# A MODEL FOR MEMO TRACKING AND DELIVERY

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## ABSTRACT

The traditional means for sending documents (such as memos and letters) in a developing work environment involves the dispatch of hardcopy of such documents to a receiver. Such documents while on transit could be varied and diverted. Sometimes a document might need to go through a third-party for comments before being routed to appropriate office for their necessary comments. The manual process of moving documents from office to office can be very slow, cumbersome and might even be compromised. In this paper, we developed a solution that can be deployed to ameliorate this challenge and it is aimed at delivering secured mails while being transmitted. With this system in place, members of any community connected to a common Local Area Network (LAN) are able to send secured paperless memos and letters to one another. The system can also be implemented where internet connectivity is available.

*Keywords*: Document Management System, Mail Tracking System, LAN, ICT, FUL

## 1.0 INTRODUCTION

Electronic monitoring and tracking system is an important ICT concept that can be leveraged upon to efficiently deliver documents in the work environment. On a daily basis, academic institutions and corporate organizations deal with large volume of documents; Federal University Lokoja (FUL) as the case study is not an exception. The challenges faced by FUL staff members while sending and sharing memos are numerous. These challenges may not be unconnected with the current manual methods of documentation and information dissemination. The practice at FUL, just like most organizations in our clime, is to carry hardcopy documents to be delivered, from office to office by dispatch clerks. This mode of delivery is characterized by inefficiency and lack of Information integrity. Using this method of document delivery can lead to possible misplacement or mishandling of mails. In addition to the identified challenges above, documents could be read by unauthorized persons that carry them.

Furthermore, the time wasted in the delivery of important documents are some of the banes of the current manual method. Another pertinent issue associated with this method is the lack of secured storage facility. From the foregoing, it becomes a necessity to automate this manual process. This system can help memo writers track/monitor actions being taken on their documents.

The research is therefore, aimed at developing an electronic and automated document monitoring and tracking system. This system was developed with the following objectives: (i) enhanced monitoring and tracking of memos and other documents (ii) reduction in the search time for memos and documents (iii) improved reduction in the incidences of loss/misplacement of documents by maintaining an activity log (iv) to provide access control measures on documents that have been delivered or on transit. In this paper, we present the design, implementation, results, discussion and conclusion as part of the effort made to digitize document delivery at Federal University Lokoja (FUL) and elsewhere.

## 2.0 LITERATURE REVIEW

Building a paperless community is an important goal of Information Technology (IT). The main aim of digitalizing the operations of an organization is to avoid the use of papers with a view to going green. Going green is simply building a paperless environment which is the new technology direction. Enumerating the environmental impact of just 10 million pages of paper, the US Environmental Protection Agency reported the destruction of 2,500 trees, a waste of 450 cubic yards of landfill space; usage of 56,000gallons of oil and 595,000KW of energy (EPA, 2017). Suffice it to say that the health hazards are enormous as cutting trees depletes the amount of oxygen in the environment and the high energy release harmful gases into the environment. Also, the economic impact is highly demanding as the production and distribution of reams of paper is costly. GoPaperless (2015) noted that the pulp and paper industry is the $2^{nd}$ largest consumer of energy in the US. The average US officer prints 10,000 pages per year thus helping Americans to generate 85 million tons of paper into the waste stream and an estimate of more than 400 million ink and 100 million toner cartridges end up in landfills each year.

To solve these problems, the implementation of Document Management System (DMS) was proposed as a solution. Leppert (2016) defined DMS as the orderly, structured electronic filing of your content, and the storage, retrieval, archiving of both electronic and scanned paper records and files. We can also define it as computer software that can store electronic documents for businesses/organizations to implement the green initiative and improve efficiency. It can be used to manage different versions of the same document modified by different users. This facility also gives DMS the ability to track the location of the document(s). Kirkby (2011) itemized four (4) types of DMS depending on how an IT infrastructure is designed; Web-based document management packages, client-server based document management packages, database document management and cloud-based document management, or hosted DM. The key features of all DM systems are document security and information integrity, document integration and sharing, and scalability.

There are many DMS available on the market today. Brooks (2017a) reviewed over 60 commercial document management systems by visiting their company websites, making calls to customer service, testing out free trials when possible and interviewing real users. Based on some factors like ease of use, search capabilities, integration options, collaboration tools and workflow abilities, he found top 17 document management systems to seriously consider as best picks: Agiloft, Contentverse, Content Central, Doccept, docSTAR, DocuWare, Dokmee, eFileCabinet, FileCenter Pro, FileHold, Laserfiche, LogicalDOC, M-Files, PaperPort, PinPoint, Speedy Organizer and Zoho Docs.

Despite the availability of these vendor DMS, educational organizations still design and implement their specific DMS which is highly tailored to their needs. Principally, these organizations hope to achieve a variety of features to maximize their benefits which may include reduced retrieval costs or timely search and retrieval of documents or memos, lower data entry costs, ease of locating documents for retrieval, security of access and storage, better collaboration, recovery of physical space, simultaneous access to single document, and provision of remote access to records from anywhere according to Leppert (2016) and Brooks (2017b). The University of Utah implemented an integrated DMS that provides web-based application tracking services for all their admission processes. This enables applicants to keep a trail of the progress made on their admission documents into the University. The University of Sheffield is currently planning to introduce a new tracking system to track mail items around the University to minimise the risk of lost mail around the campus. GrTech (2016) developed a Memo Management System that can track the amount of time spent on each memo, trace the progress on each process of validation and give memo rejection/approval notifications. The system works fully online and allows creating, sending, receiving and replying memos within a configured due date. AA Intelligent Systems (nd) developed a network-based Letter Management System that can both function on a central database server running on Linux and a GUI

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running on the windows client. The system can track formal letters sent to clients. It has the facilities for inserting, editing, deleting and searching letters by date, subject and/or recipient's name.

Another letter management system was developed by Adare SEC (2018) with the capability of SmartEdit features which enable users/staff with relevant privileges to edit and review existing documents/letters. Likewise, Expedien University ERP (2015) developed a letters/correspondence movement system that sees to the dispatch and receiving of mails within an organization. It offers an advanced search option that works with parameters like source, destination, topic/subject, date, and keyword search facility. The system can generate a barcode for the letters and search can also be made using the barcode. Adnan (2015) studied and analyzed the mail system at IBS Technology Kuala Lumpur and developed a computerized mail system according to user requirement using an agile methodology. The final result of the study was the implementation of a Mail Management System (MMS) that can store mails and search using different criteria.

A secured suite of email management templates named ContactMonkey was developed by Salesforce to help track messages and ensure prompt follow-up by senders in real time. The templates were designed to be integrated into existing email management systems and it is believed to be the most advanced and simplest email integration system in the vendor's market as the system also provides an on-screen pop-up once an email has been opened by the recipient. Overall descriptions of how the system works was given as well as the overall design archetype were given in Sifton (2017). FlexStream (2018) is a robust and secured email tracking system that uses the SSLPost security service for sensitive business documents. The system design is made up of three major sub-systems: Channel selection which allows the processing and distribution of mails in multiple formats; Secure Email which is a cost-effective component for sending documents over the network in an encrypted format. This sub-system is responsible for generating a personalized link which enables the receiver access the encrypted content.

Finally, the Tracking Audit sub-system ensures that documents and mails can be tracked and information about its state (received, read, archived, etc) can be obtained.

Electronic Document management system (EDMS) hold great promise for effective and efficient management of sensitive documents vital to the smooth operations of an organization. Many researchers have conducted research on this subject according to previous scholarly literature. Hung and colleagues (2009) adopted the theoretical framework of the Theory of Planned Behavior (TPB) to investigate factors that border on users' intention to embrace and utilize EDMS in Taiwan. The results of their study revealed some very vital predictors which assist users to utilize EDMS. These predictors include self-efficacy, perceived usefulness and ease of use, compatibility, amongst others. Electronic Document Management (EDM) acts as a catalyst that can help to boost workers' productivity and guarantee increase in performances. This is evident from the study conducted by Sprague (1995). The explorative paper presented by Sprague highlighted the scope, detail significance of EDM and its contributions to information management. Sprague's paper viewed and foresaw the development of EDM as a major revolution and advancement in information management. Electronic Document Management System (EDMS) has been implemented and applied in other sectors such as the government sectors. In the study conducted by Jones (2012), a case analysis was presented on the justification for implementing and adopting eGovernment Document Management Systems in the United Kingdom. Lessons from the case analysis were presented. The lessons from the case analysis are system utilization, training, improvements to user ownership, processes of information management, and post-implementation review, amongst others. The contributions from Jones' work are of great relevance to academicians engaged in the research and implementation of EDMS. In another study conducted in Ukraine by Burtylev and colleagues (2013), the merits and efficiency provided by EDMS were presented. In their work, they identified the provision of a more accurate and organized business process within an organization as one of the merits of EDMS. Other

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merits include efficient processing of information (O'Sullivan and Sheffrin, 2003), a better and more productive workforce, and optimization of organizational operations amongst others (David, 1993; Dolin, 2005 and Dolin, 2006). Their paper also discussed the problems and solutions associated with the implementation of EDMS. They presented a sample of an EDMS useful in Housing and Household services– the implementation of a registration and calculation of instrumentation module for the Water Management Authority in Ukraine. The implementation was done using Borland C++ Builder version 6.0 and EhLib 5.6. Another example presented by Burtylev and colleagues (2013) include "TransLis" – an EDMS (An Accounting Document), used in the Trade sector, "BookLet" – an EDMS used in taking inventory and the one used in inventory control. In another study, two researchers, Konishi and Ikeda, proposed a data management system which integrated paper documents with electronic documents (Konishi and Ikeda, 2007). Anoto digital pen technology was used to implement the system.

Document Management System (DMS) has been developed to provide web-based application tracking services for University admission processes. In some educational institutions, DMS has been adopted to conduct application processes, admission processes, appraisal processes and recruitment processes. Digitalizing of operations in many organizations has helped to guarantee effectiveness, efficiency, and better productivity.

### 3.0 METHODOLOGY
In this research, the Design Research (DR) and Science Research method were applied. It involves the study of artefacts as they are used thereafter with the goal of solving practical problems emerging from real-life settings (Akker et al., 1999 and Johannesson & Perjons, 2012). In this research, the purpose is to design and develop mail tracking system using FUL as a case study with the aim of implementing it as an official communication system. The design and development stages were modeled to follow the DR processes as depicted in Fig. 1. During the initial phase, activities such as data/requirement gathering were carried out, which

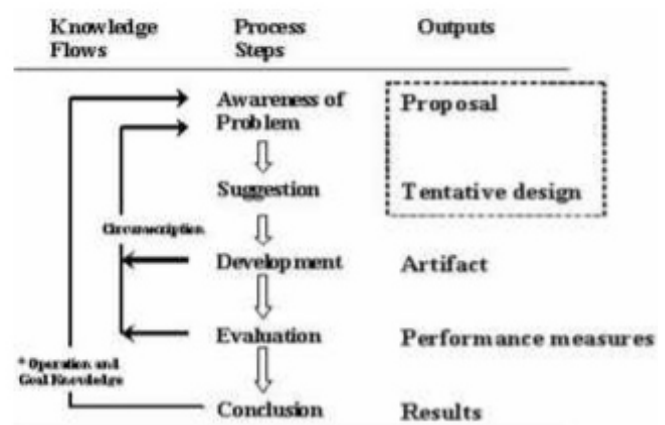led to the representation facts, scenarios and system flow.



Fig. 1: General Methodology of Design Research (Source: Vaishnavi & Kuechler (2004))

**3.1 Data Gathering:** An rigorous survey of the existing (manual) system was carried out in the different departments and units in order to gather first-hand data on how documents are circulated and treated in FUL. During this phase, interviews were conducted with users at different levels to arrive at a point where the tentative design was necessary to have a prototype solution envisaged before full automation can commence.

**3.2 Requirement Analysis:** The requirements gathered at the previous stage provide the conceptual design of the automation and the underpinning connectivity and security technologies that should be implemented. Fig. 2 gives the general and technical flow of data and the architectural design of the system, while Fig. 3 gives the outlook for the new system.
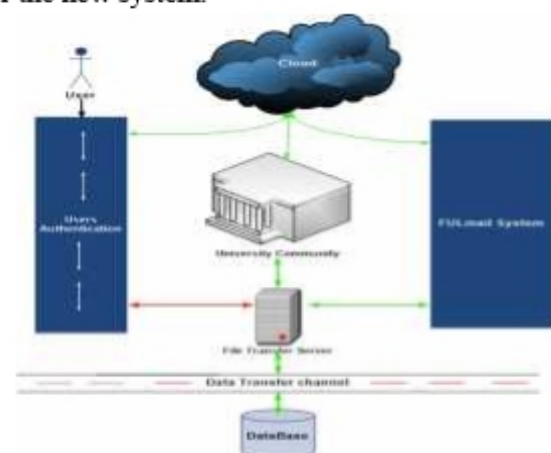


**Fig. 2:** High-Level Technical Design of FUL Mailing System

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Fig.2 presents the high-level architectural design and communication that happens between the University community and the FUL mail system. The model also consists of a file transfer server and a database which store both the documents and users profile data. The system is built to run on either local server or hosted in the cloud to enable remote access.
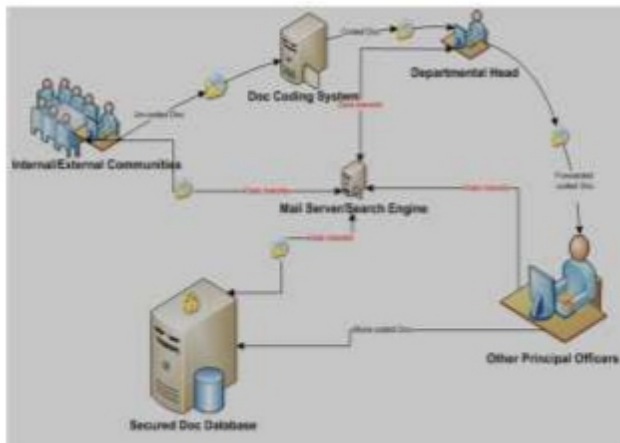


**Fig. 3:** Model of the new system

Detailed communication flow of memo from one user (sender) to another (receiver) is shown in Fig.3. It consists of the interactions and data flow between the internal/external communities, departmental head and other principal officers.

**3.3 Application Development:** The application development is divided into two modules:
1. The document coding and tracking module
2. Message and file sharing module

**3.3.1 The Document Coding and Tracking Module**
The document coding and tracking module are designed to handle the creation, sending and approval processes of memos and other documents. In doing this, the system automatically generates unique identification numbers for each document. The document unique code is used to track the document while in transit.

**3.3.2 Message and File Sharing Module**
This module enables communication and file sharing between members of the university community who have an active account registered in the system's database. This feature can also enhance communication between staff and students in a LAN setting, without having to subscribe to the internet which leads to cost considering the economic peculiarities of the university. As discussed in the earlier section, one of the aims of this automation is to ease the stress associated with the problem of having to move from one place to another that is susceptible to corruption and lack of data integrity

**3.4 Users**
This mail tracking system has three categories of users with three schemas specified in different access levels and privileges;
1. System Administrator
2. Super Users
3. Normal Users

The system administrator has the overall privilege with the highest access level. He/she is responsible for setting up all the parameters needed for the system to run effectively and work efficiently. The super users have the next privilege and access level. They are considered to be the principal officers of the institution. The last and lowest level privilege is assigned to any other users (staff or students). To maintain seamless and flexible access to the system, a Role Based Access Control (RBAC) approach was employed to design the user's login interface. RBAC manages user's access level and privileges by providing a single login page to all users and the system redirect him/her to the personalized page with the roles assigned being made available.

**4.0 IMPLEMENTATION**
While implementing this system, two major components were involved; the coding side and the networking side. The code implementation has been described previously. The networking side is what we need to describe in this section. The network implementation involved the installation of additional equipment on the existing star topology network architecture currently on ground at the institution. This was done to leverage on the existing infrastructure in order to save cost. The network implementation is depicted in Fig. 4 which indicates the network flow from Directorate of ICT and the various buildings where test have been carried out. The additional equipment used is listed as follows:

1. Cisco WS-C 2960 TC-L Catalyst intelligent 24 Ports Switch.
2. System Cat6 Pure copper cable
3. RJ45 Connectors
4. UTP Cat6 keystone jack 90 Degree
5. 9 U mega Rack
6. Face plate with shutter port
7. Cable tie
8. Patress for face plate
9. Trucking pipes

## 4.1 Network Flow

For the purpose of testing this project, the network was deployed to the following offices.

1. The Registrar office
2. The Registrar's Secretary
3. The VC office
4. The VC's secretary
5. The DVC office
6. The DVC'S secretary
7. Faculty of science and other part of the campus are linked to the network through wired and wireless facilities.
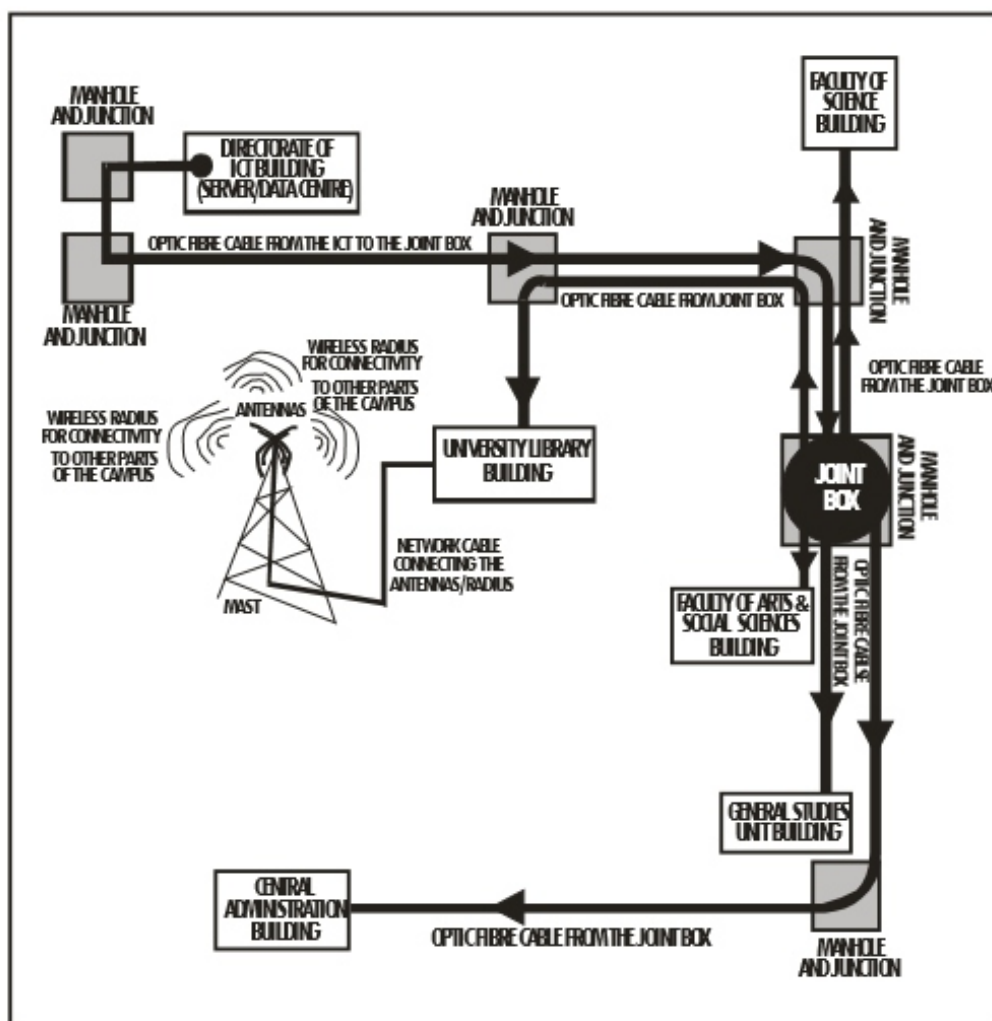


**Fig. 4**: Block Representation of the Network Flow Layout.

The network media within the buildings covered was laid using cat6E cable and each building have their links to the ICT building via fiber optic cable. The server that controls the application resides at the ICT building.

## 5.0 RESULTS

Some of the outcomes of the implementation of this mail tracking system are presented in this section, in which Fig. 5 represents the login page.

Fig.5. RBAC login page

The system grants access to the user's personalized page where all activities by the user within a session are all logged. Figure 5 for example, shows the dashboard with the menus available to a user that successfully logged into the system.



Fig. 6. The Mail Tracking Users Dashboard

Four types of memos are expected to be available on the user's dashboard; memos written by the user, memos written to the user, memos written through the user, and memos forwarded to the user. All these types of memos can be viewed at a glance from the columns provided on the dashboard, see Fig. 5. The status marked X indicates that the memo has not been treated while that mark indicates that the memo has received some form of treatment. Composing a memo is made possible by using the form provided with Microsoft Word feature buttons (see Fig. 6). This user-friendly interface should be familiar to users since Microsoft Word is the commonly used word processor by the staff.



Fig. 7. Memo Composer Interface

To treat a memo under transmission, the receiver would have to login and either uses the prompt at the dashboard to ascertain the pending mails or uses the button at the menu to comments on the memo. At Federal University Lokoja, the hierarchical structure of transmitting mail is from the baseline staff at the departmental level, through the faculty level to the top management. For example, an executive officer in a department can write to the Vice-Chancellor but must route it through the Head of Department, and through the Dean of the Faculty.



| Sender | Date Sent | Open Memo | Download Attachment | Status | Print Memo |
|---|---|---|---|---|---|
| David, Daniel Dungs | 01-Apr-2014 | | | Treated | |
| Shelly, Okey ruth | 31-Mar-2014 | | | Treated | |
| Samuel, Ajah Joel | 31-Mar-2014 | | | Treated | |
| Samuel, Ajah Joel | 29-Mar-2014 | | | Pending | |
| Shelly, Okey ruth | 28-Mar-2014 | | | Pending | |
| Shelly, Okey ruth | 27-Mar-2014 | | | Pending | |
| Agbo, Fred Joseph | 27-Mar-2014 | | | Treated | |
| Shelly, Okey ruth | 19-Mar-2014 | | | Treated | |

Fig. 8. Inbox containing treated and pending memos

For the integrity of the document, the system is built in such a way that once a memo is transmitted through any office, the memo is first treated by the Head of Unit of the lower office (a bottom-up approach) before the memo is transmitted to a higher level in the hierarchy.

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Fig. 9. Showing the output of a memo transmitted and treated via FUL Mail Tracking System

## 6.0 DISCUSSION

Under the introduction section, we set forth to achieve four objectives which are:

i. Enhanced monitoring and tracking of memos and other documents

ii. Reduction in the search time for memos and documents

iii. Improved reduction in the incidences of loss/misplacement of documents by maintaining an activity log

iv. To provide access control measures on documents that have been delivered or on transit.

Taking the objectives one at a time, we see that the first objective have been achieved as staff can now monitor and track where there memo/letter is current been treated (Fig. 7). The system can now say categorically who is doing and holding what. The desire of every staff is to know what is happening to their memo at point in the time. This will help transparency in governance as the era whereby a staff will hide colleague's file will be eradicated as a thing of the past. The second objective was achieved in Fig. 7 where pending and treated memos are displayed for the user see. The user can carry out

search and replace at the editor is similar to MS Word that most users are familiar with. The third objective was achieved as a result of the implementation of a better secured algorithm based on MD5 and SHA algorithms. Again, the system maintained a log of who is doing what at any point in time. Cases of misplacement of memo have been eradicated as the user will always take responsibility for what happens to his/her mail. The fourth and last objective was achieved with the implementation of Role Based Access Control (RBAC) with three level of access controls. There are 3-level of users, System Administrator, Super Users and Normal users. The system was implemented with no conflicts in the roles amongst these users.

From the results, and starting from the login page, various users are provided with different interfaces that enhance their experiences while using the application. The system has the features of a mail system but with the capability of being used in a LAN environment where connectivity is usually a challenge. This application finds ready to use in such environment that lacks internet connectivity.

## 7.0 CONCLUSION

In this research, we realize the aim of the research which is to track and deliver a secured mail from a sender to a receiver. It achieved this through rigorous system development methodologies that leveraged on existing LAN architecture in order to save cost. Its implementation will enhance communication amongst users and the Management in a secured environment. Wherever this system is implemented, cases of loss, tampering and the lack of storage facilities papers will be a thing of the past. The environment will be better for it, as the use of paper will reduce.

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