DOCUMENT TRACKING SYSTEM FOR AKANU IBIAM FEDERAL POLYTECHNIC UNWANA, AFIKPO: DESIGN GUIDELINES AND MODEL IMPLEMENTATION

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ABSTRACT

Documents have become part of the daily activities ranging from communication to decision making. When these documents, containing sensitive or useful information, are not properly monitored, it can result to their loss, delay or even deliberate destruction usually at the detriment of the owner or the intended recipient. In addition to the effort made by previous studies to enable remote users track their documents in real-time using both SMS and email, most of these systems failed to monitor the two types of documents (paper documents and electronic documents) from one platform. In this study, a prototype system have been proposed to solve the problem of tracking both paper and electronic official documents. To achieve this objective, three modules - electronic movement register, a search tool and a status notification module - were developed and integrated into a single cloud application in order to ensure both easy accessibility of documents and real-time alerts of document status. Using Object Oriented Analysis and Design Methodology (OOADM), the proposed system was designed. The implementation was done with Java and XML at the front-end; and PHP at the back-end while MySQL was used for managing the database. After proper system evaluation which was done with both an emulator and a Lenovo 101020A Android phone, the proposed document management systems proved to provide single tracking platform for both paper and electronic documents; and real-time monitoring of these documents using a combination of SMS and email updates.

Keywords: Document tracking, paper documents, electronic documents, design methodology, system implementation

INTRODUCTION

Communications involving documents can be between two persons or group of persons either within the same organization (internal mails); or in different organizations (external mails).In some cases, these documents are archived for reference purposes, while in some other cases, they are moved from one person to another in other to be reviewed, approved or rejected. The process of moving these documents from one location or person to another in other to receive

the needed attention is regarded to as document routing (Centre for Technology in Government, 2003). Document routing could also mean the automation and processing of relevant document through collaborative effort in which case, the said documents will be moved from one office to another office or one person to another person (Sarantinos, 2018).

When it comes to moving (routing) documents, every organization has its unique communication hierarchy. This is the correct line or order of communication in an organization for which everyone is expected to discuss personal and corporate issues and concerns with his/her supervisor, first. The supervisor either takes it up to the next level or advices such a person on what to do. However, where such a person takes the issue directly to the director or head of the company, he/she will be turned down, and advised to discuss the matter, first, with his/her supervisor. This official hierarchy of communication instils discipline, division of labour and privacy of discussions. In the conventional email systems the messages are routed directly to the recipient instead of following the organizational hierarchy (Schanilman, 1999; RSKPL, 2015). This is the primary reason why emails are not used for internal communication since it does not obey the organizational hierarchy of routing documents -though it is regarded as the most common, fastest and easiest means of communication (Vanguard, 2017). More so, research has shown that the integration of email system into office operations doubles the use of paper in office environments (Adam, 2008).

The Documents Management Systems (DMS) came as an enhancement to the email systems. DMS allow electronic documents to be moved from person to person and from office to office similar to the use of dispatch register; and its design was mainly for paperless office environment where documents are in digital form (Khan, 2016; Gates, 1999). Open source document systems on its part provided free and standard tracking applications for handling documents but its management (application and data) were handled by unknown third parties.

The combination of paper and electronic documents has remained the mode of operation for most organizations regardless of the proliferation of Internet connectivity, abundance of digital contents and the rising advocacy for paperless office. For some corporate organizations the continual use of papers could be attributed to the level of process and volume of work involved; the cost and convenience attached to using paper documents; or other corporate preferences (Sallam, 2016; Banday *et at*, 2015). Some legal implications such as the certificate verification exercise, where digital certificates are not regarded as being equal to paper certificates and the Malaysian National Land Code, which requires the

presentation and storage of all land related paper documents, could equally result to insistence of paper (Lui-kwan, 1999; Abidin & Husin, 2018). Hence, there is need to monitor paper documents and to provide easy access to them using File Tracking Systems (FTS). These FTS involved the use of hardware tags or markings (RFID, Barcodes etc.) attached to these paper documents and integrated with their respective scanners in order to monitor the movement of paper documents. FTS were mostly expensive for SMEs and would not allow remote monitoring (Rahman, 2018; Ishayk, Othman, Talib & Ilyas, 2017). Contrary to document management systems which were used for only electronic documents, file tracking systems were used for only paper documents. Consequently, most organizations struggle to maintain several systems in other to track these two forms of document. In addition, the implementation of these existing systems did not consider rapid increase of mobile clients (Spyrou, 2016). Hence, in order to accommodate the combined use of both papers and electronic documents in corporate organizations vis-a-vis their security, monitoring and mobile access, there is need for a (single) hybrid system that captures both the storing and monitoring of changes to electronic documents; and as well, the tracking of paper documents between offices easily; and from remote locations.

This study is therefore a response to the challenge of handling documents by striving to provide an enhanced cloud based system for a networked environment which allows users to track both paper and electronic documents; to use their mobile devices; and to provide real-time alerts in form of SMS and emails at each change of documents status and location; in order to promote efficient monitoring and easy retrieval of these documents.

REVIEW OF RELATD LITERATURES

By implication, documents which are moved from one location to another location in order to attract the needed intervention or reach the intended recipient(s) are known as routed documents. Whether these documents are archived or routed (moved from place to place), There is need to maintain proper record of the current location of documents as to enable easy retrieval of these documents and to guard against their loss, damage and delays. So many systems have been proposed already to enable easy tracking of official documents such as the use of dispatch registers (Banday *et at*, 2015); web based applications (Edem & Onwuachu, 2014; Oludele, Onuiri, Olaore, Sowunmi & Ugo-Ezeaba, 2015); barcode systems; radio

frequency identification (RFID) systems (Rahman, 2018; Ishayk, Othman, Talib & Ilyas 2017; Abidin & Husin, 2018); and artificial intelligence (Sallam, 2016).

Table 1: A Summary of the reviewed related literatures

S/N	Author	Techniques Used	Limitation
1	IBM (2017)	Web-based document routing and tracking using workflows a shared central database in the Domino directory ; agent systems developed with Java Program and Lotus script program	lacked support for offline operations
2.	Ishayk *et al* (2017)	The authors combined radio frequency identifier (RFID) tags with Google Doc to track student project files.	Its RFID tags did not provide interface for users to change their document details.
3.	Perocho (2012)	The authors designed a file tracking system for monitoring medical records. Here printed barcodes were utilized to identify and register the present location of paper documents	• susceptible to physical damage • expensive for small and medium enterprise (SME) to implement
4	Oludele et al (2015)	Using Waterfall methodology designed a web-based system to track and manage criminal records in the Nigeria Police Force	• Rigid system development cycle • operated as stand-alone with no interaction
5.	Ajala (2015)	• used waterfall model to implement a prototype document management system for Oyo State government • deployed PHP advanced encryption standard (AES) encryption algorithm to encrypt and decrypt data while Zzlib library	Solely for electronic documents Rigid system development cycle-
6	Abidin and Husin (2018)	• combined fingerprint authentication with RFID technology to provide security for both paper and electronic documents	Required users to run parallel systems of both their old and new system

From table 1, it can be shown how different institutions have implemented their document tracking system to meet their unique assignment.

EXISTING SYSTEM

Akanu Ibiam Federal Polytechnic Unwana, Afikpo has offices distributed across the campuses. These offices include Departmental offices, Directorates offices, Administrative offices, Bursary, Audit, Library, Hostels and Medical centre. Every office maintains dozens of files housed within them to maintain records in categorized manner. As depicted in Fig. 1, the system involves several types of entities including users who perform different activates within the system. These include “Document”, “Dispatch Register”, “Mail Clerk”, “Officer”, and “External User”. New files of diverse types are submitted by external users and officers. Irrespective of the type of the office, these files pass from one officer to another officer within same or different office. Document tracking within the institution is usually maintained using paper-based dispatch register. The mail clerk in each office is responsible for securing and maintaining the dispatch register. For this purpose, offices such as Departmental offices are maintaining a single dispatch register while as some offices such as administrative offices maintain multiple dispatch registers. A mail clerk in the office records minimum file particulars on the dispatch register upon reception and delivery of the document.

The process model in Fig.1 presents the basic process used to facilitate the understanding of the phenomena that occur in a system, in order to increase its efficiency and to improve its performances.

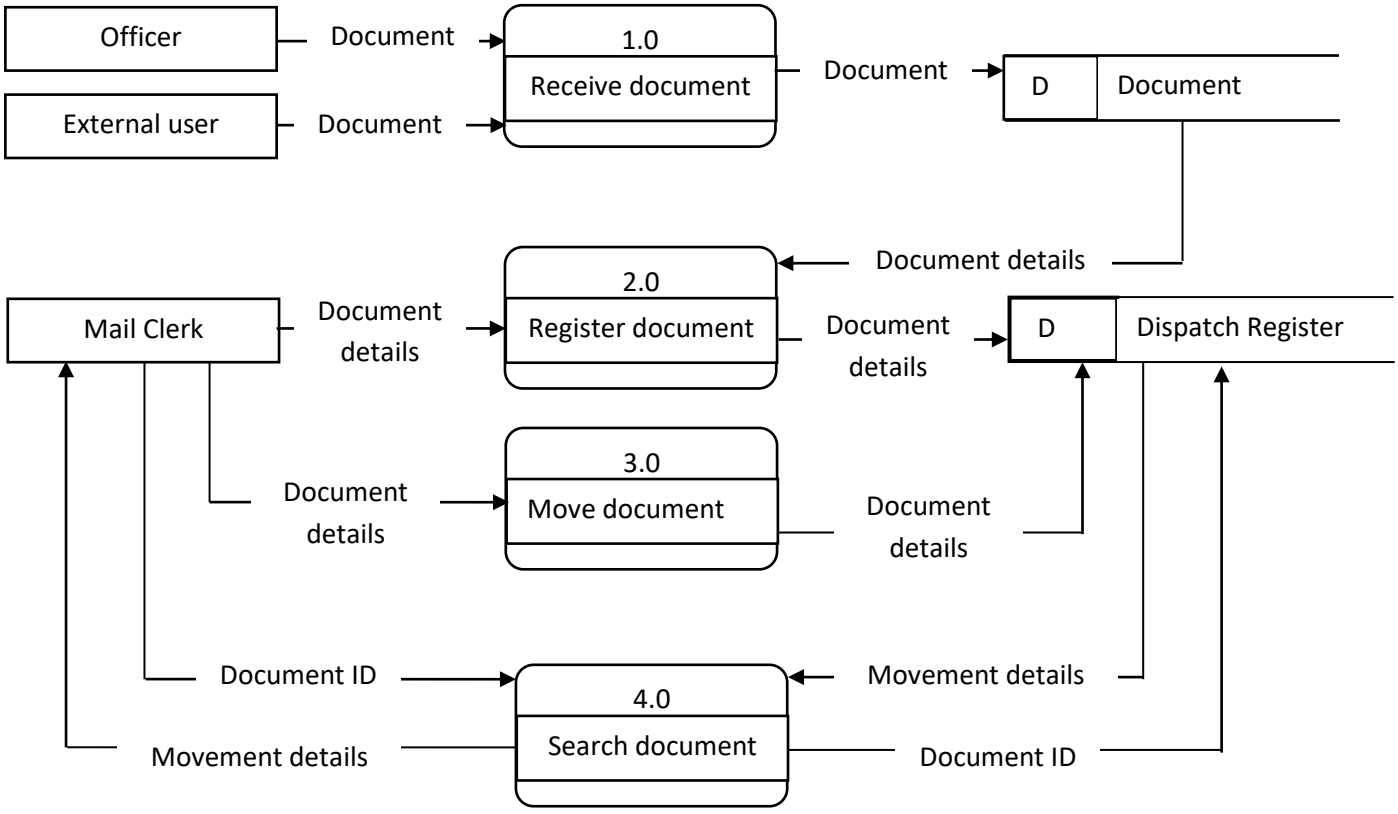

Fig.1: Data Flow Diagram of the Current System

There are several steps an officer or an external user will follow to forward a document to the intended recipient on the administrative hierarchy. The officer (or the external user) will create the paper document (or fill and submit an existing form). The document or form is the submitted to the mail clerk of the originating department. The dispatch clerk acknowledges and registers the document in their movement register; after which the document is sent to the next recipient (another officer). On receipt of the document, the receiving department acknowledges and register the document in their dispatch register. The movement of the document continues until the document gets to the final (intended) recipient. Finally, a copy of the reviewed document will be filed/archived.

PROPOSED SYSTEM

The proposed hybrid document tracking system will use a shared electronic dispatch register to keep the movement details of both existing documents and new ones. As part of its enhancement, the proposed system will handle the creation and tracking of electronic documents in addition to the paper documents. Employee of public institutions as well as external users will be able to track and get information about their owned documents. The

proposed hybrid document tracking system will involves all entities of the existing system including the "electronic movement registers", "Administrator", and "Users". Each type of user will be assigned specific roles to maintain the system. The system will be exclusively controlled by an Administrator.

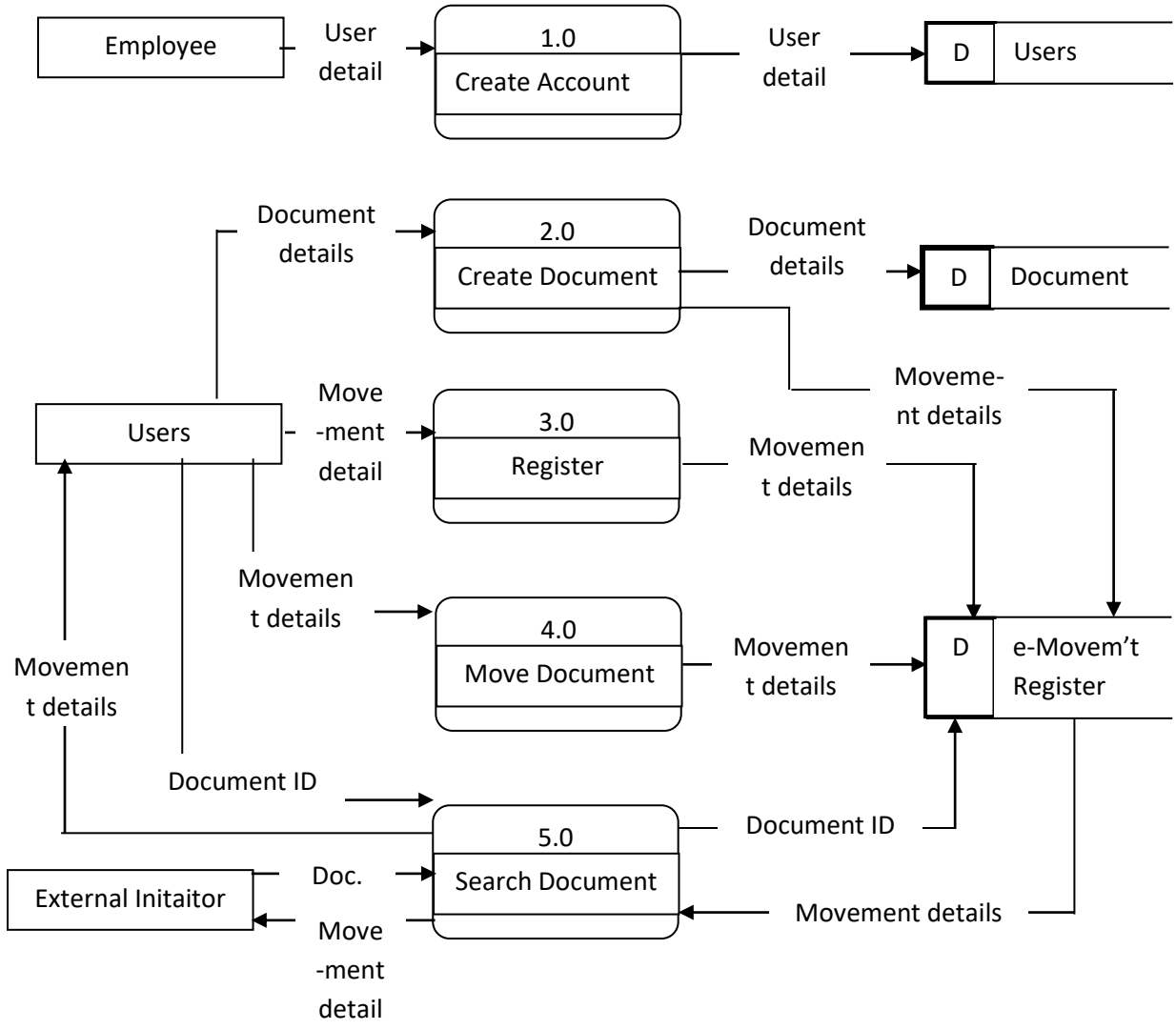

Fig.5: Proposed Enhanced Cloud-based Hybrid Document Tracking System

In this work, we are proposing an enhanced cloud-based system for hybrid tracking of official documents that will enable institutions to handle the tracking of both digital documents and paper documents. In addition, the proposed system will provide notifications on the movement of documents in both e-mail and SMS format without necessarily compelling the document originator (or the recipients) to purchase smart phones or to always check their e-mails in order to get notifications.

PROTOTYPE DESIGN

A model design of cloud-based document-tracking system was implemented with Free Open Source Technologies using HTML and CSS at the front-end for web forms and reports; PHP was used for the back-end processing while MySQL provided the database for storing documents and its movement logs. A screenshot of file creation and file dispatch user interaction forms is shown in Fig. 6 and 7.

The cloud-based document tracking system was tested on both an emulator and a Lenovo 101020A Android phone.

The testing of the new system was done on two different stages: with emulator and with targeted device. This exercise involved four different tools namely: the emulator, the local host server; android device; and Internet server. The summary of the system testing is shown in the Table 2. During the testing period, the system was evaluated to measure the level of its compliance with the objectives.

Table 2: A Summary of the result of the Evaluation

Steps	Expected Results	Actual Results	Status
If the user enters invalid login credentials	The system will deny the user access	Access denied	Passed
If the user enters valid login credentials	The system will grant the user access	Access granted	Passed
If the user registers a document successfully	The system will forward SMS and email notification to the owner only and the next recipient	SMS and email notification was forwarded to the owner only and the next recipient	Passed
If the user creates a new digital document	The system will forward SMS and email notification to the owner only and the next recipient	SMS and email notification was forwarded to the owner only and the next recipient	Passed
If the user forwards a document	The system will forward SMS and email notification to the owner only and the next recipient	SMS and email notification was forwarded to the owner only and the next recipient	Passed
If a user enters a id document to track	The document movement history of the document will be displayed	The document movement history of the document was displayed	Passed

The results of the tests were successful across tested operating systems, and browsers.

IMPLEMENTATION STRATEGY

This study suggest parallel changeover for a successful implementation of the proposed system.

Table 3: A Summary of the result of the Evaluation

Stage	Details
Pilot Implementation	**a) Training:** Training in the use of the cloud-based document-tracking system shall be provided to one administrator, one secretary from each unit/department, and other staff of the Polytechnic. **b) Implementation:** The pilot implementation of the proposed document-tracking system shall be hosted on test servers. The users trained for pilot implementation shall be given access to the document-tracking system. The office in-charge and dispatchers shall be divided in two groups who will perform the tasks as per their roles. The pilot implementation will run in two Polytechnic offices parallel with the existing system. **c) Debugging**: Any errors found during the pilot implementation of the proposed system shall be rectified. The system shall be put to another pilot implementation until successful results are achieved.

CONCLUSION AND FUTURE SCOPE

In this work, a background study of different document tracking techniques and a review on document tracking literatures was carried. Also an analysis of the current document tracking system in public institutions in Nigeria was conducted to understand the challenge of the current system and to identify the possible enhancements. Finally a cloud-based hybrid tracking system was designed and implemented to handle the challenge of poor notification and monitoring identified with the current paper-based document tracking system.

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APPENDIX 1: SAMPLE SYSTEM INTERFACE

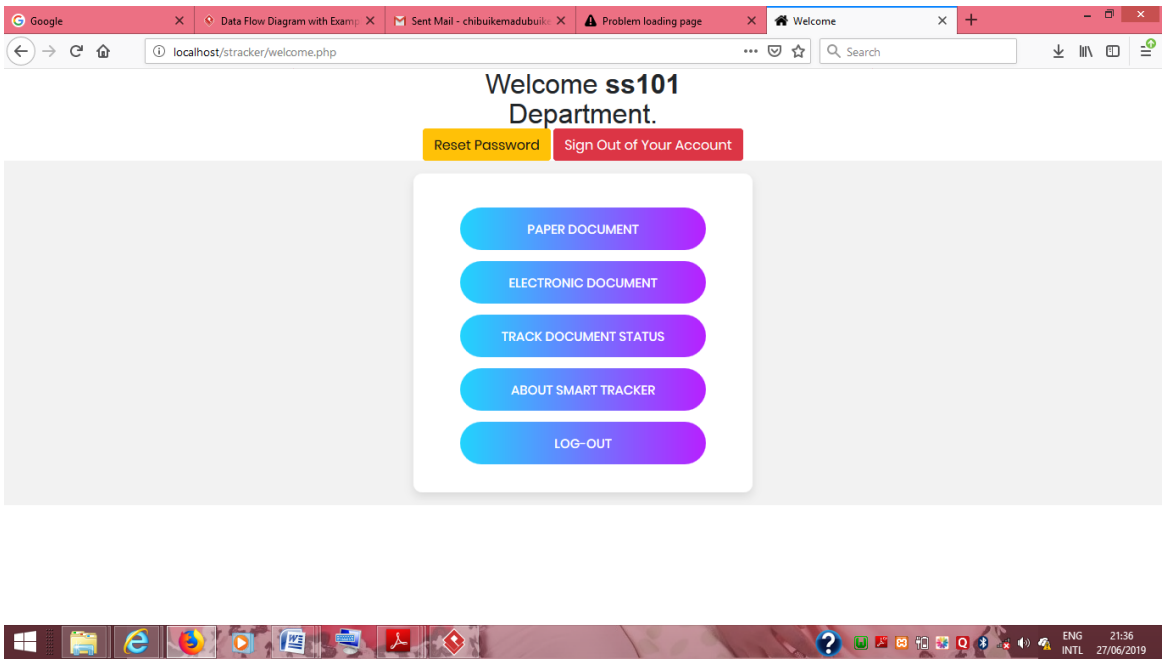

Fig. 6: User Module Interface.

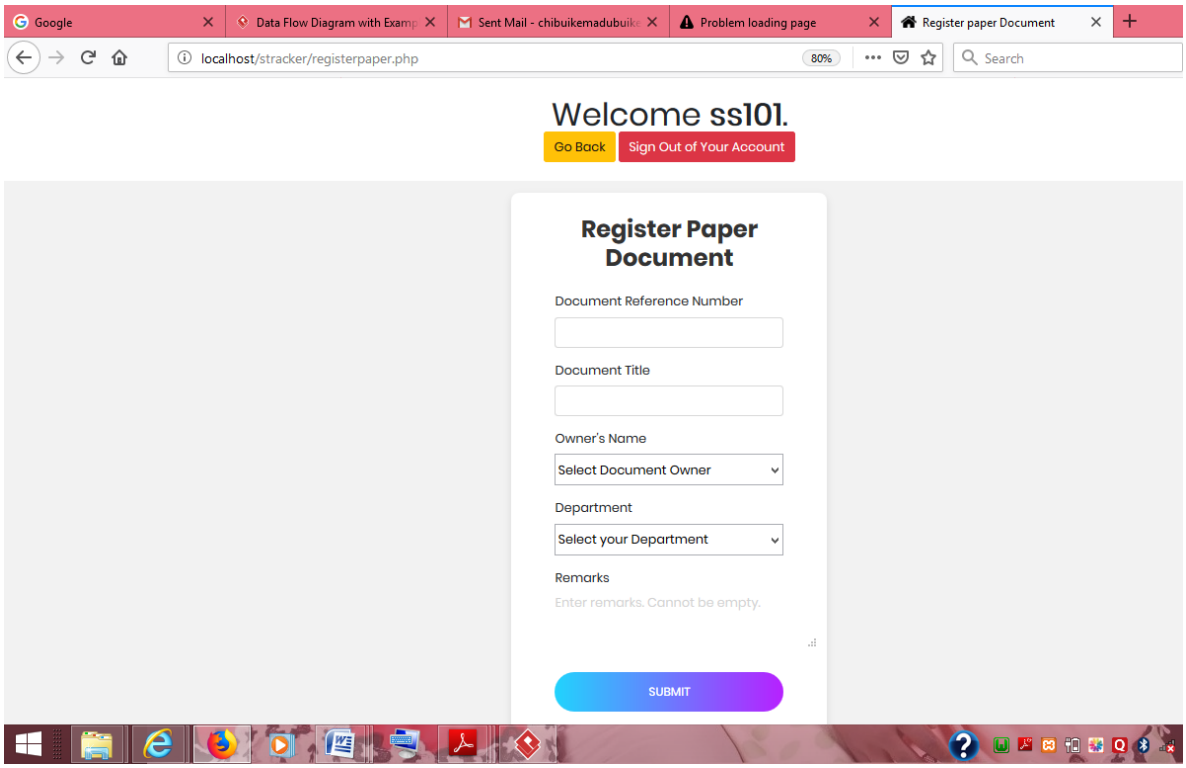

Fig. 7: Register Document Interface.