NORTH SOUTH UNIVERSITY

Project Paperless

A Green & Low-Cost Educational Platform with Paperless Thesis Submission

A DISSERTATION
SUBMITTED TO THE DEPARTMENT OF
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IN THE PARTIAL FULFILMENT OT THE REQUIREMENTS
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SENIOR DESIGN PROJECT

Declaration

It is hereby acknowledged that:

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- This document does not contain any previously published material without proper citation.
- This document represents our own accomplishment while being Undergraduate Students in the North South University.

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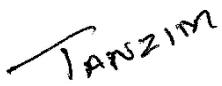

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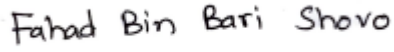

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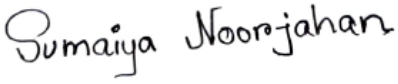

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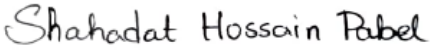

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Abstract

Every year a huge amount of paper is being used in Thesis/Report Submission in the Universities. Interestingly, a huge portion of these bulky paper works are simply discarded because it contained errors or due to inappropriate formatting. And the resubmission process is not only time consuming but also wastes a huge amount of paper. Storing these documents also requires a larger space, thus few proportions is kept. It is not only waste of space and resource but also has a negative impact on the environment. And also, sometimes the owner loses the documents after a long period of time, which is another issue. A large amount of greenhouse gases is being released during the processing of paper.

In this world of growing technology, it has now become more meaningful to store a digital version of these documents. Day by day more and more organizations are incorporating "Go paperless" concept because not only does it makes storing documents easier and reduces the chance of losing them but also contributes towards a greener environment.

To solve the aforesaid problem, we propose a convenient, secure and more efficient, “Greener” solution that reduces the carbon footprint of academic document management system. Precisely, would allow online submission and storage of these important documents such as thesis, reports, institutional materials etc. and would also ensure the exact formatting and other aspects of the documents prior to submission.

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1 Introduction

Learning Materials and Scholarly Documentations are the integral parts of any educational procedure to successfully assist the learners to achieve the learning objectives and asses their understanding and inclusion in a particular subject. The readiness of any scholarly documentation is the ideal method to invigorate the information regarding that particular topic and also ensures that the learners can work with this information, direct logical research or lead an examination. Managing all these important documents, while ensuring security and availability is undoubtedly a daunting task that most of the educational institutes have to perform. The proposed method in this research describes an online management system to securely and efficiently manage these huge resources which is very convenient for both the institutes and the learners, easy to maintain, environment friendly and also the same time affordable.

1.1 A Closer Look at the Existing Approach

1.1.1 Thesis or Report Submissions

Writing a high-quality academic paper is a matter of hard work, including extensive research and looking for reliable and confirmed sources for information, preserving the professional academic claim, reviewing the research being conducted and drawing conclusions. Every year a huge amount of these scholarly compositions or thesis papers are being submitted in the Universities in Bangladesh as part of the educational procedure. But most of these papers are either discarded due to errors, become obsolete over time, or are lost. Storing these large amounts of papers also require quite huge amount of space, and are also inconvenient to carry around. Also, the preparation phase of these papers requires lots of papers as multiple drafts are required to be created and revised in order to compose the final version; and all of which are straightly thrown away.

1.1.2 Institutional Materials

An all-in-one platform for institutional materials or learning materials of an educational institute is still absent in our country. Most of the universities in the country rely on delivering learning materials to the students either by using hard copy of the notes, using third party management applications, or by using flash drives. It becomes increasingly difficult to store or maintain all these course materials as they pile up and therefore are also easily lost. Device failures also add up to this issue. It can also become difficult to obtain the materials in the first place in case someone misses a lecture. Sometimes, higher level courses require reviewing of the materials taught in a previous course, and being not able to find those when needed further add to the inconvenience. Students also do not have a dedicated discussion forum where they can easily start a discussion with other students about a particular topic.

1.2 How Environment Friendly are these?

1.2.1 What is Carbon Footprint?

The carbon footprint of a product is usually defined as a quantification of **Green House Gases** (GHG) emissions during the lifecycle of the product and is being increasingly applied for multiple purposes. And Equivalent Cardon Dioxide CO_2 eq is used to estimate how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference) [1].

1.2.2 Green House Gas Emissions during Paper Manufacturing

Papers are mostly made out of trees and around 40% of the world's commercially cut trees are being used for this purpose [2]. The pulp and paper industry are also major contributor of deforestation as over 30 million acres of forests are being destroyed annually. Paper production also requires a huge amount of water. Production of a typical A4 paper requires about 10 liters of water. Moreover, most of the materials found in landfills are papers. In fact, the lifecycle of papers produced this way is damaging to the environment from the beginning to the end; it requires cutting down of trees to produce the papers, and when papers rot, they produce methane, a greenhouse gas, or carbon dioxide when burned or composted.

Paper manufacturing is the third largest user of fossil fuels worldwide according to the American Forest & Paper Association [1]. Although recycling paper or using tree-free paper can help decrease the environmental impacts, most paper still end up in the landfills. Paper production also causes air pollution as it releases nitrogen dioxide, sulfur dioxide and carbon dioxide during the manufacturing process. Nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) are major contributors to acid rain, whereas carbon dioxide is a greenhouse gas responsible for climate change. Waste waters discharged from pulp and papers mills contain solid, nutrients and other dissolved organic pollutants.

1.2.3 In Context of Bangladesh

There are approximately **890078** university students in the country [3]. A complete Thesis paper contains **60-70** pages. If each student has to submit one thesis paper each containing **60** pages, then 890078 students will submit 890078 thesis papers containing: **60 * 890078** pages = **53,404,680** pages or sheets.

4.64g of CO_2eq produced for one page [1]. One of these thesis papers produces **4.64 * 60** = **278.4**g CO_2eq.

Therefore, all **53,404,680** produce:

53,404,680 * 4.64 = **247,797,715**g CO_2eq which is approximately **248** tons CO_2eq each year.

A typical 80GSM A4 paper weighs **5** grams [4]. Therefore, all **53,404,680** pages weighs: **53,404,680 * 5** = **267,0023,400** grams which is approximately **267** tons.

The thickness of a typical **80GSM A4** paper is **0.1** mm, and measures **0.21**m by **0.297**m in width and height [5].

Therefore,
volume of 1 paper is: **0.21 * 0.297 * 0.0001** = **6.24 * 10e^{-6}** cubic meters. Thus, volume of all these papers combined is: **53,404,680 * 6.24 * 10e^{-6}** = **333.24** cubic meters.

1.2.4 The World of Datacenters and Cloud Computing

Meanwhile, a large group of networked computer servers are typically used by organizations for the remote storage, processing, or distribution of large amounts of data. Every large organization depends on vast arrays of servers to run applications, support electronic communications, and provide productivity tools. But building and operating the data centers facilities required consumes ever-large portions of technology budgets and contributes to greenhouse gas emissions. For some information-intensive businesses, data centers represent half of the corporate carbon footprint. This is also consistent with the fact that data centers consumed approximately 1.5 percent of the total electricity produced in 2012. However, the development of "cloud computing" has a beneficial influence on energy consumption by sharing processors and other hardware, to avoid data centers being grossly underused as in the past. The proliferation of cloud computing has promoted the wide deployment of large-scale datacenters with tremendous power consumption and high carbon emission. To reduce power cost and carbon footprint, an increasing number of cloud service providers have considered green datacenters with renewable energy sources, such as solar or wind. The proliferation of cloud computing services has promoted massive-scale, geographically distributed datacenters with millions of servers. Large cloud service providers consume many megawatts of power to operate such datacenters and corresponding annul electricity bills are in the order of tens of millions of dollars-such as Google with over 1,120 GWh (Gigawatt hour) and $67 million and Microsoft with 600 GWh (gigawatt hour) and $36 million. Reportedly, datacenters now consume about 1.3 percent of the worldwide electricity and this fraction will grow 8 percent by 2020. High energy consumption not only results in large electricity cost, but also incurs high carbon emission.

In the United States, generating 1kWh (kilowatt hour) of electricity emits about 500g of equivalent carbon dioxide on average. Each 100MW (megawatt) power station will cost $60-100 million dollars to build and emit 50 million tons of equivalent carbon dioxide during its operation. As a result, IT carbon footprints currently occupy 0.2 percent of global greenhouse gas emissions. To measure how clean is a datacenter, the Green Grid organization proposes a new sustainability metric, carbon usage effectiveness (CUE), to measure carbon emission associated with datacenters, CUE is defined as CUE = Total CO_2 Emission caused by Total Datacenters Energy/IT Energy Consumption. The units of the CUE metric are kilograms of carbon dioxide equivalent ($kgCO_2eq$) per kilowatt-hour(kWh). The renewable energy sources have less carbon emission rate than fossil fuels such as coal, gas and oil. Large IT companies have started to build datacenters with renewable energy, such as Facebook's solar-powered datacenter in Oregon and Green House Data's wind-powered datacenter in Wyoming.

1.2.5 In Comparison with Paper Based Systems

Power Usage Effectiveness (PUE): The data center industry uses the measurement PUE of 2.0 means that for every watt of IT power, an additional watt is consumed to cool and distribute power to the IT equipment. A PUE closer to 1.0 means nearly all the energy is used for computing. However, it has an indirect impact on CO_2 emission.

For example, the annual PUE of all the datacenters of Facebook in the year 2018 was: 1.11. The operational greenhouse gas emission of those in the same year was: **314,000** tons CO_2eq. [6] Though this number is still very large, but it has to be taken into account that how enormous Facebook's datacenters are. To compare, it is estimated that the book industry in the UK alone produces about 1.8 million tons of CO_2eq respectively [7].

Besides Facebook Datacenter reducing Carbon dioxide emission, Google Datacenter now took the challenge to source carbon-free energy to match the electricity consumption.

Now, moving back to the paper based systems, the important term that most organizations using paper-based processes face is security risks due to paper documents that have (a) been lost, (b) been damaged, (c) been misfiled, or (d) fallen into the wrong hands. In 2011 from various sources it was found that "more and more companies and organizations are making the shift toward electronic filing, saving space and increasing security". Large computer servers have the ability to store mass quantities of information in a secure state and location. Digital documents stored on these servers can be easily retrieved within minutes, which increases employee productivity due to the elimination of the chore of searching for misfiled physical documents (Paperless Office, 2009, p. 16).

Collaboration efforts using paper documents prove challenging at times. Employees cannot easily distribute or share paper documents compared to their digital counterparts (Welsh, 2007, p. 11). Organizations that have replaced paper-based processes with paperless processes performed on a computer or other device enjoy greater flexibility with digital documents. "Digital documents are easier to search, share, and backup than paper documents, and they take up essentially no space" (Kissell, 2013, p. 77). Stratton (2013) notes "electronic files allow better access and information sharing, cost less in terms of physical space and personnel, and can increase productivity—all of which add to the bottom line" (p. 44).

1.3 Problems Faced by Developing Countries

It is more common that educational institutes in developing countries would want to incorporate such systems within their ecosystem, but the major obstacle they find to be present is the cost of developing such system from scratch. Some organizations might also face licensing issues depending on the part of the world they're at, and this just adds up to the drawbacks. Deployment of such applications can also be expensive depending on the technologies used.

Therefore, having a robust system available at a lower cost would make it possible for such organizations to have it incorporated into their institutions.

1.4 The COVID Pandemic

"Prolonged and repeated closures of education institutions are taking a rising psycho-social toll on students, increasing learning losses and the risk of dropping out, disproportionately impacting the most vulnerable. Full school closures must therefore be a last resort and reopening them safely a priority." - Audrey Azoulay, Director-General of UNESCO

We are one year into the COVID 19 and around 800 million students, which is more than half the student population, still having significant disruptions in education due to school closers in 31 countries or reduced or part time schedules in other 48 countries [8].

The developing countries, like Bangladesh, are having a huge impact due to the situation because most of the institutes are not able to switch to remote learning due to the lack of a proper platform or infrastructure. Having such systems around would certainly have helped to reduce the impact felt by these countries

1.5 An Alternate Perspective

As the advancements in technology has provided us with the opportunity to have a plethora of ways to make more robust and convenient systems that are not only more efficient and convenient, but also 'greener' and affordable, it is the next natural step to incorporate those changes into this field also. Everyday more and more organizations are trying to incorporate "Environment Friendly" systems as people are becoming more aware. Organizations and offices are incorporating paperless management systems to help reduce the carbon footprint, and these systems also provide a very easy and reliable management solutions compared to the systems that relies on papers.

Therefore, this project focuses on creating a thesis paper submission and learning materials management system as to contribute towards a "Greener" environment, and also to provide with a reliable means to store and manage these important documents. This system would produce negligible carbon dioxide emissions compared to the current systems that are primarily dependent on the usage of papers.

This system would allow the students to submit and store their papers online. Additionally, the system would let the students know if their written documents violate any formatting rule provided by their teachers. Once submitted the teacher can view these papers online. Not only this would help reduce paper wastage but would also make the document submission process more convenient and also the students would be able to find their documents in one place pretty easily without worrying of losing them. And moreover, teachers could also use this system for all their document submissions, and thus would be able to keep track of all of them very easily.

Students and teachers can also create Lecture Materials online and include audio files, video files and pictures to make the learning process more intuitive. Students would also be able to start discussions with both teachers and other students under the same field regarding a particular lecture material.

Teachers would also be able to take online quizzes to assess the understanding of a student over a particular topic. The system would also generate a graphical view of the performance of the students enrolled in that class.

The proposed system would also allow to verify thesis papers those would be submitted using this system once approved by the authorities. And this would further increase the security and exclusively portray the ownership of the documents.

Thus this system would not only help to reduce the carbon footprints due to paper usage discussed earlier, but also would provide its users with a hassle-free and seamless experience, and would also ensure that the students would not require to worry about where these very important documents are, in the future, and would be able to find them all in one place. And moreover, these features will facilitate distance learning, and should institutes find it necessary to provide distance learning again in the future, we hope such systems would help to reduce the adverse impacts to its bare minimum.

2 Literature Review

2.1 Integrated Cloud Storage on Paperless Thesis Examination [9]

The advancements in technology have digitized almost all aspects of the present world. And the Internet is one of the most influential advancements in technology. And cloud computing has become one of the trends now. Many organizations are now incorporating cloud computing systems to provide a seamless, efficient and “Greener” management systems.

Paper consumptions results in increased cutting of trees and thus contributes to Global Warming. And with the advancements in technology, it is now possible to think about alternative to help reduce the usage of paper, and make a “Greener” and sustainable environment. As people are becoming more aware, more and more organizations are trying to help contribute towards a solution to this issue.

Paperless thesis examination system is one of the systems developed in cloud computing. Many universities are now using internal servers to store these documents. This paper discusses the design of a thesis examination system integrating cloud storage to increase efficiency and help towards producing a lower carbon-footprint.

Many researches are going on to improve the quality of thesis examination systems like this. And based on a review of these systems, the popularity of the cloud storage has not been implemented into this sector yet. And this proposed system tried to focus on this particular aspect.

The proposed system would focus on student activities during the thesis document uploading process. Each student is required to have a cloud storage account to access the service. The system would integrate that cloud storage account with the academic information system account, so that it does not require an additional account registration process. The system would only focus on the registration and uploading of the thesis examination. Activities are available to a student in this system include access to information and thesis examination requirements, filling out forms, uploading documents and viewing thesis examination schedules and the examiners.

Lectures and supervisors would only be able to see the examination schedules and download the thesis document submitted by the student.

In conclusion, with the help of advancements in technology, systems are being developed to incorporate digital thesis paper submission system into the universities, and many researches are ongoing to help improve this sector.

This document provides with a unique idea of incorporating a cloud storage account with the university system account for the thesis examination submission and storage. The user would require to have a cloud storage account for being able to upload or download the thesis document and the document would be stored in the cloud storage account instead of the internal servers of the university.

2.2 Journal Review on Paper wastes [10]

A research on paper waste management was conducted by U. Arena on paper title "Environmental Assessment of Paper Waste Management Options by Means of LCA Methodology".

In this paper, they had used to assess and compared the environmental performances of three alternative options (land-filling, recycling, and combustion with energy recovery) that could be used in Italy to manage paper and board packaging wastage. In this specific case, they showed that paper use should be viewed in the context of the international trade in bio-fuels.

Scenario on Waste Management: In the recycling scenario three represents the reference case, with the other two scenarios defined by their differences from this scenario. Scenarios a and c were represented by the best available technologies, to represent a possible new investment in alternatives to scenario b. In each scenario, the paper waste management sites (land-filling, recycling, combustion with energy recovery) are located in Italy. Paper production from virgin fiber is located in Sweden (where most of the fiber used in Italy is produced) and includes sericulture and harvesting, debarking, and chipping. The burdens related to the transportation of virgin fiber, from Stockholm to Rotterdam by ship and from there to central Italy by train, are also incorporated.

a. Landfilling: This situation covers the collection of 1.17 t of paper waste and its transport to a landfill, as nicely as the traditional manufacturing of 1 t of packaging paper from virgin fiber to provide the product made by recycling in situation b. A trendy landfill is considered, with excessive integrity bottom and top membranes for leachate containment, leachate therapy with the aid of reverse osmosis, high effectivity (55%) of biogas collection, and 60% of the accrued biogas burned in a fuel engine with an electrical conversion efficiency of 35%. The ultimate 40% of amassed biogas is flared to convert hydrocarbons to carbon dioxide and for this reason reduce its greenhouse warming effect. sixteen The amount of leachate produced used to be estimated to be 400 dm3/t of paper waste landfilled over a duration of 30 years: the price basically depends on local rainfall, the integrity of the sealing of the landfill, and the original water content of the buried waste. The conservative assumption was once made that the composition of the liquid effluent just met regulatory requirements. Biogas production was estimated to be a hundred and twenty standard cubic meters (at a reference temperature of 20 °C and 1 atm) per ton of paper waste. 15 The primary components of the landfill gasoline are methane, usually 50-55%, with the balance being often carbon dioxide plus less than 1% of hydrogen sulfide and different natural compounds. The time scale for quantifying the leachate and biogas emissions is related to the time required for the landfill to end up wholly mineralized, that is, 30 years.

b. Fiber Recycling: The recovered paper processing system varies in accordance to the paper grade to be produced and the kind of waste paper used. Recycled fiber (RCF) approaches can be divided into two main categories: (1) techniques with mechanical cleaning and deinking, which produce recycled products such as newsprint, tissue, printing and replica paper, magazine paper, lined board and carton board, and (2) processes with solely mechanical cleaning, i.e., without deinking, which produce down-cycled products such as test liner, corrugated medium, uncoated board, and carton board. All the strategies intention to separate paper fibers from impurities and contaminants by way of deliberation, deflating, and elimination of impurities. The procedure waft layout of the RCF mill, devoted to the coaching of secondary fiber packaging paper and board (i.e. recycled product), which has been used as the reference system for this study.

During the pulping stage, coarse rejects are separated, while in the successive multistage cleansing and screening tiers heavy particles, flat contaminants, stickiest, and exceptional sand are removed, main to deflating of the stock to supply suitable optical homogeneity. The review by EIPPC1 small print all the direct environmental burdens associated with this type of mill. The operations from entry to the foreground up to the RCF mill differ between distinct kinds of waste. For example, carton boards accrued from supermarkets and process scrap from paper manufacture require no sorting, only packing and transportation. However, some aspects are common to all wastes and products: all solid waste from sorting stations is routed to landfill (modeled as in scenario a), whereas waste from reprocessing is taken as 50% landfilled and 50% burned with power recovery (as in state of affairs c).As stated above, the complete recycling chain was once modeled for every of the most important Italian commercial products with the particular waste used for its production.

c. Combustion with Energy: Recovery This situation covers dedicated combustion of 1.17 t of accumulated paper waste with recuperation of electrical energy dispatched virtue distribution grid and consists of traditional manufacturing of 1 t of packaging paper in Sweden (Figure 4). A net calorific fee (LHV) of thirteen MJ/t has been evaluated on the groundwork of the composition of the accumulated waste. The waste-to-energy unit consists of three sections: combustion, strength recovery, and flue fuel treatment. A cellular grate furnace is the predominant factor of the combustion section. The strength recuperation section is assumed to have a conversion effectivity of 27.7%, which is high however possible with a modern-day plant. A semidry scrubber for acid treatment, a fabric filter for casting off fly ashes, and selective catalytic reduction to reduce NOx and organic micro pollutants comprise the flue gasoline treatment. Final gasoline emissions are assumed to be those conceivable with perfect operation of these best available technologies and are well within regulatory limits. The inventory additionally takes into account all the environmental burdens associated to the conditioning of ashes and their disposal.

2.3 A Large-scale ETD repository a case study of digital library application [11]

This paper alludes to the challenges a statewide ETD system faces and their possible resolutions.

Few challenges this paper explained are:

1. collaborator participation
2. metadata challenges
3. identity management
4. document workflow
5. repository platform
6. interoperability
7. and, preservation

2.3.1 Collaborator Participation:

As the paper stated, multiple engagement levels require for such a complicated and extensive system to succeed.

Different end-users of this app are students, administrative staff, teachers, advisors, supervisors. While using this app, the stakeholders face a significant challenge in keeping using this app properly. The possible resolution this paper explained is to provide statewide training on using this app properly. The Deans of graduate education must be involved in policies and communicating necessary information to students and faculty.

2.3.2 Metadata Challenges

Most existing metadata standard fails to provide the level of specificity required to describe the item sufficiently. The six students could resolve the issue through the publication of ETD-MS by the Networked Digital Library of Thesis and Dissertations. It is a Dublin Core-based metadata standard with a low entry barrier and broad application,

focusing on repository interoperability. Nevertheless, several ETD specific properties created difficulties, for example, disambiguating the roles assigned to multiple advisors. They wrote a descriptive application profile for ETDs using the Metadata Object Description Schema. However, they needed this presentation to convert into a more general form for external collaboration. The group finally released The TDL Descriptive Metadata Guidelines for Electronic Theses and Dissertations in 2008, including recommendations for best practices.

2.3.3 Identity Management

For example, for identity management issues, remembering usernames and passwords for every new service, another service often known as a single-use service, was introduced where the user does not need to remember the username and passwords for new services. They solved this issue through exchanging data across universities for which they used different identity management platforms, for example, Kerberos, LDP, and Microsoft Active Directory.

2.3.4 Document Workflow

It is a very complex process to review a paper by a staff member before forwarding it to the thesis office to get approved. Often it is iterative too. Thus, when establishing this workflow statewide, any individual faces difficulty since the approach for verifying the paper varies according to various institutions. Consequently, they used Dspace, a repository system, to make it much more straightforward as it is customizable. Nevertheless, it failed to provide the required service, so they made Vireo, which made the workflow much more superficial.

2.3.5 Repository Platform

The result of a statewide ETD is delivering scholarly content to the world, which requires the following capabilities of a repository.

- Publication
- Branding
- Infrastructure

They used Dspace as a repository platform.

2.4 IPAD: Integrated Paperless Document Checking and Template-based Editor for Electronic Thesis Compilation [12]

Electronic Thesis and Dissertations only include submitting the final version of the thesis paper, which the advisor-approved. This paper alludes to the revision and editing of the thesis paperless. The full form of iPad is Integrated Paperless Document Checking and Template-based editor that students and advisors can use to edit and check the research papers stored in it as a repository. This process of editing and checking is called revision. The data that is the e-thesis can then be converted into XML and stored in the database in XML form. It then can again get converted back to pdf to download it. Besides this thesis, we can scan paper into pdf format and convert it into XML to store it in the repository. According to this paper, IPAD's writing consists of two main modules: the template-based editor and documentation upload. Revision involves editing and checking. Editing is template-based. The aim of designing an iPad is to provide an alternative way of completing the thesis writing process paperless. In the end, the paper describes the framework of the design of the iPad intending to enhance it.

2.5 Design and Implementation of a Web Based Thesis Coordinator System (TCS) [13]

This paper explains the design and implementation of a Web-Based Thesis Coordinator System (TCS). The report aims to provide an effective thesis management system for the academic department and implement it in Computer Technology as a pilot department. According to this paper, TCS has nine modules. Login Module, User Management Module, Thesis Management Module, Data Entry, Course Management Module, Scheduling Module, Report Generation Module Adviser to student forum module They used the following tools for implementing the design: Apache-server, PHP-server side script language, CSS-cascading style sheets , MySQL-relational database , JavaScript-It is a front-end scripting language. It makes any web page more user interactive, JSON-It is a JavaScript object notation. We use it for using Ajax methods, API key. The paper also alludes to further research conducted for the thesis management system.

According to Thesis Management System for Industrial Partner Red Hat by Vaclav Dedik of the Masaryle University from the Czech Republic, the system has a user management module that can create, delete, update and read user information. Besides that, it has a registration module where only students of that specific university can register.

The paper also mentioned another research paper regarding the e-thesis management system where the system has searching facilities. They developed their interface using Adobe Dream weaver CS4 and used the spiral life cycle.

According to TCS design, it has got a CRUD system where the facilities differ according to users that is: Thesis Coordinator, Advisors, Panel, Student.

It provides the following features: CRUD process, an adviser account can manage his profile and account, view and download students' documents, and disapprove it paperless.

2.6 Awareness and Use of Electronic Thesis and Dissertations (ETD) with special Reference to Shodhaganga [14]

This paper draws attention to the awareness and usefulness of the electronic-thesis management system. Nowadays, it is easy to conduct the study of literature and review it. None has to go to the library and look for necessary resources and articles since the Internet's emergence. The Internet made it possible to search a paper one click away. We manage the thesis online using Internet paperless. This paper spreads awareness among the researchers to edit and publish their thesis report online without the fear of plagiarism. One would instead want to use an electronic thesis management system than using paper. It is relatively more straightforward and more manageable. The report concludes with the study of some resources and reviewing other works of literature.

2.7 Design of a digital dissertation information management system [15]

Dissertations contain extremely valuable information. The various components of the system include

1. The database.
2. The information retrieval engine.
3. Dynamic Web pages via mark Up languages.
4. Client-side Java Scripts.
5. Managerial and information retrieval issues associated with a digital dissertation information system.

2.7.1 Potential benefits

The department maintains a file with minimum information on dissertations. Such a digital dissertation information system should have three major functions:

1. To help managers (dissertation coordinators, support staff, etc.) in the management of information on past dissertations.

1. To help supervisors and students perform current dissertation-related activities online.
2. To provide online access to (search and browse) the dissertations.

2.7.2 Methodology

In order to find the problem establishing the stakeholder and conducting interview using open ended questionnaire is required.

1. Outlining options to solve the problem.
2. Defining system specifications based on the user requirements.
3. Developing a prototype.

2.8 An auto management thesis program webmis based on workflow [16]

The paper mainly presents three key contributions:

1. The idea of using the thesis management Web MIS which is designed and developed on a platform Linux and most important fact is that Apache and Tomcat are used as web server and MySQL is used as database server so that it can be helpful for all of the region. Another thing is that MVC is selected as the development model and the system architecture is in conformity to J2EE. In this topic we can found out the rules and regulations of the thesis management by which that include the major solution for a thesis like and according the paper mobilization, program planning, etc.

This paper mainly contents the function of the system that is extracted according to the user requirement and the rules and regulations of thesis program management. According to the paper it was highlighted that the time-limitation and logicality of each work flow, the thesis program is divided into 12 operation flows, including mobilization and arrangement, thesis topic submission, thesis topic selection, thesis opening report, intermediate checking, thesis results submission.

2. WebMIS is divided into 2 classes, one is data used to define and control the workflow including workflow definition, running environment and status of workflow description, dispatching rule of the workflow engine, user information etc. The other is data generated during the thesis program operations. The workflow engine interprets events according to defined computer processes and facilitates the flow of information, tasks, and events. In this auto-management thesis program webMIS, a module used for work flow dispatching is designed and developed based on J2EE and MySQL which indicates the work flow of the thesis program according to the work principle of workflow engine.

3. System Structure and User Interface In the self-workflow engine which is a servlet. Tasks are processed through the workflow engine. In this self- sis program webMIS, java beans are used to handle the business operation as the model in MVC, java servlets are used as a controller to receive input and initiate a response by making calls on model objects, jsp web pages are used to render the model into a user interface suitable for interaction. There are 3 layers of the interface pages in this system. The first layer is the homepage of the system, log in the system and some hypertext links. Email URL is validated by regular expression and the ID code is also validated. The actor homepage is the second layer interface. The third layer is the interface jsp pages which display in the main display area in the actor homepage.

3 Proposed Method

3.1 Features

The proposed system would consist of a centralized database and server to maintain and store the submitted thesis papers and learning materials. The system would not only help to store the thesis papers but would also perform checks on the document formatting to identify whether it is correctly formatted prior to submission, which is quite unique up until now. Students and teachers would have their respective accounts with students being able to submit, store and view the thesis papers, or lecture materials and teachers would be able to view those thesis papers and provide with corrections or view and create lecture materials or take and evaluate quizzes.

3.1.1 Registration

Both teachers and students are required to have accounts to use this service. To create an account, a student must fill up the form provided by the system, with the student identification number provided by the University. An email with a verification code would be sent to that student's North South University Email address to complete the registration process.

Teachers on the other hand would be required to provide with the URL of his/her profile page in the NSU website. If the URL is valid, the system would acquire the email address from the provided URL, and would send a verification code into that address to complete the registration process as an instructor.

3.1.2 Thesis Management

Registered students would then be allowed to use the services provided by the system. As mentioned earlier, each student would be allowed to submit a new thesis file, revise the submission upon requirement, and view submitted thesis files. Students would be required to create Groups and request the respective teachers to allow Thesis Submission. Once the submission request is accepted by the teacher, Students would be able to upload and submit the Thesis Document.

After a student has uploaded a thesis paper for submission, the file would first be stored into a temporary storage in the server. The system would then compare the format

of the submitted document with the requirements set by the teacher or the department for the particular submission, and then notify the student of certain errors, if there is any, otherwise the system would permanently store the file. The document can be revised any number of times during this period. After a successful validation from the teacher, the document would then be restricted from any further modification. During this process, a digital signature would be attached to the document for authenticity. Any revision of the document from this point onwards would require passing through the above-mentioned steps again.

Teachers would be able to verify any thesis paper submission requested by a student, and view the thesis file any time after it is successfully submitted by a student. Teachers can also make corrections to a document and upload it back to request a revised version with those mentioned corrections from the students. (It is noted that most of the free PDF readers provide some sort of proofreading functionalities which will be adequate for this purpose).

The students would be able to view their submitted thesis papers for free for a limited period of time. But teachers would always be able to view the papers those were submitted to them.

3.1.3 Thesis Verification

Anyone would be able to verify the integrity of a Thesis Paper that was submitted to them, or the person who claims to be the owner is actually the rightful owner of that piece of document. A document passing the verification would prove that the document was not tampered in any way and it is the authentic documentation that was accepted by the University, and the person who claims to be the owner is the rightful owner of the document.

Once a Thesis submission is approved the authority, the system would generate a hash and store it to ensure the integrity of the document. Each Thesis Paper would be provided with a Unique Identification Number that can be used to search the records and match with the stored encrypted version. This verification system would help to reduce document forgery or unwanted claims.

3.1.4 Lecture Materials

Both students and teachers would be able to create lecture materials using the integrated Text Editor. They would be able to add pictures, or link audio or video files to make the learning process more interesting. This would also ensure that all the required materials are in one place and can be easily accessed by any student whenever required just by using a compatible device with an active internet connection. And they would also be able to refer back to these notes if required any time in the future without having to worry about losing them.

Students would also be able to start discussion sessions, regarding a lecture material, with their instructors, or course mates or even other students within the same department. This would help them to increase their understanding over a particular topic or help them solve complex problems.

3.1.5 Online Quizzes

Teachers would be able to set questions with respective points and correct answers to take online quizzes. The system would automatically evaluate the students' responses based on the correct answers provided for the respective questions. Teachers would also be able to set time restrictions for each question, which implies that the student would not be able to view or answer that question once the time has run out, and the system would automatically move forward to the next question. Once the quiz is finished, the system would generate a graphical view summarizing the performance of the students enrolled in that class. A quiz can also be marked as open for practice purposes, so that any student enrolled in that class can view the quiz questions any time, as long as it is available.

The quiz interface for students are integrated security measures to discourage dishonest behaviors. Minimizing the quiz window or changing the screen while participating in a quiz would automatically disqualify the student from that particular quiz.

Once a quiz is over and reports are generated, students would be able to view their individual performance in their respective dashboards. Their answers would contain proper highlighting depending on whether their answers were correct or not, and the correct answers would also be shown in case of wrong answers.

3.1.6 System Diagram

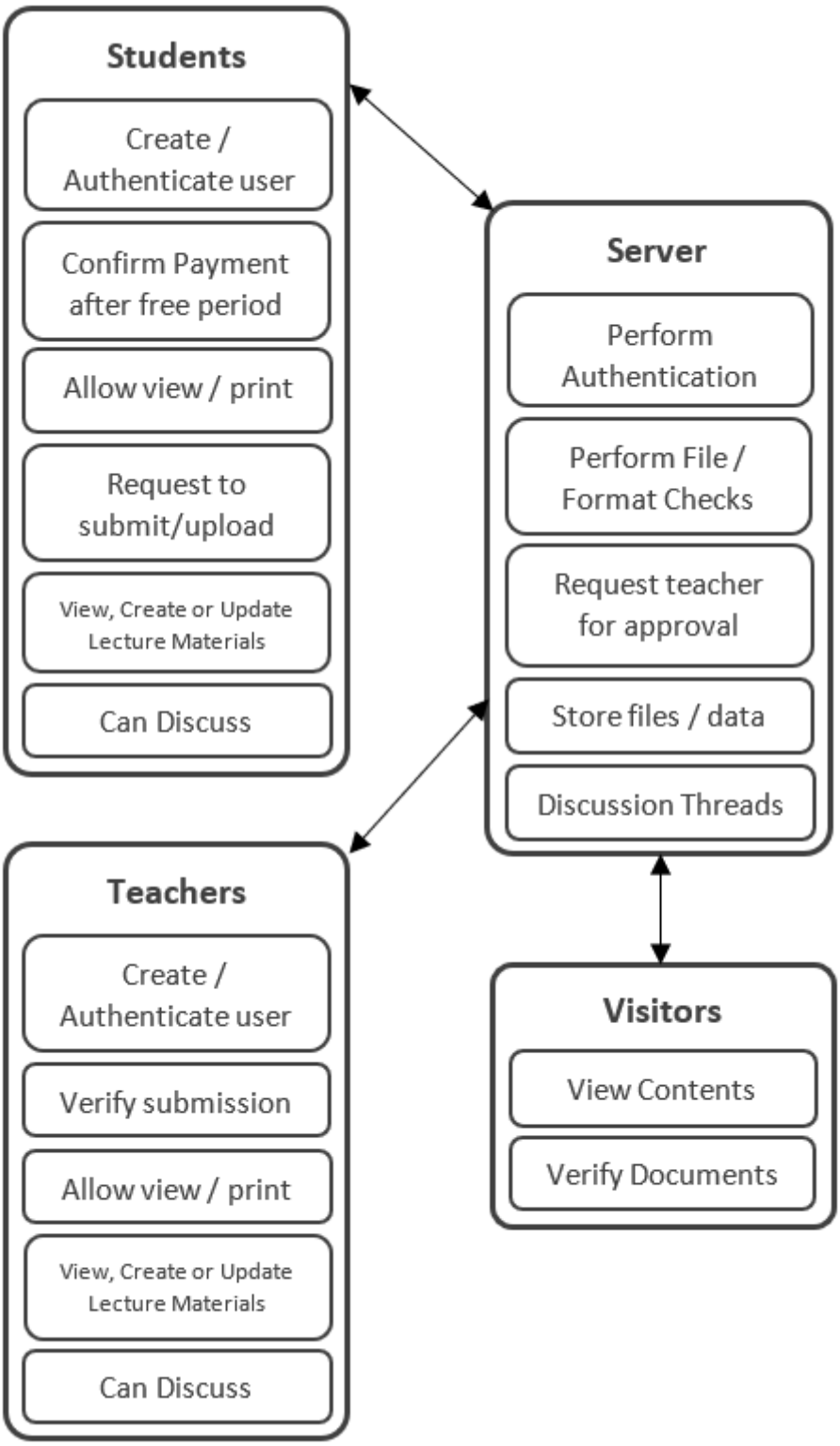

Figure 1: System Diagram

3.2 Tools

The system would be implemented using HTML, CSS, JavaScript, Python, Django (Python-Web Framework).

Since the system would be implemented using the Client-Server architecture, using a web application would ensure an easier solution for a wide variety of devices. Only a device with a working Internet Connection and a Web-Browser would be required to use this service.

HTML5, CSS3 and JavaScript would be used to build the client side of the application. The user interface would be a responsive interface to ensure a seamless experience across most of the devices. The server side would be built using Python (Django).

Python is one of the most used Programming Languages that are being used now, due to its strong emphasis on readability and efficiency compared to other languages like PHP. It is very easy to learn compared to many other languages and many complex functionalities can be implemented with very few lines of codes. Apart from that, Python is also very flexible, that is, it has several robust integrations with other programming languages. For example, CPython - integrated with C, Jython – integrated with JAVA and so on. And since, it is quite popular among the programming community, it offers a wide range of resources or packages.

Python also offers a very high-level web-framework, Django, that encourages rapid development, and clean and pragmatic design. It is very robust, extremely fast and secure, and also very scalable all at the same time. Organizations like Instagram, The New York Times, The Guardian, MIT, NASA, National Geographic and many more have incorporated Django into their systems [17].

Django is also an Opensource Web Framework. All the tools and packages used in this project are from opensource platforms to ensure a minimum cost to integrate this system. As mentioned earlier, organizations in developing countries sometimes find it difficult to incorporate such systems due to higher deployment costs, and also there is the added cost for deployment which is required to be paid in a regular basis.

The project featured a discussing section, that transmits data in real time. Though web-sockets (using Django Channels) were used for efficiency, by using the Observer Software Design pattern, but this would add up to the deployment cost as a slightly expensive hosting package than the basic ones, is required to support such protocol. The entry level hosting packages are the shared hosting packages and usually they cost less than 7 USD per month, but they should be sufficient for most of the average sized institutions. To keep the system compliant with such hosting packages, another, a slightly less efficient version is developed, which uses the HTTP protocol for communication. Though this will cost some performance, but it will help keep the cost of deployment to its minimum.

Providing such a robust system with the minimum cost would encourage a large number of educational platforms to incorporate this or such systems, which would not only ensure a 'Greener' and 'Sustainable' environment, but will also help the light of Education to reach every part of the country, and eventually – the whole WORLD.

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