

# **uPrint: Redefining Document Printing Through a Cutting-Edge Solution for Enhanced Efficiency, Convenience, and User Satisfaction**

by

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A thesis submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Science in Computer Science and Engineering



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**December, 2023**



## Declaration

This is to certify that the thesis work entitled **uPrint: Redefining Document Printing Through a Cutting-Edge Solution for Enhanced Efficiency, Convenience, and User Satisfaction** has been carried out by **Md. Sazzat Hossen Akon**, Roll No: 12011016, **Abu Taher Hos-sain**, Roll No: 1182368, **Umme Habiba Suma**, Roll No: 12021019, in the Department of Computer Science and Engineering , University of Global Village (UGV), Barisal. The above thesis work or any part of this work has not been submitted anywhere for the award of any degree or diploma.

Signature of Supervisor

Signature of Candidate



## Approval

This is to certify that the project work submitted by Md.Sazzat Hossen Akon, Abu Taher Hossain, Umme Habiba Suma, entitled uPrint: Redefining Document Printing Through a Cutting-Edge Solution for Enhanced Efficiency, Convenience, and User Satisfaction. has been approved by the board of examiners for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering in the Department of Computer Science and Engineering, University of Global Village (UGV), Barishal in December, 2023.

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## Abstract

uPrint emerges as an innovative automated printing ecosystem meticulously crafted to redefine the printing landscape for students within academic environments. The system's intricate design introduces a spectrum of features meticulously tailored to not only elevate user accessibility but also optimize administrative processes for a holistic printing experience. At the foundation of uPrint's user-centric approach are individualized student profiles, fortified by a secure and intuitive login infrastructure. These profiles seamlessly integrate with personalized dashboards, offering students nuanced insights into their comprehensive printing history, cover page customization options, and nuanced document classifications. The implementation of robust security protocols ensures the integrity and confidentiality of student accounts. One of uPrint's standout features lies in its dynamic cover page generation. This empowers users with the unique ability to customize and preview cover pages before initiating the printing process, a feature not only enhancing user control but also ensuring a professional touch to printed materials. The system's versatility is further highlighted by its adept handling of various document types, ranging from personal files to official university documents, establishing uPrint as a flexible and user-intuitive platform accommodating diverse printing needs. This collaborative method extends to the ingenious balance transfer functionality, enhancing user flexibility by facilitating seamless transfers of account balances between students. Administrators, wielding extensive insights through comprehensive transaction histories and analytics. In line with contemporary sustainability initiatives, uPrint incorporates features like notifications designed to encourage responsible printing practices among users. These serve as timely reminders, fostering an eco-conscious printing culture within academic institutions. The system's administration module, facilitated by an intuitive dashboard, provides administrators with a panoramic view of system health, user activities, and intricate financial transactions. This holistic perspective enables administrators to proactively manage and optimize uPrint's functionalities.



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## **List of Technology**

1. HTML
2. CSS
3. Bootstrap
4. JavaScript
5. AJAX
6. jQuery
7. PHP
8. Laravel
9. MySQL



## **List of Package**

1. Spatie
2. Ckeditor
3. Intervention Image
4. Data Table
5. Select2
6. SweetAlert2
7. Dompdf
8. Dropify
9. Toastr



## **Chapter I**

### **Introduction**

#### **1.1 Introduction**

In an age defined by rapid technological advancements and an increasing emphasis on streamlined efficiency, the significance of an innovative and user-friendly printing solution cannot be overstated. uPrint, a cutting-edge venture in the world of document management, stands as a testament to the commitment to redefine the printing experience for users across diverse sectors. This preface serves as an introduction to the world of uPrint, where the complexities and challenges commonly associated with printing tasks are transformed into a seamless and intuitive process. With a strong focus on user convenience and time-saving functionalities, uPrint sets out to revolutionize traditional notions of document printing, ensuring that users can dedicate their valuable time to more critical endeavors. By integrating an array of features such as personalized cover page generation, secure balance transfer, comprehensive printing history access, and hassle-free account recharge, uPrint aims to provide uninterrupted and efficient printing services, solidifying its position as a frontrunner in the realm of streamlined document management.

#### **1.2 Problem Statement**

Students face a twofold challenge in the process of submitting assignments: first, the elevated costs associated with printing services, and second, the limited availability of printing facilities during crucial hours. This issue is particularly pronounced when students engage in last-minute assignment completion, discovering in the morning that printing options are unavailable before the impending submission deadline. The consequence is not only increased financial strain due to higher printing costs but also the hindrance of timely assignment submission, thereby affecting students' academic performance and overall well-being.

Adding to these challenges is the frequent occurrence of errors in data entry during the assignment submission process. Students often inaccurately input critical information such as

subject names, subject codes, and teacher names. These errors not only compromise the efficiency of the evaluation process but also introduce confusion and potential delays in grading.

### **1.3 Motivation**

The motivation behind the uPrint project stems from the recognition of the persistent challenges faced by individuals and businesses in accessing fast and affordable printing services. In today's dynamic and fast-paced world, the need for quick and cost-effective printing solutions is paramount. Time constraints often lead to last-minute printing requirements, and traditional printing services can be both time-consuming and expensive.

The uPrint project is motivated by a commitment to address these challenges head-on. By focusing on speed, the project aims to eliminate the frustration and stress associated with tight printing deadlines. Additionally, the emphasis on low-cost printing acknowledges the financial constraints that users, especially students and small businesses, may encounter. The project seeks to democratize access to printing, ensuring that it remains an accessible and affordable resource for all.

Beyond the immediate practicalities, the uPrint project is also motivated by the broader impact it can have on productivity and efficiency. Quick and economical access to printing services can enhance workflow, improve communication, and contribute to overall time management. This project aligns with the belief that efficient printing solutions not only address a practical need but also empower individuals and businesses to operate more effectively in their respective endeavors.

In essence, the uPrint project is motivated by a desire to create a positive change in the way people approach and experience printing services, making them more convenient, swift, and economically viable for everyone involved.

### **1.4 Objectives**

The main objective of the uPrint project is to enhance the functionality and efficiency of a printing system. The overarching objective is to refine and optimize printing system for improved performance and user experience. The specific goals of the project include-

- Enhance the printing speed and efficiency to reduce turnaround time for users.
- Implement cost-effective strategies to provide affordable printing solutions.
- Improve user accessibility to printing services by ensuring the availability of printing facilities during extended hours.
- Develop a user-friendly interface for the printing system to streamline the printing process and enhance overall user experience.
- Ensure the security and confidentiality of printed documents.

### **1.5 Scope**

- Implement uPrint across educational institutions, providing a centralized and efficient printing solution for students, faculty, and staff.
- Extend the printing system to cater to small and medium-sized businesses, offering a cost-effective and streamlined printing infrastructure for office use.
- Develop mobile applications that integrate with the printing system, allowing users to print directly from their smartphones or tablets.



## **Chapter II**

### **Background Study and Related Works**

#### **2.1 Background Study**

Within the conventional printing paradigm, users grapple with challenges such as extended waiting periods, exorbitant costs, and restricted access to printing facilities during specific hours, creating a demand for a more evolved solution. The uPrint project emerges as a transformative response to these challenges, envisioning a comprehensive system that redefines the printing experience. It aims to provide not only enhanced speed, cost-effectiveness, and user accessibility but also a user-friendly interface. The background study delves deeply into the technological landscape, analyzing the current state of printing technologies and identifying trends that shape user expectations. Additionally, it explores market dynamics, drawing insights from successful case studies that offer valuable lessons for uPrint development. Regulatory compliance, technological feasibility, and user feedback are pivotal considerations in this study, ensuring that uPrint aligns with legal standards, harnesses feasible technology, and resonates with the evolving expectations of its diverse user base. Through this holistic background exploration, uPrint aims to revolutionize the printing domain, offering a cutting-edge solution that anticipates and meets the dynamic needs of modern users.

#### **2.2 Related Works**

In the ever-evolving world of cloud computing, IBM pioneered the concept in 2007, defining it in a seminal technical white paper titled "Cloud Computing" [2]. Notable platforms in this domain include IBM SmartCloud [3] and Amazon Elastic Compute Cloud (EC2) [4]. Cloud printing, a popular application of cloud services, has garnered substantial interest in both academic and industrial circles in recent years. Numerous cloud computing techniques have been introduced and put into practice. Prominent among these are solutions like Google's Cloud Print [5], Hewlett-Packard's ePrint, and Cortado's cloud printing offering. Google's Cloud Print stands out by allowing the "cloud" to manage print jobs originating from Chrome

OS and web applications. Upon processing, the cloud directs the document to the user's designated printer and provides status updates to the initiating application. In contrast, HP ePrint [6] offers users the convenience of printing documents from anywhere by emailing them to a printer's designated email address. Users can also access HP ePrint center for printer status monitoring, settings configuration, and print history management. However, both Google Cloud Print and HP ePrint have limitations, notably the absence of support for point-to-point communication. Cortado Cloud Printing [7], developed for portable devices such as smartphones and tablets, serves as an advanced printer driver with enhanced intelligence. It boasts compatibility with multiple mobile operating systems, integration with a wide range of printer drivers, and crucially, support for point-to-point communication. While these services eliminate the need for users to install printer drivers, some additional software installation on internet-enabled devices may be required, albeit being a minor inconvenience. Notably, Cortado Cloud Printing is unique in offering point-to-point communication support. Another noteworthy entrant is PrintNode [8], a hosted printing service offering rapid remote printing. PrintNode leverages event-driven software and socket technology to transmit print jobs to printers nearly instantaneously, with the transmission speed influenced by factors like print job size and internet connection performance.



## Chapter III

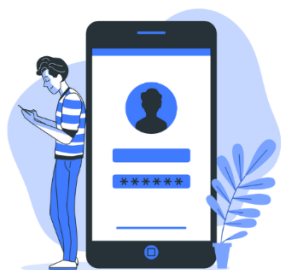
### Transforming Document Printing for Optimal Efficiency, Seamless Convenience, and User Delight

#### 3.1 Introduction


The uPrint web application is a versatile platform designed to serve two distinct user roles: students and administrators. Each user has an individual account with an associated account balance. The primary function of uPrint is to provide a seamless and user-centric printing experience, allowing users to effortlessly upload PDF files via a web interface and initiate printing operations with maximum convenience.

#### 3.2 Student Panel

##### 3.2.1 Login & Registration



**REGISTER NOW**

<b>FULL NAME *</b> <input type="text" value="Enter full name"/>	<b>SELECT DEPARTMENT *</b> <input type="text" value="Computer Science and Engineering"/>
<b>STUDENT ID *</b> <input type="text" value="12011016"/>	<b>SELECT SEMESTER *</b> <input type="text" value="1st Semester"/>
<b>DATE OF BIRTH *</b> <input type="text" value="mm/dd/yyyy"/>	<b>PASSWORD *</b> <input type="password" value="*****"/>
<b>PHONE NUMBER *</b> <input type="text" value="Enter phone number"/>	<b>CONFIRM PASSWORD *</b> <input type="password"/>
	
<input type="text" value="Enter captcha"/>	
<input type="button" value="Registration"/>	

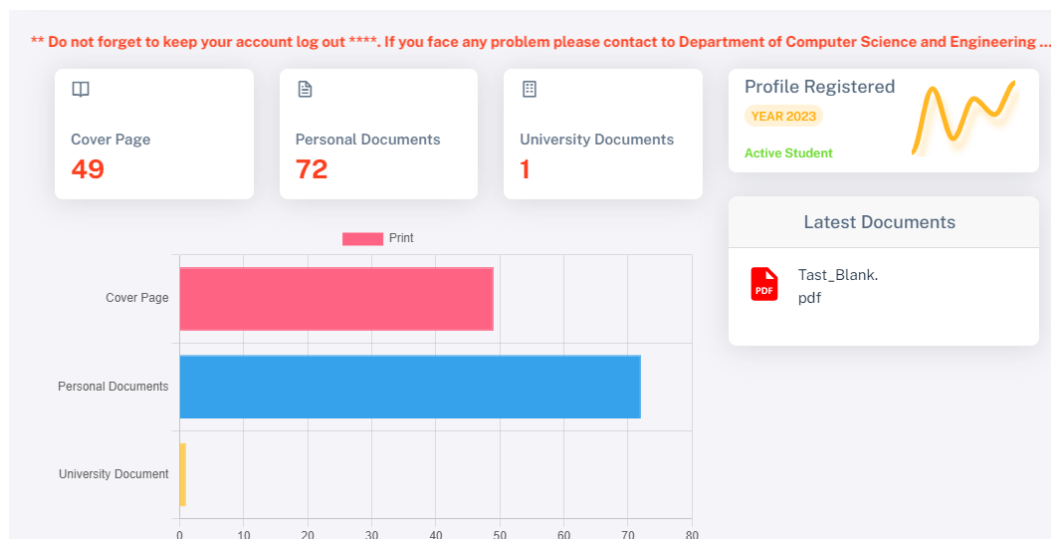
Already have an account? [Login now](#)

**Figure 3.1:** Login & Registration

Embark on a seamless journey with uPrint, your go-to automated printing system designed for a personalized experience. Logging in is a breeze—students can access their accounts effortlessly using their unique student ID and password. In the event a user is not yet part of the uPrint family, worry not! The system welcomes new registrations, ensuring a smooth onboarding process for each student. To initiate registration, students are required to provide

essential details: full name, student ID, date of birth, phone number, department, current semester, and a captcha for added security. uPrint prioritizes uniqueness, validating that each student ID is distinct. If the system detects an existing student ID, the registration process is halted to maintain integrity. Only when all provided data is valid, the student successfully registers into the uPrint system, unlocking a world of personalized printing possibilities.

### 3.2.2 Student Dashboard



**Figure 3.2:** Student Dashboard

The student dashboard within uPrint offers a comprehensive overview of the user profile, encompassing details such as the number of cover pages, personal documents, and university documents printed. The dashboard goes beyond a mere snapshot, presenting this information in a visually intuitive chart format for easy comprehension. Additionally, users can track the year of their registration, providing insight into their longstanding engagement with uPrint. For those specifically interested in university documents, a dedicated list is available, ensuring transparency and accessibility to this critical category of printed materials. The uPrint student dashboard not only streamlines printing management but also enhances user awareness and control over their printing activities.

### 3.2.3 Generate Cover Page

"Generate Cover Page" feature in uPrint, empowering users to create and print personalized cover pages with ease. To facilitate this process, users are prompted to provide specific details,

ensuring a tailored cover page for their documents. Here's a breakdown of the information required:

1. **Select Department:** When a user chooses a department, uPrint presents a list of subjects associated with the selected department in the "Select Subject" input field. This streamlined process allows users to conveniently browse and select their subject from the displayed options. To further enhance accessibility, a search functionality enables users to quickly locate their subject by typing its name. In instances where the desired subject is not found in the system, uPrint accommodates flexibility by allowing users to manually input the subject name.
2. **Subject Code:** The subject code in the "Generate Cover Page" feature is designed for user convenience. Upon the user's selection of a subject, uPrint automates the process by populating the subject code into the designated input field. This automation ensures accuracy and eliminates the need for users to manually input the subject code. However, recognizing the importance of flexibility, uPrint also allows users the option to manually write the subject code in the field, providing an adaptable solution to accommodate varying preferences. This dual functionality aims to streamline the cover page generation process while allowing users the freedom to customize their experience based on their specific requirements.
3. **Select Teacher:** This feature specifying the course teacher is a crucial step as each subject is associated with a particular instructor. To simplify this process, uPrint offers an intuitive solution. Users can effortlessly search for their course teacher by typing the teacher's name into the "Select Teacher" field. This search functionality not only enhances user convenience but also ensures accuracy in attributing the assignment to the correct instructor.
4. **Section:** In the context of uPrint's "Generate Cover Page" feature, the accommodation of multiple sections within a semester is recognized. Users affiliated with a specific section are given the option to select their section during the cover page generation process. However, uPrint acknowledges that not all users may be assigned to a particular section. In such cases, selecting a section becomes an optional step, ensuring a flexible and user-centric experience. This approach allows uPrint to cater to the varying needs of users, providing a seamless cover page generation process for both those with designated sections and those without.
5. **Assignment Topics:** In the "Generate Cover Page" feature of uPrint, users have the option to specify the assignment topic. If the assignment requires a designated topic, users can input

the relevant information in the provided "Assignment Topic" field.

6. Date of Submission: In the uPrint "Generate Cover Page" feature, users are empowered to choose the assignment submission date. The process is user-friendly, allowing individuals to select the desired submission date for their assignment. This flexible approach ensures that users have control over the timeline, facilitating a seamless and personalized experience in setting the assignment's submission deadline.

7. Student Information: In uPrint's "Generate Cover Page" feature, the system defaults to automatically generating a cover page with key user details, such as the user's name, semester, department, and student ID. This automated process ensures that the cover page reflects accurate and relevant information associated with the logged-in user.

Furthermore, uPrint recognizes the need for flexibility and user customization. Therefore, users are given the option to modify or change the default information before proceeding with the printing process. This user-centric approach empowers individuals to personalize the cover page according to their preferences, accommodating variations or updates to their information as needed. By combining automated generation with user customization, uPrint provides a seamless and adaptable experience for creating personalized cover pages.

After generating the cover page in uPrint, users can proceed to print it, provided two essential conditions are met. Firstly, users need to ensure their uPrint account has sufficient funds to cover the printing costs. Secondly, the availability of the printing service relies on the online status of the designated printer. Only when these prerequisites are fulfilled can users successfully print their cover page. This dual verification process aims to guarantee a seamless and reliable printing experience, emphasizing financial transparency and the operational status of the printer.

### **3.2.4 Print Documents**

The "Print Document" feature in uPrint streamlines the printing of PDF files directly from the user's account. However, uPrint exclusively supports PDF files, and if the user attempts to select any other file type, an error message is displayed. Upon selecting a PDF file, uPrint presents another page detailing essential information.

This additional page provides the user with details such as the number of pages within the PDF file, the cost associated with printing the document, and an option to specify the number of copies required. By default, the number of copies is set to 1, and users can adjust this value according to their needs. Notably, as users increase the number of copies, the printing price adjusts accordingly.

To complete the printing process, the user must ensure they have a sufficient account balance to cover the total printing cost. Additionally, the availability of the printing service is contingent upon the online status of the designated printer. Once these conditions are met, users can proceed to print their PDF file, enjoying a user-friendly and transparent printing experience with uPrint.

### **3.2.5 My Drive**

The "My Drive" feature in uPrint empowers users to upload their PDF files to their accounts, providing a convenient storage solution. This feature displays essential information, including the upload date, filename, number of pages, and associated price for each uploaded file. However, it's important to note that files are retained in the system for a duration of three days, after which they are automatically deleted.

Users have the flexibility to manually delete their files from "My Drive" at any time. Additionally, if the user intends to print a file from their drive, the system checks two crucial conditions: the availability of sufficient printing page balance in the user's account and the online status of the designated printer. Only when these criteria are met can users proceed to print their files, ensuring a seamless and rule-compliant printing experience with uPrint.

### **3.2.6 University Drive**

The "University Drive" feature in uPrint serves as a hub for users to print lecture sheets and official documents provided by the admin. This feature offers a clear overview, showcasing details such as the upload date, file name, number of pages, and associated printing cost for each document.

Upon selecting the "Print" option, users are redirected to another page equipped with additional features. This includes the ability to specify the number of pages to print, view the

printing cost, and choose the desired number of copies. The default copy value is set to 1, allowing users the flexibility to adjust this as needed.

To complete the printing process, two critical conditions must be met: the printer designated for the task must be online, and the user should possess a sufficient balance to cover the printing cost. Only when these criteria align can users successfully print the document, ensuring a seamless and rule-compliant printing experience with uPrint.

### **3.2.7 Balance Transfer**

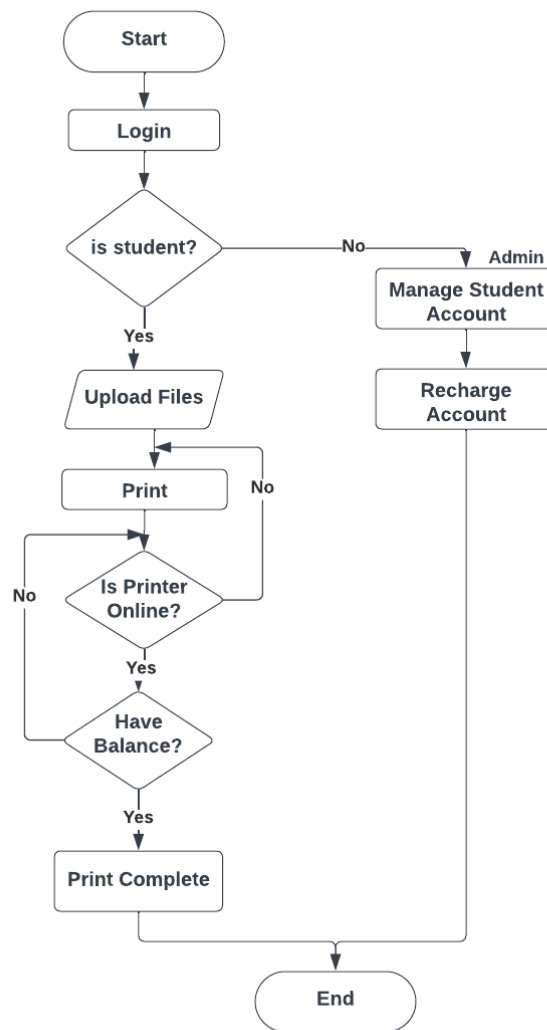
In the "Balance Transfer" feature of uPrint, students can seamlessly transfer their account balance to another student within the system. When the sender types the receiver student ID, the recipient's name is automatically displayed in the designated section. Following this, the sender inputs the transfer amount, with a minimum transfer limit set at 10.

To finalize the transfer, the sender must then input their account password in the password field. Subsequently, a confirmation prompt is triggered, seeking user confirmation. If the user confirms the prompt, the specified balance is successfully transferred to the recipient's account. This multi-step process ensures a secure and user-friendly experience, emphasizing user verification and consent before executing the balance transfer in uPrint.

### **3.2.8 Transactions History**

In the "Transaction History" feature of uPrint, users have the capability to view a comprehensive record of their activities, including printing, recharges, and balance transfers. This feature allows users to specify a date range, enabling them to access their complete transaction history within the defined period.

Users can easily retrieve and review details such as the date, type of transaction (printing, recharge, or balance transfer), and relevant information associated with each activity. This user-centric design empowers individuals to monitor and track their uPrint usage efficiently, providing transparency and control over their financial and transactional history within the specified date range.



**Figure 3.3:** System Flowchart

### 3.3 Admin Panel

#### 3.3.1 Dashboard

The admin dashboard in uPrint serves as a centralized hub, offering a comprehensive overview of the entire system. It includes details such as the number of departments, teachers, available subjects, total semesters, and the count of registered students. Additionally, the dashboard provides real-time information on available printer pages, with a blinking alert for low page counts, prompting admin attention for page reloading. Essential financial metrics like the total recharge amount are highlighted, along with a breakdown of printed pages, remaining balance, and copied pages for the current month. The inclusion of a chart visually represents

trends in total recharge amounts and printed pages, enhancing data interpretation for efficient system management. This holistic dashboard equips administrators with vital insights, enabling them to make informed decisions and maintain optimal performance across uPrint.

### **3.3.2 Print**

The "Print" option for administrators in uPrint facilitates the printing of PDF documents. Within this section, administrators can observe the total number of pages contained in the PDF file. Admins also have the flexibility to select the desired number of copies for printing. However, if the designated printer is not online, the printing function will not be available. This streamlined process ensures that administrators can efficiently manage and execute print jobs for PDF documents, with the system seamlessly accommodating the online status of the printer for a smooth printing experience.

### **3.3.3 Departments**

In the uPrint's department module, administrators have the capability to add new departments by providing both a short name and a full name for the department. Additionally, administrators can view a comprehensive list of all added departments. Each department entry is accompanied by two buttons – one to ensure the department is marked as active and another to add subjects to the department. If a department is not marked as active, it won't be visible in the student panel.

Administrators retain the flexibility to update department details or delete a department as needed. This modular approach empowers administrators to efficiently manage and organize departments within uPrint, ensuring a dynamic and responsive system that aligns with the evolving needs of the educational institution.

### **3.3.4 Teachers**

In the uPrint's teacher module, administrators have the capability to add new teachers by providing essential details such as the department, teacher designation, and teacher name. The module also allows administrators to view a comprehensive list of all added teachers.

Each teacher entry is accompanied by a status button, enabling administrators to mark the teacher as active. If a teacher is not marked as active, their information will not be visible in



the cover page generation section of the student panel. This feature allows administrators to easily manage and control the visibility of teachers based on their current status.

Administrators have the flexibility to update teacher details or delete a teacher from the system, ensuring a streamlined and responsive process for teacher management within uPrint. This modular approach empowers administrators to maintain an up-to-date and organized record of teachers, aligning with the dynamic requirements of the educational environment.

### **3.3.5 Designations**

In uPrint's Designations module, administrators possess the capability to add new teacher designations, providing a structured framework for roles within the system. Administrators can easily view a comprehensive list of all added designations.

Each designation entry is accompanied by options for administrators to update the designation details or delete a designation from the system. This modular approach facilitates efficient management, enabling administrators to align and customize teacher roles according to the evolving needs of the educational institution.

### **3.3.6 Subjects**

In uPrint's Subject module, administrators have the capability to add new subjects by providing essential details such as the semester to which the subject belongs, the department name it is associated with, the subject name, and the subject code. This structured approach ensures a clear organization of subjects within the system.

Administrators can conveniently view a comprehensive list of all added subjects, each accompanied by an activation button. This button ensures the security of the subject in the student cover page generation. If a subject is not marked as active, it won't be available for students during the cover page generation process.

Furthermore, administrators retain the flexibility to update subject details or delete a subject from the system, providing a modular and responsive approach to subject management within uPrint. This feature-rich module facilitates efficient handling of subjects, aligning with the dynamic academic structure of the educational institution.

### **3.3.7 Semesters**

In uPrint's Semester module, administrators have a comprehensive overview of added semesters and the flexibility to add, update, or delete semesters as needed. Each semester entry is accompanied by an activation button, allowing administrators to activate or deactivate a semester.

The activation button serves a dual purpose by controlling visibility in both the admin and student panels. When a semester is activated, it becomes accessible in both panels, ensuring a synchronized and efficient user experience. Conversely, deactivating a semester removes its visibility from both panels, maintaining system coherence.

### **3.3.8 Load Balance**

In uPrint's Load Balance module, administrators are equipped with the ability to recharge and discharge student account balances. The module provides a comprehensive list of all registered students, featuring their names, departments, student IDs, and current account balances.

When administrators initiate a recharge or discharge, a confirmation message is displayed, seeking admin approval before proceeding with the transaction. This two-step verification process ensures precision in managing student account balances and emphasizes the importance of administrator confirmation for financial transactions within uPrint. This user-centric and secure approach enhances transparency and control over account balance operations, fostering a reliable and accountable system.

### **3.3.9 Load Pages**

In the uPrint Load Page module, administrators have the capability to load pages into the printer, a numerical operation that notifies users of the available pages. Unlike sensor data, this numerical representation serves as a notification for users about the current page availability in the printer.

A notable feature is the dynamic alert system — if the available pages in the printer fall below a minimum threshold, the module signals the user dashboard by activating a blinking red light. This visual cue is designed to promptly capture user attention and indicate the need for page reloading. It emphasizes the significance of maintaining an adequate page count to enable seamless printing within the uPrint system. This user-friendly and proactive approach ensures

that users are well-informed and can take timely actions to ensure uninterrupted printing services.

### **3.3.10 Manage Student**

In the uPrint Manage Student module, administrators have a comprehensive overview of all registered students, providing details such as the registration date, profile picture, name, student ID, and department. Each student entry is equipped with a status button, enabling administrators to activate or deactivate a student's login access to the system.

Furthermore, administrators possess the ability to view detailed information about a specific student, including their transaction history. The module also allows administrators to generate reports for a student's transaction history, enhancing transparency and record-keeping.

An additional feature in the Manage Student module empowers administrators to reset a student's password in the event of a forgotten password. This user-centric approach ensures that students can regain access to their accounts seamlessly with the assistance of administrators.

### **3.3.11 Search Student**

In the uPrint Search Student module, administrators experience a user-friendly and efficient tool designed to simplify the process of locating specific students within the system. This module is specifically tailored to enhance the search experience with a focus on the student ID.

Administrators can effortlessly search for a relevant student by entering the student ID. The search results provide a comprehensive overview of the student's details, including recharge and discharge information, transaction history, and the option to reset the student's password.

This streamlined approach optimizes the search functionality, ensuring that administrators can quickly access and manage student profiles by utilizing a unique and easily identifiable identifier—the student ID.

### **3.3.12 Queries**

The Queries module serves as a platform for users or students to provide feedback through the contact us section on the homepage. Users can share their comments or concerns about

the system through this feature. The messages submitted by users are stored in the Queries module, allowing administrators to review and manage user feedback.

Administrators have the ability to access the full message content in the Queries module. This functionality empowers admins to understand user sentiments, address concerns, and gather valuable insights for system improvement. Additionally, administrators can delete messages as needed, ensuring a streamlined and organized repository of user feedback.

The Queries module thus plays a crucial role in fostering communication between users and administrators, facilitating an open feedback loop that contributes to the ongoing enhancement and optimization of the uPrint system.

### **3.3.13 Pricing**

In the Pricing section, administrators are provided with a dedicated platform to configure and manage printing page prices. This section allows administrators to set prices for three distinct types of pages: Assignment Cover Page, Personal Document, and University Document. For each page type, administrators can define a specific page price.

A key feature in the Pricing section is the activation button associated with each page type. If administrators choose to turn off the activation button for a particular page type, the corresponding page price will no longer be visible on the home page. This offers flexibility in controlling the visibility and accessibility of different page types based on the system's needs.

Furthermore, administrators can update page prices by inputting numerical and integer values, ensuring precision and accuracy in the pricing configuration. This user-centric approach in the Pricing section of uPrint allows administrators to efficiently manage and customize printing page prices, contributing to a transparent and adaptable printing system.

### **3.3.14 Histories**

In the uPrint History section, administrators have access to a comprehensive set of features providing a detailed overview of the system's activities. Here's how the different options within the History section operate:

1. **Earning History:** Administrators wield a robust tool for precise financial analysis, focusing on a the-selected date range. This feature presents a daily breakdown of key financial activities, including recharges, discharges, printer page events, and printed page balance. Administrators gain valuable insights into the system's financial dynamics on a day-to-day basis. The flexibility of generating reports in CSV, Excel, and PDF formats empowers administrators to analyze, share, and store financial data efficiently, aligning with their reporting preferences.

2. **Recharge History:** Recharge History option is a robust tool for administrators to meticulously examine recharge activities within a specified date range, categorized by individual roles. This feature offers a detailed breakdown, encompassing the administering admin's name, the student ID of the recharging user, the recharge amount, and, when applicable, the discharge amount. Administrators can efficiently track and analyze financial transactions, gaining valuable insights into the system's financial dynamics. The capability to generate reports in CSV, Excel, and PDF formats enhances reporting flexibility, allowing administrators to document and analyze recharge histories with transparency and accountability in the system.

3. **All Recharge History:** In this option, administrators can efficiently obtain a comprehensive overview of all admin recharge activities for a selected date. This feature offers a quick glance at the details of each admin's recharges, including the admin name, recharging amount and any associated discharge amounts. The summary also includes the total recharge and discharge amounts for a consolidated understanding.

The capability to generate reports in various formats such as CSV, Excel, and PDF further enhances the reporting functionality, providing administrators with flexible documentation and analysis tools.

4. **My Transaction History:** In My Transaction History module, a login admin has a tailored tool to efficiently access and review their individual transaction history. This feature allows the admin to focus specifically on their own financial interactions within the system, providing details such as recharges, discharges, and other relevant transactions for a selected date.

The user-centric design of the My Transaction History module ensures that a login admin can seamlessly navigate and retrieve pertinent information. Additionally, the admin can generate

detailed reports in various formats, including CSV, Excel, and PDF, offering flexibility in documenting and analyzing their personal transaction history.

5. All Transaction History: In All Transaction History module, administrators gain a consolidated view of all admin transactions for a selected date, featuring critical details such as credit and debit statuses, transaction student IDs, transaction amounts, and the transaction type. This comprehensive overview allows administrators to track financial activities effectively. The user-friendly interface enables admins to navigate and analyze the data effortlessly. Moreover, administrators have the flexibility to generate detailed reports in various formats, including CSV, Excel, and PDF, enhancing their ability to document, analyze, and report on transaction histories.

#### 6. Print History:

In print History module, administrators have a comprehensive tool to track printing activities, capturing essential details such as student name, student ID, document type, the number of pages printed, and associated printing costs. This feature enables administrators to closely monitor and manage the printing process, ensuring transparency and accountability.

The user-friendly interface facilitates effortless navigation, allowing admins to quickly retrieve pertinent information. Additionally, administrators can utilize the reporting functionality to generate detailed reports in diverse formats like CSV, Excel, and PDF. This capability enhances administrators' analytical capabilities, enabling them to analyze and document printing histories efficiently.

### **3.3.15 Testimonials**

Testimonials Module serves as a valuable platform for administrators to curate and showcase student feedback on the homepage. This dynamic feature allows admins to effortlessly add, update, or delete testimonials, each accompanied by an image, student name, department, detailed feedback message, and a rating under 5. The Active Button provides administrators with the flexibility to control the visibility of testimonials.

### **3.3.16 Upload Document**

This Module provides administrators with a robust platform to manage uploaded files efficiently. Admins can seamlessly upload and delete files, and the system automatically calculates the number of pages for each document. The file details, including name, page count, and relevant information, are neatly organized in a table format.

Key functionalities of the University Drive Module include the ability for admins to control file visibility on the student portal using an Active Button. This feature enhances content management, ensuring a transparent and user-friendly experience for administrators.

### **3.3.17 User Settings**

The User Settings Module in uPrint empowers administrators to efficiently add new administrators to the system. This feature requires essential details like the admin's role, name, email, and password. Additionally, the module provides a comprehensive display, showcasing the last updated user's role and image. Administrators can access key information such as the user's name, email, and a status button, allowing them to enable or disable login access for the respective admin.

### **3.3.18 Role Settings**

Role Settings Module provides administrators with a flexible and granular approach to defining roles within the system. Administrators can create new roles and customize their functionalities by selectively assigning modules. The module interface offers the convenience of either selecting individual modules or utilizing the "Select All" option for a comprehensive role assignment.

A notable feature of this module is its role-based access control system. When an admin is assigned to a specific role with minimal permissions, they are restricted to using only the functionalities associated with that role. This ensures a secure and controlled administrative environment, allowing system administrators to tailor access levels according to the specific responsibilities and requirements of each role. uPrint's Role Management Module stands as a pivotal tool in optimizing system security and administrative efficiency.

### **3.3.19 System Backup**

uPrint's System Backup Module offers a robust solution for administrators to secure and manage critical system data. The backup process involves converting system data into a ZIP file, providing administrators with the flexibility to either download the file for offline storage or delete it if it's no longer needed.

Key functionalities of the System Backup Module include:

1. **Backup Initiation:** Administrators can trigger a backup process to safeguard essential system data.
2. **ZIP File Conversion:** The system efficiently converts the backed-up data into a ZIP file for streamlined storage.
3. **Download and Delete Options:** Administrators have the option to download the ZIP file for offline storage or delete it as per their discretion.
4. **Backup List Display:** A comprehensive list of previous backups is presented, showcasing details such as the last backup time, file name, and file size. This feature enhances administrative oversight and decision-making.
5. **Backup Mail Notification:** The system automatically sends a backup mail notification to the system admin, ensuring timely awareness of the backup completion.

This module not only ensures the security and integrity of system data but also enhances administrative efficiency through detailed backup lists and proactive notifications.

### **3.3.20 General Settings**

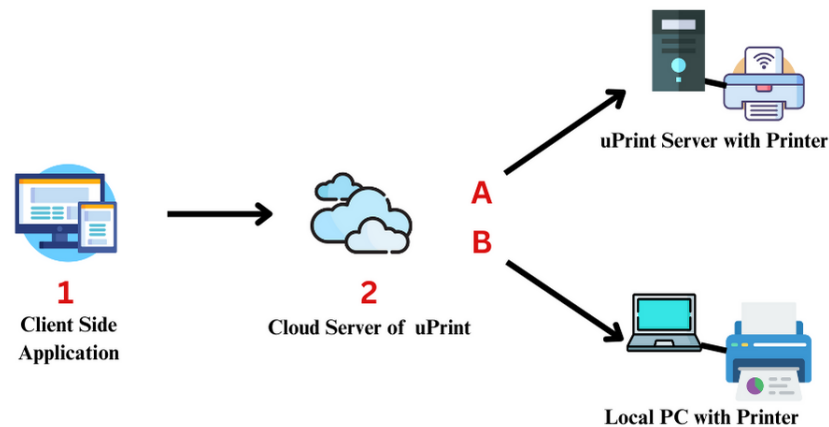
General Settings module empowers administrators to tailor the content displayed on the system's homepage, specifically in the "About Us" and "Our Policy" sections.

In the "About Us" section, administrators can articulate the system's purpose, objectives, and any other relevant information to provide users with a comprehensive understanding of the platform. This allows for a transparent and engaging introduction to the system.



Similarly, the "Our Policy" section offers a dedicated space for administrators to communicate the policies governing the system's use. This ensures that users are aware of guidelines and expectations, fostering a responsible and compliant user community.

The written content crafted in the General Settings module becomes prominently featured on the homepage, serving as a valuable source of information for users. This customization not only enhances user experience but also establishes transparency and trust within the system. Overall, the General Settings module contributes to creating a user-friendly and well-informed environment.



**Figure 3.4:** Workflow of uPrint

### 3.4 API

The uPrint web application is designed to streamline the printing experience by seamlessly integrating with uPrint API, a sophisticated component for efficient print job processing. The linchpin of this integration is the "print\*queues" table within the uPrint web application's database, serving as a conduit for exchanging critical print job information between the two systems.

1. The "print-queues" Table: Within the uPrint web application database, the "print-queues" table acts as a pivotal bridge connecting user-initiated print job requests and the uPrint API. This table stores essential data crucial for print job processing, including the number of copies, file location, creation date and time, printing type (e.g., one-sided or two-sided).

2. Real-time Monitoring and Action: The uPrint API continuously monitors the "print-queue" table for new entries, swiftly detecting and responding to newly added print job requests.

### **3.4.1 Efficient Data Extraction**

When a new print job entry is identified, the uPrint API promptly extracts essential details, such as the number of copies required, the file's location, the desired printing type, and the designated printer.

1. Streamlined Print Job Processing: With this extracted information, the uPrint API efficiently manages the entire print job processing cycle, including file download, printer configuration (e.g., one-sided or two-sided printing), and copy management based on the table's parameters.

2. Feedback and Status Updates: The uPrint API actively keeps stakeholders informed by updating the status of each print job within the "print-queue" table, providing clear indicators of job progress, initiation, or completion.

### **3.4.2 Resource Creation**

During the course of this research, we developed several key resources to support our user-centric printing system. The uPrint web application, which serves as the primary interface for users, was created alongside the uPrint API to streamline print job processing. The "print queues" database table acts as a pivotal bridge for exchanging print job information between users and the uPrint API. Additionally, a sample dataset of print job requests and user interactions, carefully anonymized and sanitized to ensure privacy, was collected for research purposes. Researchers interested in accessing this dataset can contact the corresponding author for further information.

## **3.5 Conclusion**

In conclusion, uPrint stands as a comprehensive and user-friendly automated printing system tailored for educational institutions. With its diverse modules, uPrint efficiently manages

user accounts, printing, and administrative tasks. The system offers a personalized experience for students, allowing them to navigate through features such as account management, document printing, and transaction tracking. Admins benefit from a robust dashboard that provides a holistic overview of the system, including department and teacher management, subject organization, and semester control. The modular design ensures flexibility, allowing administrators to add, update, or delete various components seamlessly. uPrint's emphasis on user control, security, and adaptability positions it as a valuable tool for enhancing the printing experience within educational settings.



## Chapter IV

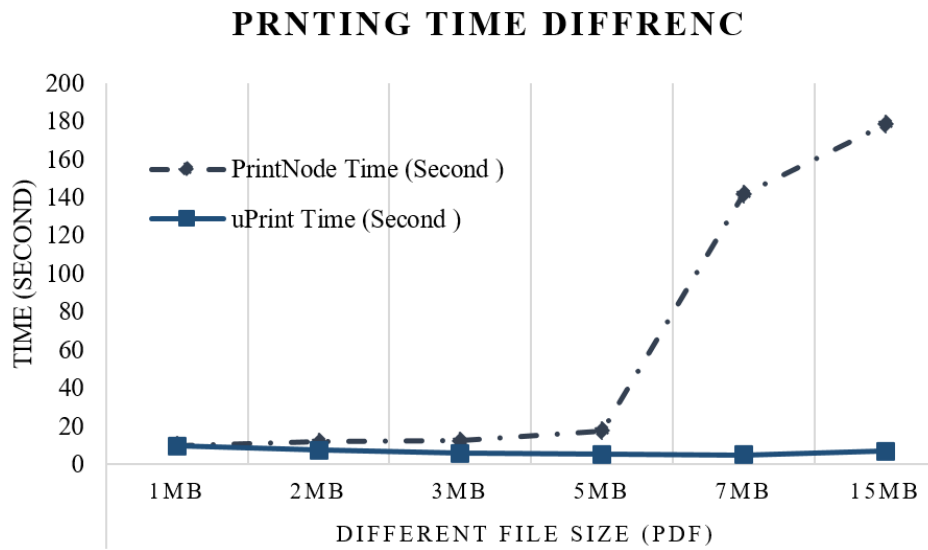
### Experimental Results

#### 4.1 Introduction

Experimental results refer to the outcomes of a scientific experiment or study that have been collected and analyzed to draw conclusions and make inferences about a particular phenomenon or system. These results are typically presented in the form of data, which can include numerical measurements, graphs, charts, or other visualizations. The experimental results provide evidence for or against a hypothesis or research question, and they are essential for validating or invalidating a scientific theory or model. The process of collecting experimental results involves the careful design and implementation of experiments, the collection of reliable and accurate data, and the statistical analysis of that data to identify patterns or trends. The interpretation of experimental results is critical to drawing valid conclusions and making sound decisions based on those results. It is essential to consider the limitations and potential sources of error in the experimental design and data collection process and to interpret the results within the context of the specific research question or hypothesis being tested.

#### 4.2 Analysis

Within the context of user-centric printing solutions, this paper presents a comparative analysis of uPrint and PrintNode, both recognized as prominent contenders in the field, each offering a unique array of features and functionalities. This in-depth examination aims to elucidate critical factors that distinguish these two solutions, providing valuable insights to assist users in selecting the most appropriate solution for their specific printing requirements. The analysis encompasses a comprehensive evaluation of factors such as cost-effectiveness, printing speed, security, and bandwidth utilization, shedding light on essential aspects that define the strengths and weaknesses of uPrint and PrintNode. This comparative assessment empowers users with the information needed to make well-informed decisions regarding their printing needs.



**Figure 4.1:** Time Difference for Different File Size

### 4.3 Conclusion

In this study, we introduced uPrint, a user-centric printing system designed to empower both students and administrators with seamless printing capabilities. The uPrint web application provides students with a convenient platform for managing documents, initiating print jobs, and monitoring their account balances. Administrators, on the other hand, benefit from robust user management and system performance insights. The integration of uPrint with the uPrint API via the "print queues" table streamlines print job processing, ensuring efficient and timely printing operations. Through a comparative analysis with PrintNode, we highlighted key distinctions between the two printing solutions, including cost, user information handling, printing speed, security, and bandwidth usage. These insights assist users in making informed decisions regarding their printing needs. Overall, uPrint represents a valuable addition to the realm of user-centric printing systems, offering enhanced functionality, security, and transparency. Its flexibility and integration capabilities make it a versatile solution for educational institutions and organizations seeking to optimize their printing workflows while providing a user-friendly experience. Future work may involve further enhancements to uPrint, exploring additional integrations, and conducting user studies to continuously refine and improve the system's features and performance.

## Chapter V

### Conclusion

#### 5.1 Summary

uPrint is an automated printing system designed to provide a personalized experience for students. The system includes features like user registration, login, and profile management, allowing students to access exclusive functionalities. To register, students provide essential details such as full name, student ID, date of birth, phone number, department, current semester, and a captcha for security. Upon successful registration, students can log in, accessing a dashboard that provides an overview of their profile and details about the number of cover pages, personal documents, and university documents printed. The system generates cover pages with default user information, which can be customized before printing. Additionally, students can directly print PDF documents, upload files to their drive, and print official documents provided by the university. The system incorporates a balance transfer feature, allowing students to transfer account balances between accounts. Transaction history and a dashboard for administrators provide a comprehensive overview of the system's usage and finances. uPrint also includes role management, backup functionalities, and a settings module for administrators to customize content displayed on the system's homepage. In summary, uPrint streamlines the printing process for students, offering personalized features and efficient management tools for administrators, contributing to a seamless and user-friendly printing experience within the academic environment.

#### 5.2 Future Works

The future developments outlined below hold the promise of refining the functionality and practical utility of the uPrint system. These enhancements aim to elevate the accuracy and applicability of uPrint, ultimately improving the printing experience and administrative capabilities for users.

- Expand document format support beyond PDF to accommodate a wider range of file types commonly used by students.

- Implement a real-time printing queue that shows students the status of their print jobs, estimated wait times, and notifications when the printing is completed.
- Integrate uPrint with popular cloud storage services, enabling students to print directly from their cloud accounts without manual uploads.
- Collaborative printing features, allowing students to share documents for group projects and print them collectively.
- Implement automated notifications, such as SMS or email alerts, for students when their print jobs are completed, or if there are issues with their accounts.
- Expand Admin Dashboard: Enhance the admin dashboard with more comprehensive statistics, visualizations, and real-time monitoring capabilities.



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