking system. The Methodology defines how the research is conducted in line with DSRP methodology, clearly stating the instruments of data collection at both the problem identification and evaluation stages. Results and Discussion presents the analyzed data in a table and chart and discuss them. The conclusion gives a

conclusive overview of the entire research and Future work gives a clue on what need to be added in future to KaDeS to meet the paperless office paradigm.

METHODOLOGY

We adopt the Design Science Research Process (DSRP) model in this research. DRSP involves the design of unique or advanced artifacts and analyzing the performance of the system for improvement in the area of Information System (Kuechler & Vaishnavi, 2008). The six stages of DRSP that guide this research are Problem identification and motivation, objective for solution, design and development, demonstration, evaluation, and communication (Peffer, Tuunanen, Marcus, & Samir, 2007).

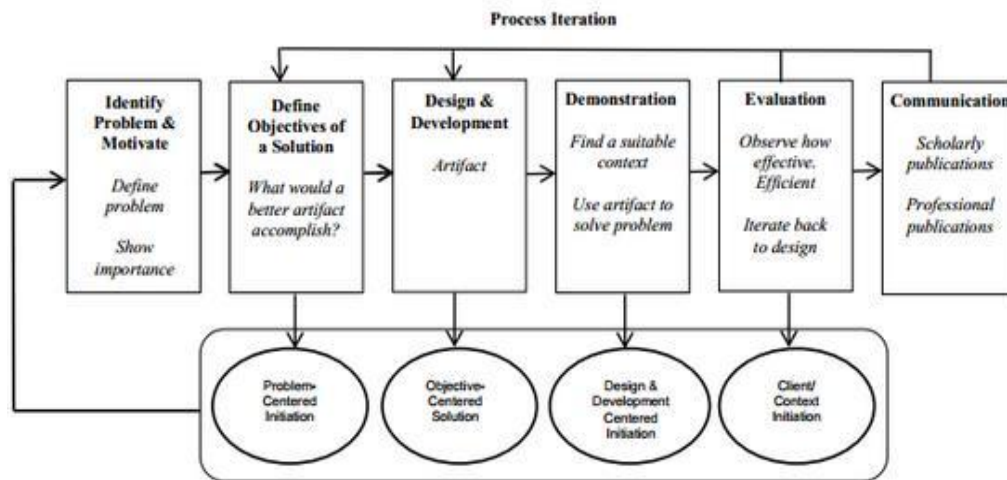


Figure1. Design Science Research Process Model.

(Peffer et al, 2007)

The enormity of the problem was identified at the awareness of problem phase. The study identifies the mode of document movement within the organizational structure of Kaduna Polytechnic and this is done by direct observations by the researchers and interviews of the most senior administrative officer (mostly in the rank of Principal Assistant Registrar) of each of the five colleges. The Director of ICT was engaged to determine the level of ICT facility that can support the conceived system.

The second phase was the clear specification of the expected system which was easily itemized from the analysis of the results from phase one.

In the third phase, Unified Modeling Language (UML) was used to effect the various system designs showcasing the structural representation and data flow within the system. At the development stage an open source scripting

language (PHP 5) is used with MySQL 5 another open source database management system adopted to manage the back-end. HTML 5 aids the interface design with CSS for seamless designs. The Dynamism of the client-side interface is achieved with Ajax and JavaScript. AJAX (asynchronous JavaScript and XML) is a group of interrelated Web development techniques used on the client-side to create asynchronous Web application. It is an important front-end web technology that lets JavaScript communicate with a web server (treehouse, 2015).

We achieved the demonstration phase by installing developed web e-tracker on the existing LAN in ICT for testing.

The evaluation stage actually involved the testing of the system by administrative staff of Kaduna Polytechnic. These staffs were selected from the five academic colleges of Kaduna Polytechnic

to use the system after training. Maguire (2001) stated that International Standard Organization (ISO) defined the extent to which a specified user can use a product in achieving specified goals in a specified use context. The usability centers on users' goals which are effectiveness, efficiency, and satisfaction of the users with the system within a context that is specified.

The usability test of the designed and implemented E-Track prototype for Kaduna Polytechnic was done based on Perceived Usefulness and Perceived Ease of Use of Questionnaire (PUEU) proposed by (Davis, 1989). The questionnaire consists of 12 questions categorized into 3 of effectiveness, efficiency and satisfactory; analyzed on psychometric theory scale consisting from one to seven degrees using the terms "Strongly disagree" for 1 and "Strongly agree" for 7 and a Not Applicable (N/A) for point outside the scale (Zaharias & Poulymenakou, 2009). A sample of 31 users was selected randomly to measure user satisfaction towards the E-Track prototype. The questionnaire is made up of two sections; the general information section and user evaluation section.

The last stage involves the publications of the report of the research. This is where this article stands as part and parcel of Kadpoly Document e-track System (KaDeS) research process.

RESULTS AND DISCUSSION

The result of the preliminary study obtained through interview of the head of the admin of each of the colleges and the ICT manager indicate that while the staff saw the need for a tracking

system in any form to assist them, the ICT manager present the limitations of ICT infrastructure in Kaduna Polytechnic to withstand paperless office. The five Principal Assistant Registrars (PAR) heading the five colleges (College of Science and Technology CST, College of Engineering CEO, College of Environmental Studies CES, College of Business and Management Studies CBMS and College of Administration and Social Sciences CASS), overwhelmingly saw the need for effective document management. They agreed that the current manual system is bedeviled with a lot of problems especially during the peak periods of student registration and end of the programme clearance processes. However, the ICT manager after agreeing for the automation cautioned that the ICT infrastructure of the Polytechnic is not robust enough to withstand a full automation if we are looking at a complete paperless office.

On the evaluation of the developed system part, the 20th version of Statistical Package for Social Sciences (SPSS) is used to carry out statistical analysis of the collected data while histogram is used to depict frequencies in the result. The 31 respondents are grouped into 16 females representing 51.61% and 15 males representing 48.39%.

A system is effective and useful if only its users are able to achieve their intended goals. Effectiveness can be measured by investigating whether users are able or not to complete a particular task with ease.

Table 1: Using this system, in my work will enable me to accomplish tasks more easily and quickly

Scale		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	6	19.4	20.0	20.0
	5	2	6.5	6.7	26.7
	6	13	41.9	43.3	70.0
	7	9	29.0	30.0	100.0
	Total	30	96.8	100.0	
Missing	0	1	3.2		
Total		31	100.0		

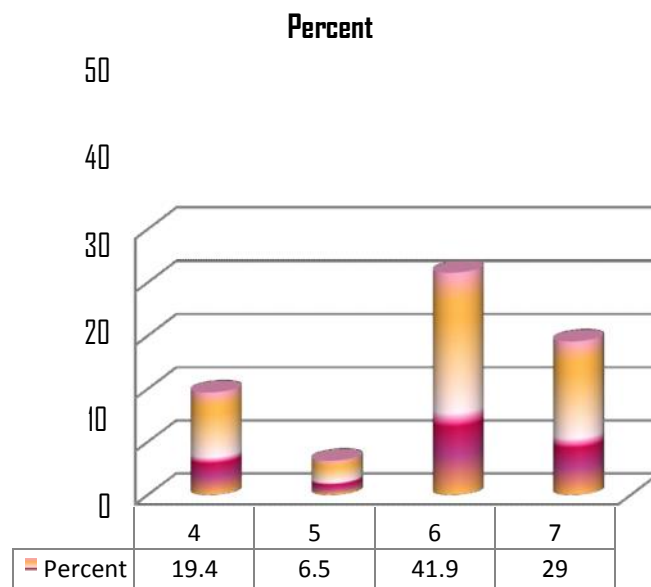


Figure 1: Effectiveness

The first question analysis is illustrated in the Table 1 and Figure 2, where four levels of responses are shown. However, Most of the responses (41.9 %) are satisfied with how the system is easy to use, on other hand, about (19.4 %) responses were not sure about this.

The second analysis is on performance which clarifies the efficiency of the system.

Table 2: Using the system would improve my work performance

Scale		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	3.2	3.3	3.3
	4	2	6.5	6.7	10.0
	5	5	16.1	16.7	26.7
	6	12	38.7	40.0	66.7
	7	10	32.3	33.3	100.0
	Total	30	96.8	100.0	
Missing	0	1	3.2		
Total		31	100.0		

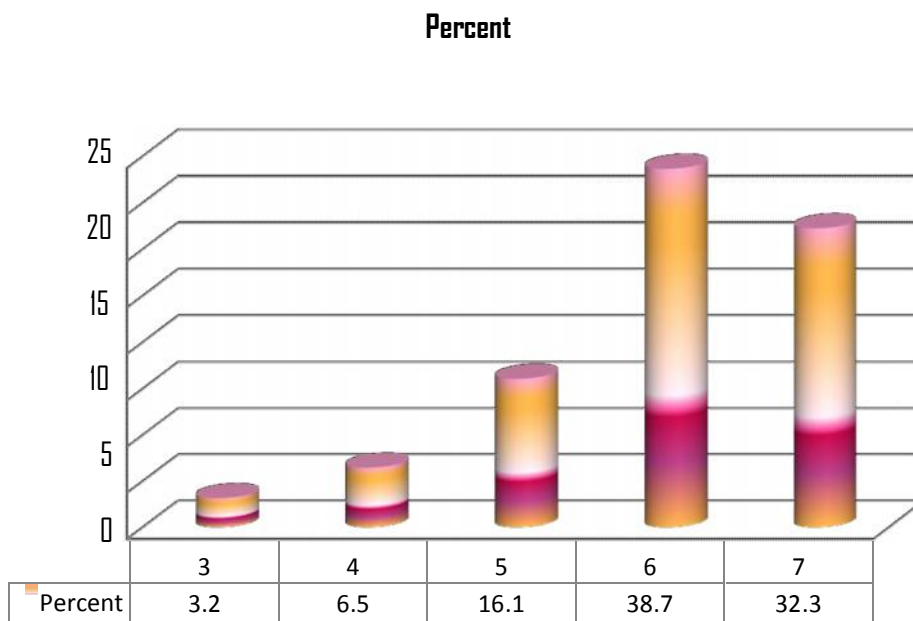


Figure 2: Efficiency

Table 2 and Figure 2 elucidate five levels of responses; 10 respondents with (32.3%) give 7, and 12 respondents with (38.7 %) give 6; that shows that the users believes the E-Track prototype is efficient enough to improve their performance at work.

The third is on productivity showed on Table 3 and Figure 4 respectively to define user satisfaction.

Table 3: Using the system in my work would increase my productivity

Scale	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	9.7	9.7
	4	2	6.5	16.1
	5	4	12.9	29.0
	6	12	38.7	67.7
	7	10	32.3	100.0
Total	31	100.0	100.0	

Percent

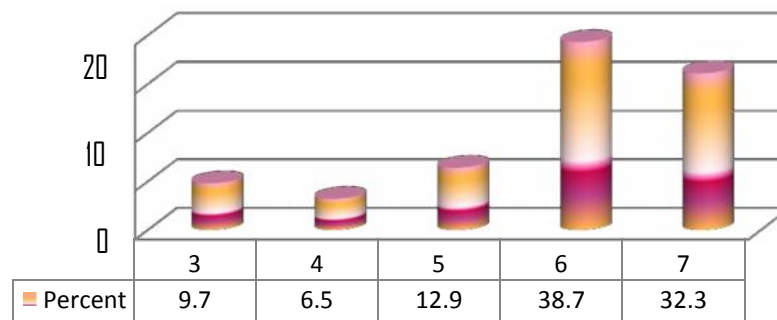


Figure 3: Satisfaction

The table and figure show five levels of responses, that the highest level with (38.7%) is 6 that given by (12) responses. Then the second level is the strongly agree level with (32.3 %). Four users (12.9%) responses choose 5 to answering the question that the users will have job satisfaction with the system hence increase productivity.

CONCLUSION

This study focuses on designing, implementing, testing and evaluating a documents e-tracker for Kaduna Polytechnic. The interview

conducted with the senior admin officers of the colleges and the ICT manager defends the need for document tracking system and available ICT facilities to support the designs. The designed and implemented prototype was evaluated with questionnaires issued to users to answers questions that are sub-grouped into 3 viz; effectiveness, efficiency and satisfaction. The response shows that the users overwhelmingly accept Kadpoly Document e-track System (KaDeS) to meet their needs.

FUTURE WORKS

The prototype (KaDeS) should be improved to

work in a much anticipated paperless office. Though most of the reviewed designs are already on that platform, it is pertinent to note that they cannot easily be integrated to work for Kaduna Polytechnic because of the institution's peculiar setup hence the need for proprietary. Therefore since KaDes is proprietary already, as soon as the institution improves its ICT base, KaDes should be improved for full electronic document monitoring while the base design for manual document still subsists because a full paperless office is a mirage.

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