

VIETNAM NATIONAL UNIVERSITY,
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY (HCMUT)
FACULTY OF COMPUTER SCIENCE & ENGINEERING



SOFTWARE ENGINEERING

Assignment

HCMUT-SSPS

Lecturer: Trương Thị Thái Minh
SV: Đoàn Thê Anh – 2252019
Lê Anh Khôi - 2252370
Hồ Gia Tường – 2252887
Huỳnh Văn Anh Hoàng - 2252229
Huỳnh Thành Duy - 2252114

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Revision History

Name	Date	Reason For Changes	Version
Group meeting	9-2024	Task 1: Requirement Elicitation	1.0
Đoàn Thé Anh	9-2024	Benefit of the system, Use case: Upload Documents	1.0
Lê Anh Khôi	9-2024	Domain context, whole diagram, Use-case: Print Documents	1.0
Huỳnh Thanh Duy	9-2024	Functional requirements, use case Specify Printing Properties	1.0
Huỳnh Văn Anh Hoàng	9-2024	Non-functional requirements, Use-case: Cancel Printing	1.0
Hồ Gia Tường	9-2024	Stakeholders and Needs, Use-case: Choose a printer	1.0
Group meeting	30-9-2024	Reformatting, ensuring logical coherence	1.1
Đoàn Thé Anh	27-10-2024	Activity diagram	1.2
Hồ Gia Tường	27-10-2024	Sequence diagram	1.2
Huỳnh Thanh Duy	27-10-2024	Class diagram	1.2
Lê Anh Khôi & Huỳnh Văn Anh Hoàng	27-10-2024	Develope MVP (figma)	1.2
Huỳnh Thanh Duy	7-11-2024	Architectural diagram	1.3
Group meeting	7-11-2024	Standardize writing & Proofing	1.3
Đoàn Thé Anh	8-11-2024	Component diagram	1.3
Hồ Gia Tường & Đoàn Thé Anh	1-12-2024	Rewrite in LaTeX	1.4

Task 1: Requirement elicitation

1. Domain Context

1.1. Domain Context

As with any academic setting, students at Ho Chi Minh University of Technology need to print documents such as textbooks, lecture notes and reports. Traditional printing methods such as purchasing printing equipment or employing third-party photocopy services can be inefficient, time consuming and may even be costly. To address this problem, the university plans to implement an in-house printing service. We will streamline the printing process of HCMUT Smart Student Printing Service (HCMUT-SSPS) by deploying a software integrating with the university's Single Sign-On (SSO) authentication system to allowing students to upload files digitally, select printers located across the campus, and customize their print jobs. This system will also help the Student Printing Service Officer (SPSO) to easily manage and catalog printing requests.

1.2. Stakeholders and Needs

The stakeholders of HCMUT-SSPS are: the students, the IT team, and the SPSO, each with specific needs and criterias.



- Students are the primary users of the printing service. As such, the baseline for the service is the ability to facilitate printing for the students. They must be able to upload documents; specify printing options; track their remaining balance and printing history.
- The system administrators are responsible for the security and reliability of the end product, which can be achieved through the implementation of several functionalities: activity logging, authentication, access restriction, and a maintenance toolkit to perform regular system updates and maintenance smoothly and efficiently.
- Student Printing Service Officer (SPSO) are the managerial bodies, providing service to students with the assistance of software. Said software should help them manage and keep track of assets, in this case, printers and paper supply by tracking relevant information like the printers' details, the amount of paper in stock, their assignment to the individual customers, transaction records, ect. It should also provide administrative functions such as access control, system configuration.

1.3. Benefits of the System

For every stakeholder, the HCMUT-SSPS will provide some benefits.

- For students, it provides a convenient self-service printing option that they can use from anywhere on campus.
- For the Student Printing Service Officer (SPSO) the system facilitates the management of printers and print quotas. It augments their ability to allocate resources, log printing and ensure optimal service performance.
- The IT staff benefit from having fewer printers to manually monitor and maintain, while the ones that are under HCMUT-SPSO have simpler maintenance operations. Moreover, the IT staff can also utilize usage reports to plan maintenance accordingly.

2. Functional & Non-Functional Requirements

2.1. Functional Requirements

Student:

- Students shall be able to upload document files for printing.
- Students shall be able to choose a printer and specify printing properties(such as paper size, pages to print, one-/double-sided, and number of copies).
- The system shall automatically calculate the correct number of pages from the student's balance based on the paper size chosen.
- Students shall be able to cancel a print job before it finishes.
- Students shall be able to track when a print job starts and finishes.
- Students shall be able to view their printing history for a specified time period.
- Students shall be able to filter their printing log by printer, paper size, or date range.
- Students shall automatically receive a default number of A4 pages at the start of each semester.



- Students shall be able to view their current page balance.
- Students shall be able to buy additional printing pages using BKPay.
- Students shall be prevented from printing if the number of pages exceeds their available page balance.

IT Team:

- The system shall require all users to authenticate via the HCMUT-SSO authentication service.
- The system shall be accessible through both a web-based app and a mobile app.
- The system shall allow the IT Team to monitor server load and resource usage.
- The system shall log system errors, failed user uploads, failed logins, unsuccessful print jobs.
- The system shall allow the IT Team to monitor printer availability and status.
- The system shall automatically generate and store reports on the usage of the printing service at the end of each month and year.

SPSO:

- The SPSO shall be able to add, enable, and disable printers in the system.
- The SPSO shall be able to configure the permitted file types for printing.
- The SPSO shall be able to set the default number of A4 pages assigned to students each semester.
- The SPSO shall be able to set the dates for crediting students with their default printing pages.
- The SPSO shall be able to view the printing logs for all students or a specific student, filtered by time period and printer.
- The SPSO shall be able to filter the printing logs by specific printers.
- The SPSO shall be able to view reports on system usage at any time.

2.2. Non-Functional Requirements

- Performance:
 - The loading time of the sending the request of user to the printer should be at most 5 seconds.
 - The system should maintain performance when handling up to 100 requests concurrently
- Availability:
 - The system should operate all the time (24/7 mode)



- The system should not experience more than 1 hour of unplanned downtime per month.
- Maintainability:
 - The system's code should be modular to allow updates with minimal effort.
 - The code should follow a consistent naming convention and coding standard to ensure readability and maintainability.
 - The system architecture should allow for new features to be added with minimal changes to the existing codebase.
- Reliability:
 - The system must perform automatic data backups every hour to prevent data loss.
 - The system must ensure that no data is lost or corrupted during storage and retrieval operations.
- Synchronization:
 - One account should not be used in many printers at the same time.
- Security:
 - All users have to be authenticated by the HCMUT-SSO authentication service before using the system.
- Usability:
 - New users can learn to use basic functions in 10 minutes.
- Portability:
 - The system is provided through a web-based app and a mobile app.

3. Use-case Diagrams

3.1. Use-case Diagram for the Whole System

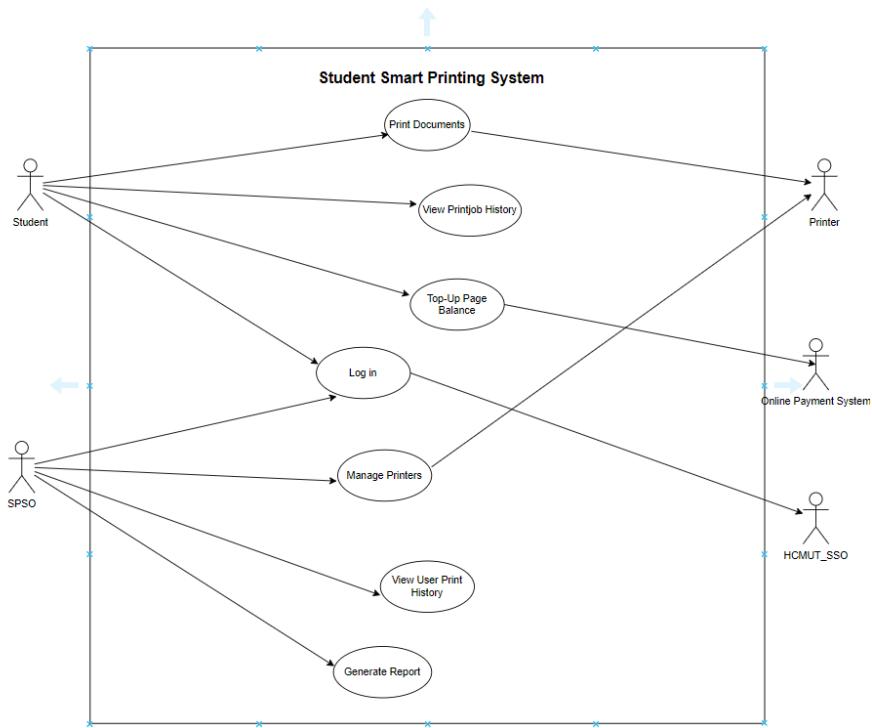


Figure 1: Use-case Diagram for the Whole System

3.2. Use-case Diagram for Print Documents Module

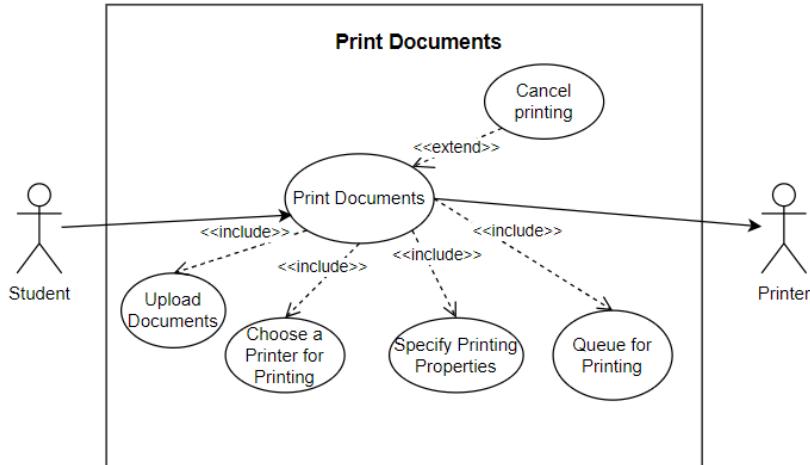


Figure 2: Use-case Diagram for Print Documents



3.3. The Details of Usecases in Print Documents Module

3.3.1. Usecase Upload Documents

Name	Upload Documents
Created by	Thé Anh
Date	29/9/2024
Primary actor	Student
Secondary actor	N/A
Description	The student uploads the document to the system for later printing. The document type and size are also limited and managed previously by SPSO.
Trigger	The student chooses the upload function of the app on their device.
Precondition	PRE-1. Student identity has been authenticated. PRE-2. The SSPS database is still working.
Postcondition	POST-1. The document is saved on the local cache successfully
Normal Flow	1. The system will open a tab for students to drop in their documents from their device or drive. 2. The system will check the permitted file type and size of the document. 3. The system uploads to the local cache.
Alternative Flow	2.1 Invalid document(s): Notify the student and suggest re-upload. Return to step 1.
Exception	Network Failure: Notify the student and suggest refreshing the page or app.

3.3.2. Usecase Specify Printing Properties

Name	Specify Printing Properties
Created by	Thanh Duy
Date	29/9/2024
Primary actor	Student
Secondary actor	N/A
Description	The student specifies the size of paper they want to print in, the pages, number of copies, single-sided or double-sided, black and white or colored, and orientation (portrait or landscape).
Trigger	The student finishes uploading the document(s) to the cache.
Precondition	PRE-1. Student identity has been authenticated. PRE-2. The documents for printing are ready and valid.
Postcondition	POST-1. The printing specifications will be selected.
Normal Flow	1. The student chooses the paper size. 2. The student chooses the pages they want to print. 3. The student chooses the number of copies. 4. The student chooses if the document should be single-sided or double-sided. 5. The student chooses whether the document is colored. 6. The student chooses the orientation of the documents. 7. The system calculates the number of papers needed. 8. The student confirms the specifications.
Exception	Network Failure: Notify the student and suggest refreshing the page or app.



3.3.3. Usecase Choose a Printer for Printing

Name	Choose a Printer for Printing
Created by	Gia Tường
Date	29/9/2024
Primary actor	Student
Secondary actor	N/A
Description	The student selects a printer from a list of available printers within the system. The student can review printer details (e.g., location, status, and type of printer) before making a selection.
Trigger	The student finishes specifying properties.
Precondition	PRE-1. Student identity has been authenticated. PRE-2. Printers have been configured and are available for selection. PRE-3. The printing properties are specified and valid.
Postcondition	POST-1. The selected printer is queued for the print job.
Normal Flow	1. The system displays a list of available printers to the student. 2. The student reviews the available printer details (location, status, type). 3. The student selects a printer from the list. 4. The system saves the selected printer for printing the document.
Alternative Flow	1.1 No Available Printers: Notify the student and suggest waiting or contacting support. End use-case. 3.1 Printer Unavailable (offline, out of paper): Notify the student and suggest alternative printers. Return to step 1.
Exception	Network Failure: Notify the student and suggest refreshing the page or app.

3.3.4. Usecase Queue for Printing



Name	Queue for Printing
Created by	Anh Khôi
Date	29/09/2024
Primary actor	Student
Secondary actor	Printer
Description	The student initiates the print job after selecting the desired printer and specifying the print properties (e.g., number of copies, paper size, double-sided). The system sends the document to the selected printer, tracks its progress, and updates the student's printing balance and printing history.
Trigger	The student selects the "Print" option after configuring the print properties and choosing a printer.
Precondition	PRE-1. Student identity has been authenticated. PRE-2. The printing properties are specified and the selected printer is available.
Postcondition	POST-1. The document is successfully printed. POST-2. The student's printing log and balance are updated.
Normal Flow	<ol style="list-style-type: none">1. The student reviews the documents for printing.2. The student confirms the printing job.3. The system verifies the student has sufficient page balance.4. The system queues the documents for printing.5. The system tracks the progress and notifies the student once printing is complete.6. The system updates the student's page balance and printing history.
Alternative Flow	3.1 Insufficient Balance: Notify the student and suggest purchasing additional pages. Transfer to "Top-Up Page Balance" module.
Exception	Printer Disconnects: Attempt to resume printing or notify the student to choose another printer. Network Failure: Store the print job and retry once the connection is restored.

3.3.5. Usecase Cancel printing

Name	Cancel Printing
Created by	Anh Hoàng
Date	29/09/2024
Primary actor	Student
Secondary actor	N/A
Description	The student can cancel queued printing request(s).
Trigger	The student views sent requests and selects the "Cancel" option.
Precondition	PRE-1. Student identity has been authenticated. PRE-2. The chosen printing request(s) must be in waiting state.
Postcondition	POST-1: The chosen request will be removed from the printer's waiting queue.
Normal Flow	<ol style="list-style-type: none">1. The student tracks queued printing requests.2. The student selects the request(s) they want to cancel.3. The system asks the student to confirm cancellation.4. The system removes the requests from the waiting queue.
Alternative Flow	3.1 Student refuses confirmation: End use-case. 4.1 Request Already Canceled: Notify the student. End use-case. 4.2 Request Already Completed: Notify the student. End use-case.
Exception	Network Failure: Notify the student and suggest refreshing the page or app.

Task 2: System modeling

1. Activity Diagrams

1.1. Usecase Upload Documents

The activity diagram represents the "Upload Documents" use-case in a Smart Student Printing Service (SSPS). To access the printing function, a student must be logged in, and the system's database must be operational. The process begins with the student selecting the printing function, prompting the system to display the upload screen. The student then uploads a file, which undergoes verification by the system to ensure it meets the acceptable type and size requirements. If the file is invalid, the student is directed back to re-upload an appropriate file. If the file passes verification, it is temporarily stored in the system's cache. The student can then proceed by selecting the "Next" button, which transitions the system to the Specify-property use-case.

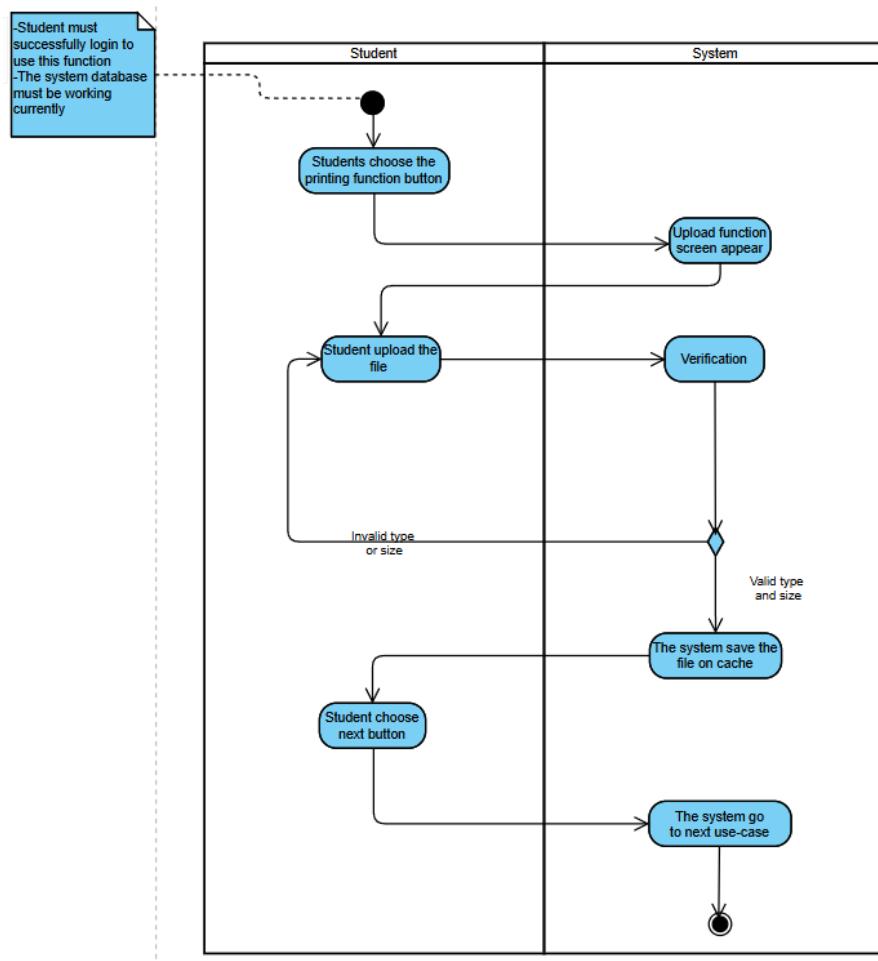


Figure 3: Upload Documents usecase



1.2. Usecase Specify Printing Properties

After successfully uploading a verified file, the student proceeds by clicking the "Next" button. The system then displays a customization page, which includes details such as the student's current balance. The student is prompted to specify various print settings, beginning with the number of pages to print. Additional customizable properties include selecting the paper size, the number of copies, single-sided or double-sided printing, color options, and the print orientation (portrait or landscape). Once all preferences are set, the student clicks "Next" to proceed, allowing the system to transition to the choose-printer use-case.

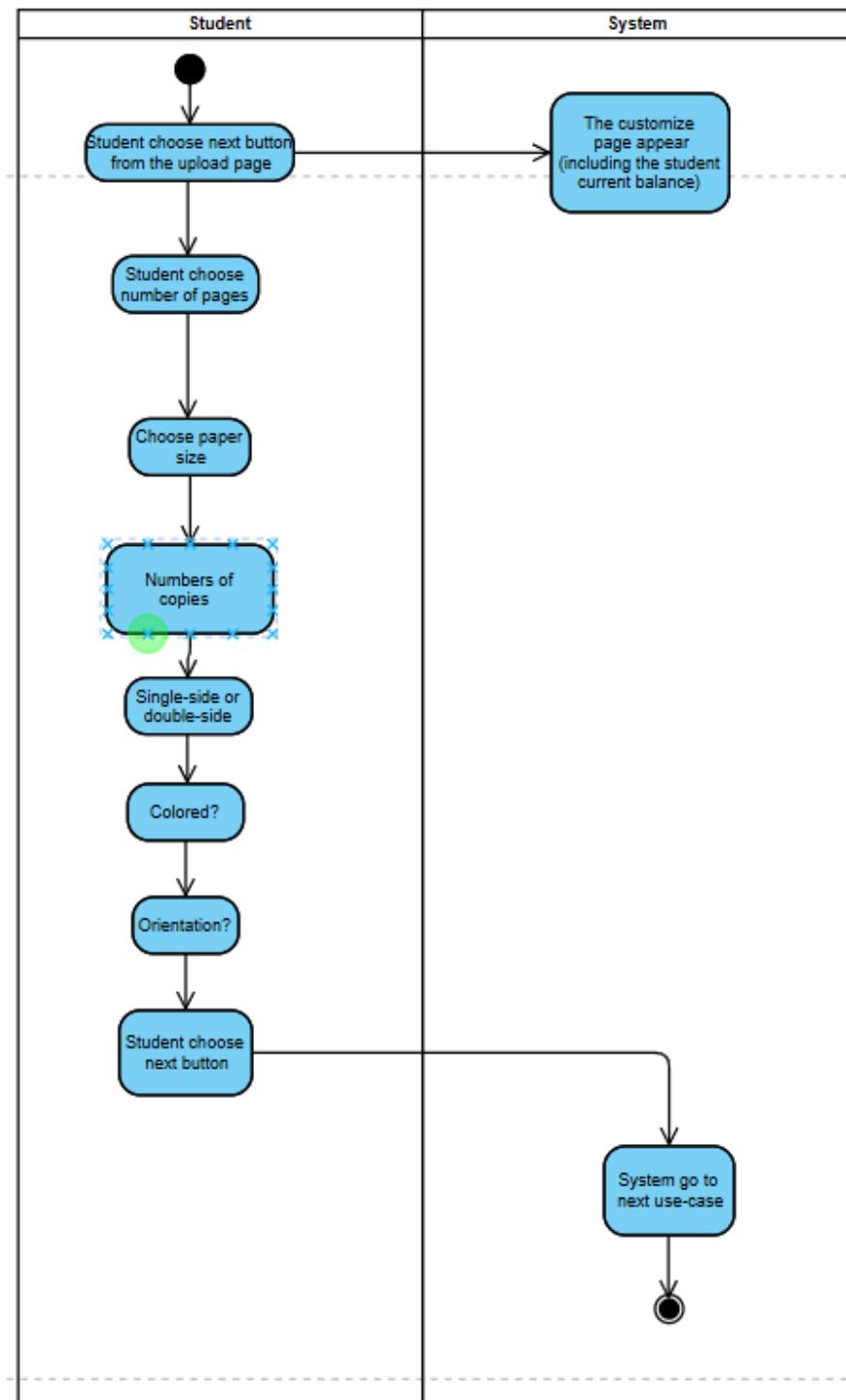


Figure 4: Specify Printing Properties usecase

1.3. Usecase Choose A Printer

After setting the print properties, the student clicks the "Next" button to proceed to the printer selection stage. The system uses the specified print configurations to display a list of suitable printers based on their availability, location, and type. If no printers meet the current requirements, the system notifies the student about the unavailability. However, if at least one printer matches the specified constraints, the "Choose Printer" page appears, displaying details for each printer, such as location and status. The student can preview the options and select a printer. If the chosen printer becomes unavailable during this process, the student is prompted to select another option. This use-case ensures that students have access to compatible printers that meet their specific requirements.

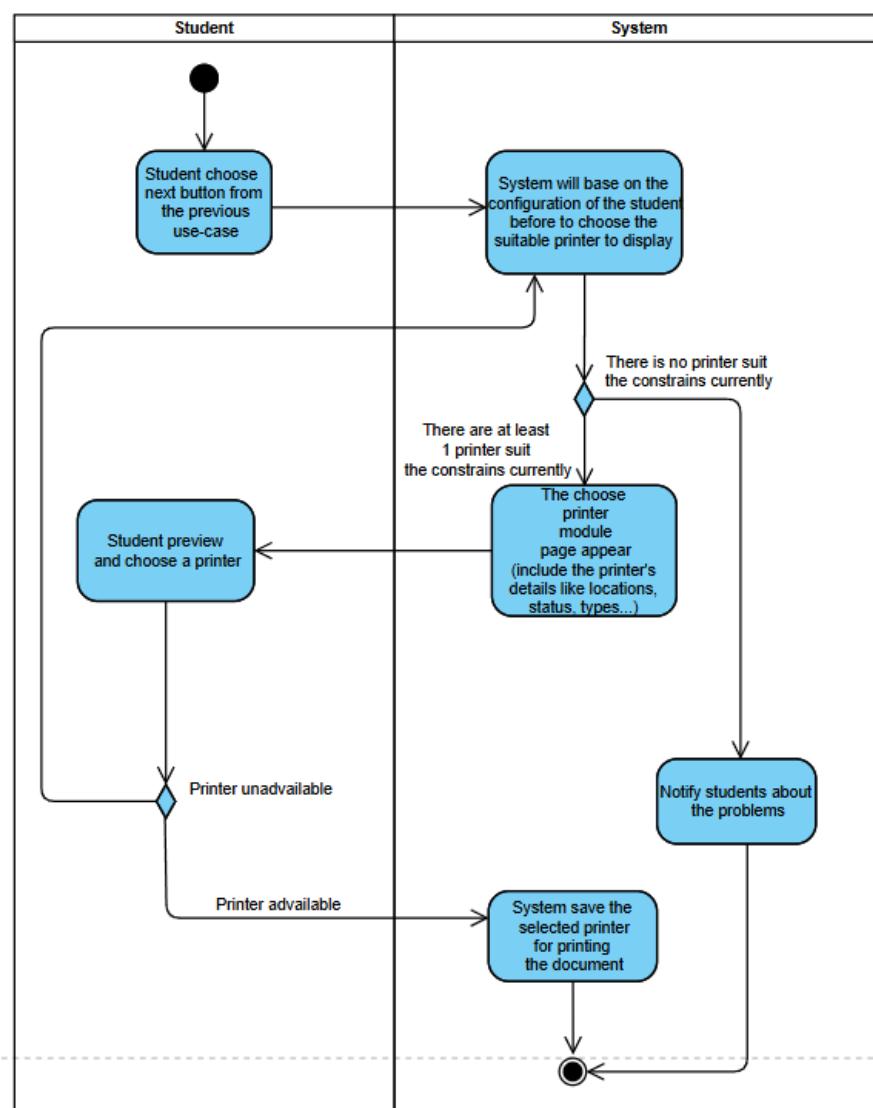


Figure 5: Choose A Printer usecase



1.4. Use Case Queue for Printing

After selecting a printer, the student clicks "Next" to reach the printing review screen. Here, the student can review the document details before finalizing the print job. Upon confirming, the system checks if the student's balance is sufficient for the printing costs. If the balance is insufficient, the system notifies the student and suggests purchasing additional credit. If the balance is adequate, the document is queued for printing, and the system tracks the printing progress. Once printing is complete, the system notifies the student and updates their balance accordingly. This step ensures that students are informed of any balance issues in advance, providing a seamless experience as they complete the printing process.

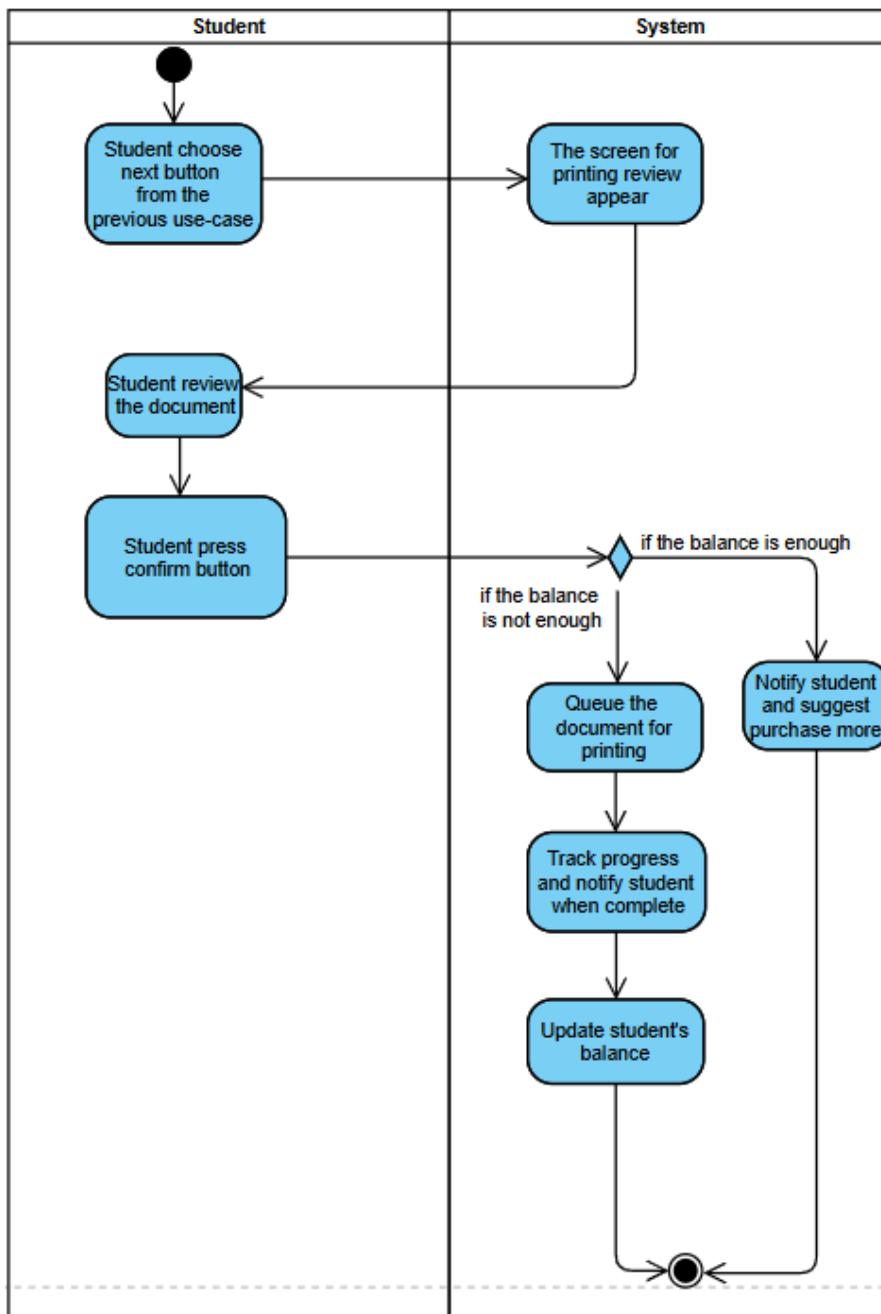


Figure 6: Queue for Printing usecase

1.5. Usecase Cancel Printing

The process begins with the student tracking their queued print jobs. If they choose to cancel a specific request, the system prompts them for confirmation. Once the student confirms the cancellation, the system checks the status of the request. If the request is already canceled or

printing or already printed, the system will notify students about this error. Otherwise, the system will delete the request in the queue. This use-case provides students with control over their queued print jobs, ensuring they can manage their print tasks effectively.

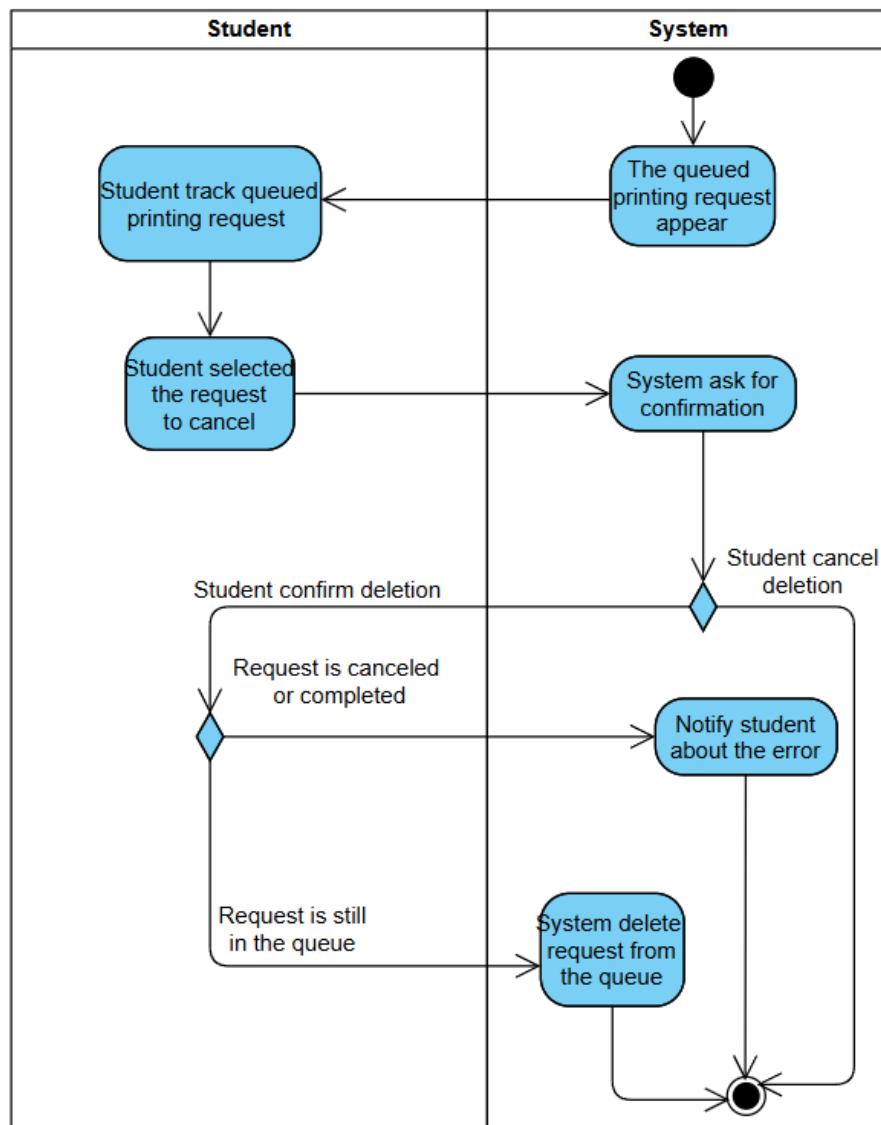


Figure 7: Cancel usecase

2. Sequence Diagrams

2.1. Usecase Upload Documents

The "Upload Documents" sequence diagram begins with the student selecting a document to upload through the system interface. Upon receiving the document, the system validates the file type, then file size to ensure compatibility with supported formats and meets uploading limits.



If the file type or file size is invalid, the system notifies the student with the respective error message and restarts the upload process. Once both validations are successfully completed, the system uploads the document and provides confirmation of the successful upload, which is then reflected in the student's document list for future printing options.

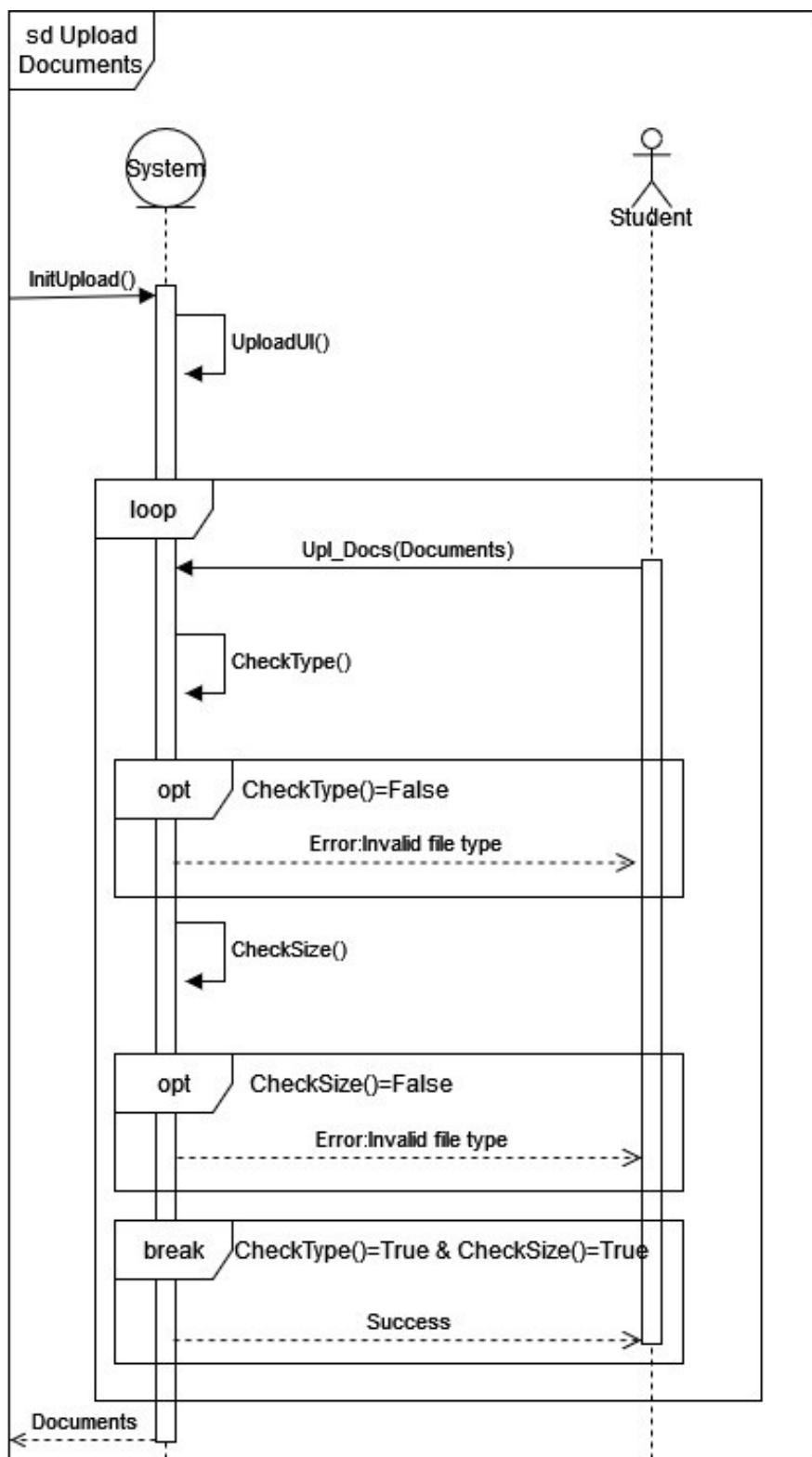


Figure 8: Upload Documents usecase

2.2. Usecase Specify Printing Properties

The "Specify Printing Properties" sequence diagram begins with the student initiating a request to input various printing parameters, such as paper size, which page to print, number of copies, whether the pages are printed on both sides, whether it's colored, and orientation. The system then checks whether these inputs are valid, if they are, the system asks the student to confirm this and saves it for printing. Should any input be invalid, the system notifies the student, prompting them to re-enter the necessary information.

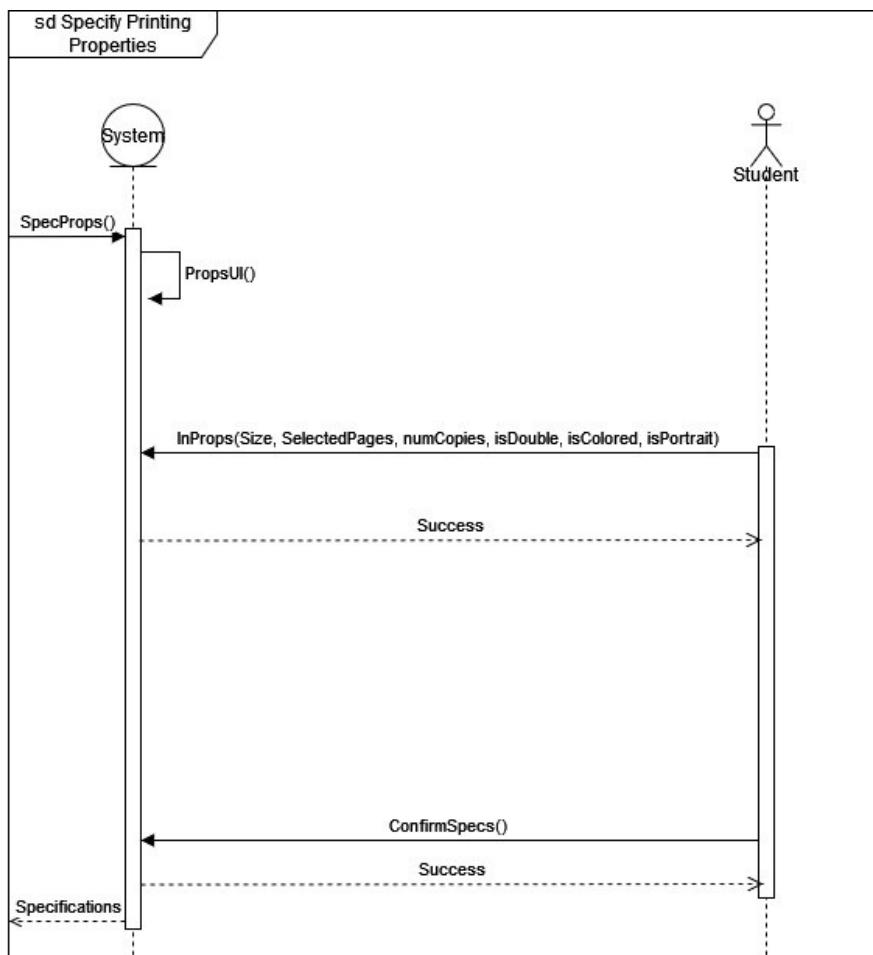


Figure 9: Specify Printing Properties usecase

2.3. Usecase Choose A Printer

The "Choose A Printer" sequence diagram begins with the student initiating the "Select Printer" option within the system interface. The system then retrieves a list of available printers and conducts a filtering process to identify suitable options. If no printers are found, a notification informs the student that no printers are available, prompting them to act accordingly. If printers are available, the system presents this list to the student, who then chooses their desired printer. Upon selection, the system again verifies the printer's availability through a function call. If the

selected printer becomes unavailable during the process, the system notifies the student that the printer is no longer accessible, thus requiring them to select a different one. If the selection is successful, a success message is displayed, and the system returns the chosen printer.

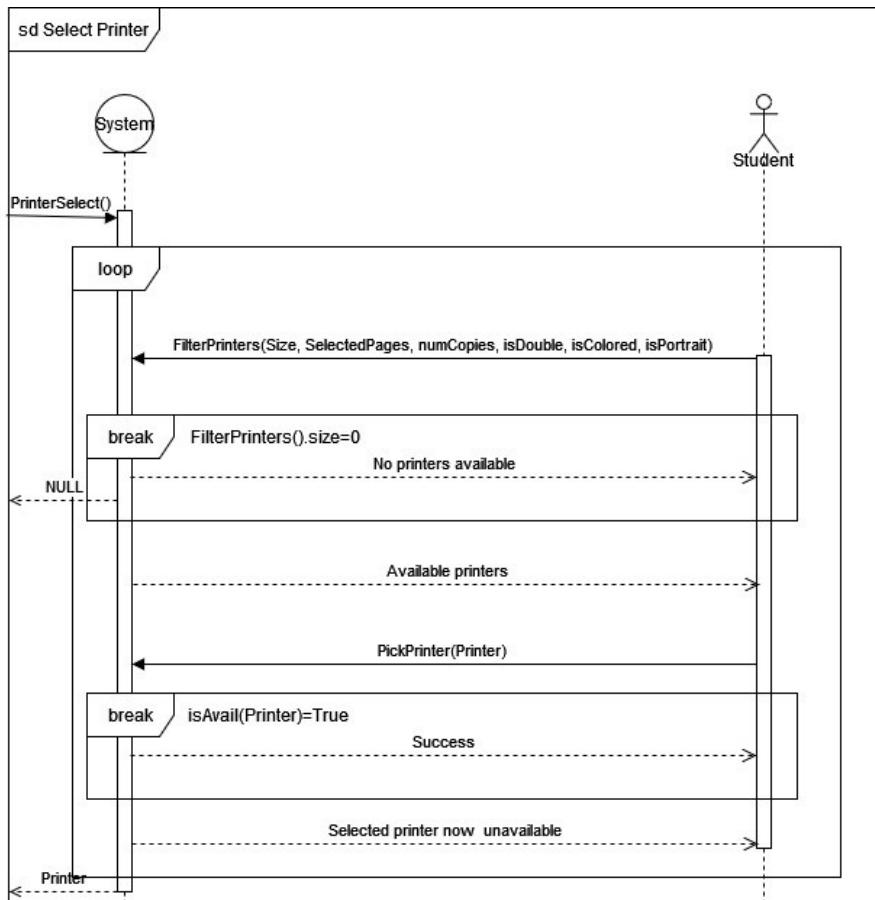


Figure 10: Choose A Printer usecase

2.4. Usecase Queue for Printing

The "Queue for Printing" sequence diagram begins with the student selecting the "Print Documents" option in the system interface. The system promptly displays the documents queued for printing and the specifications the student made previously and asks for student confirmation. If the student has insufficient balance for the print order, they have the option to purchase additional balance using a different module in the system "Buy Pages". Otherwise, the system queues the documents for printing at the user-specified printer(s), during which time, the system tracks the completion of the order. Once the order is completed, the student's balance is updated to reflect the transaction, and the system logs the print history for archiving, which can be accessed by SPSO using their dedicated modules.

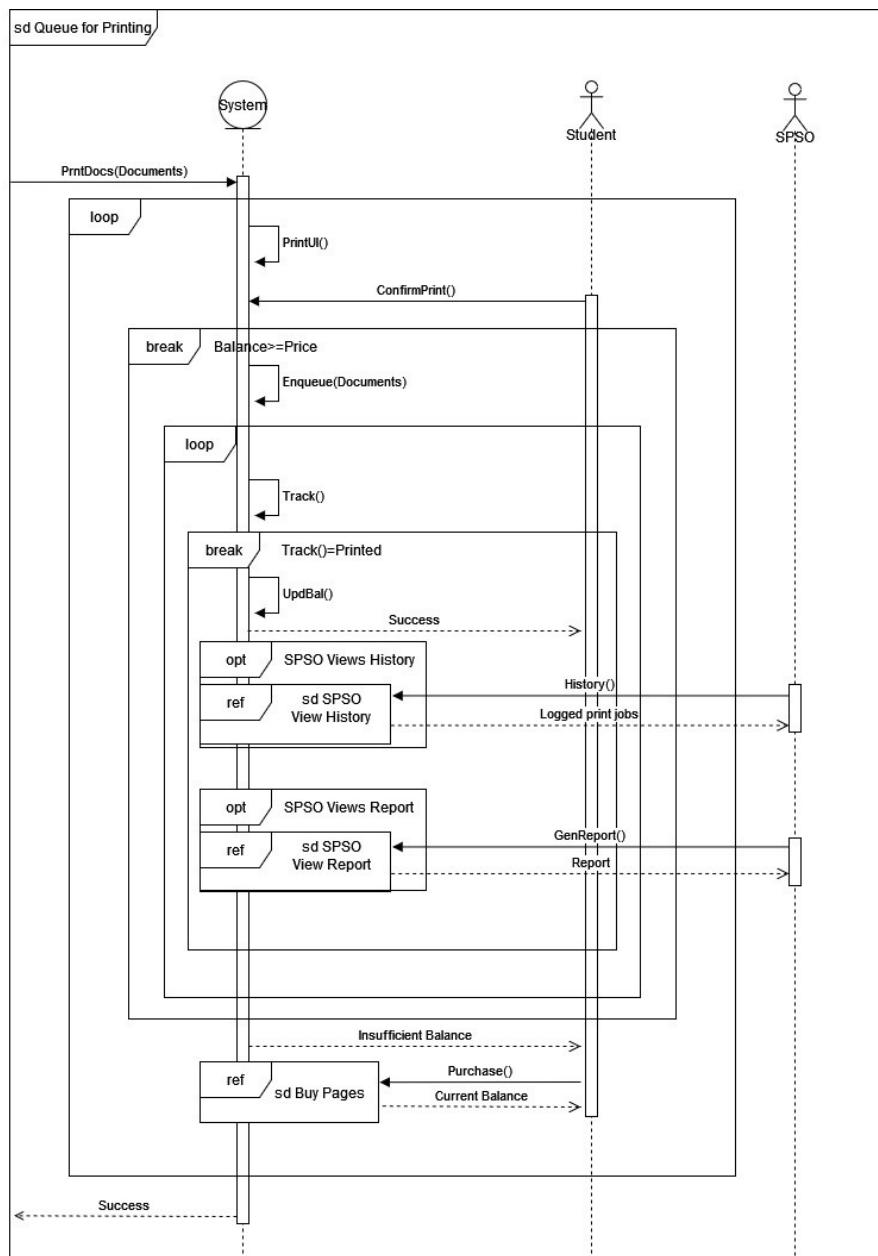


Figure 11: Queue for Printing usecase

2.5. Usecase Cancel Printing

The "Cancel Printing" sequence diagram begins with the student initiating a cancellation request through the system interface. Upon receiving this request, the system verifies the job's status to ensure it is still cancelable. If the print job has not yet begun, the system updates the status to "canceled". The system then updates the student's print history to reflect the canceled status and provides confirmation of the successful cancellation, at which point, the Student Printing



Service Officer (SPSO) can view the changes made through their dedicated modules. Should the cancellation not be feasible, the student will be notified.

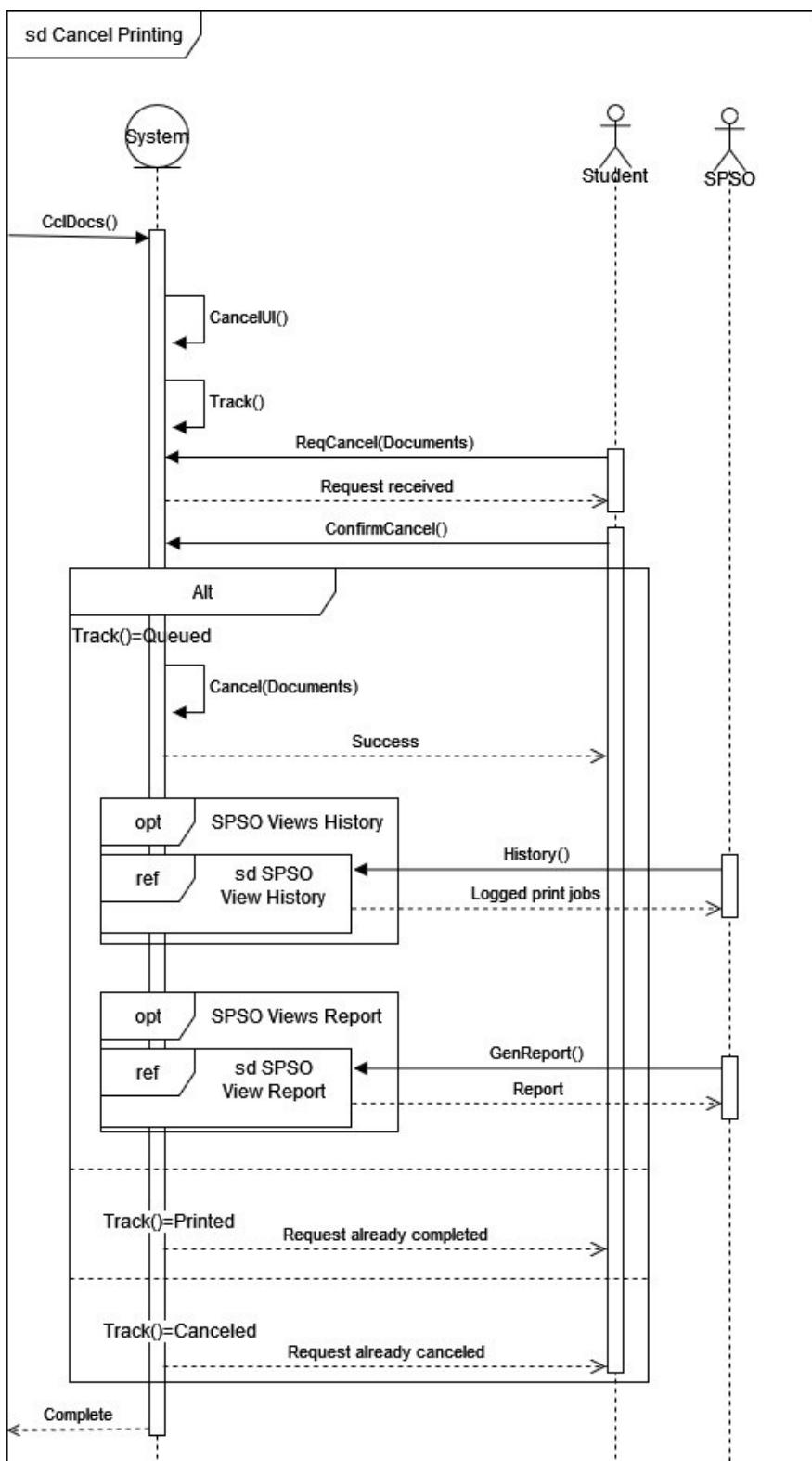


Figure 12: Cancel usecase

3. Class Diagrams

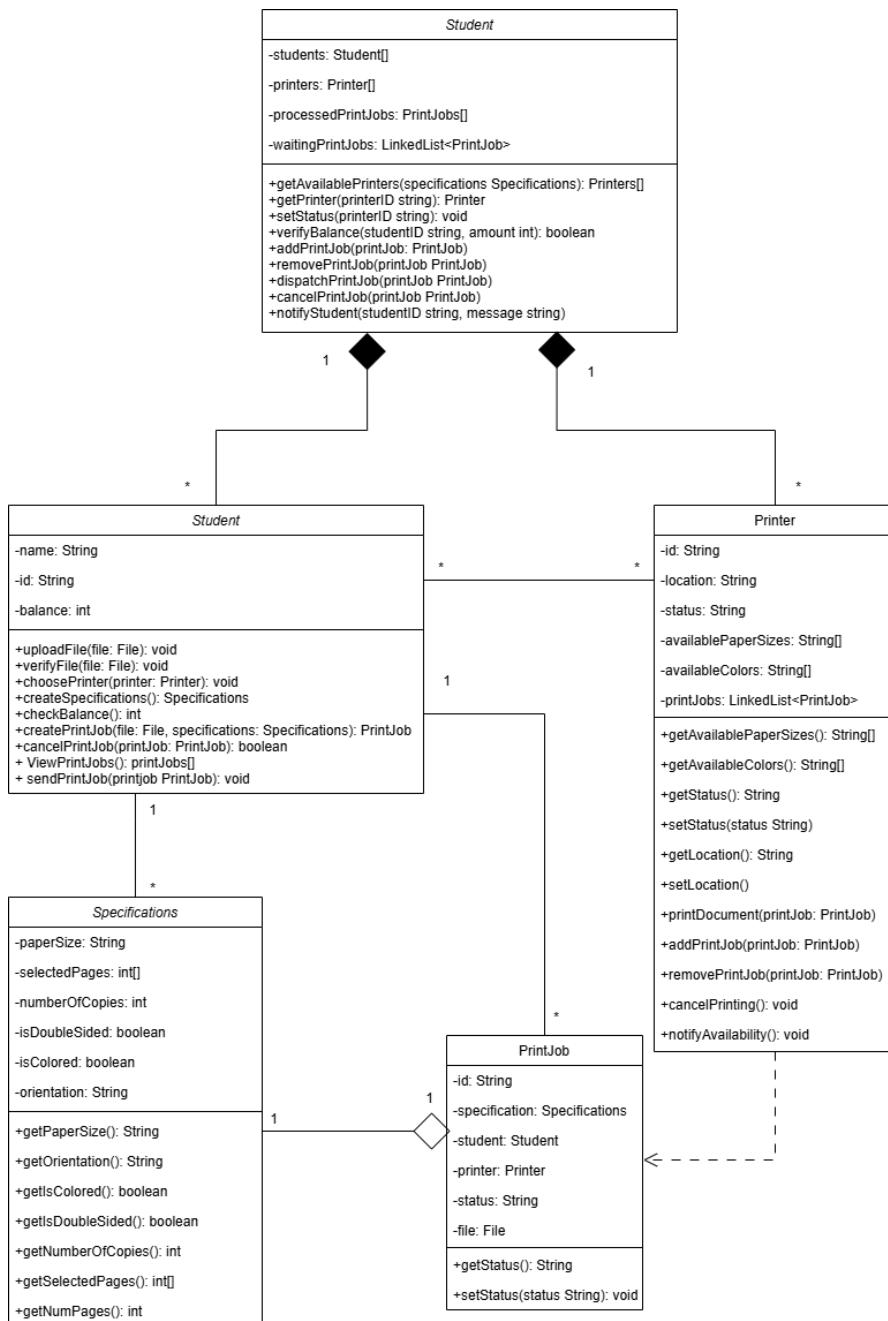


Figure 13: Class diagram of Printing module



4. MVP Development

The following Figma design focuses on simplifying the user interface while maintaining a professional appearance. The design draws inspiration from the visual style of Learning Management Systems (LMS), particularly in terms of color scheme and button positioning, establishing a connection with the overall identity of Bach Khoa University.

4.1. Homepage

The Homepage of the HCMUT-SSPS website serves as the main entry point for users. At the top, a header contains the option to "Login", which the user clicks to begin using the service



Thông báo chung

[Thông báo chi tiết về các quy định chung khi sử dụng ứng dụng in thông minh](#)

[Thông báo chi tiết về các quy định chung khi sử dụng ứng dụng in thông minh](#)

Thông tin về các quy định và hướng dẫn sử dụng ứng dụng in thông minh và máy in

Figure 14: The default homepage of HCMUT-SSPS

4.2. Choose Role page

The choose role page contains a simple UI presenting the two possible options to redirect different users to different sites for logging in either as an Administrator or a User.

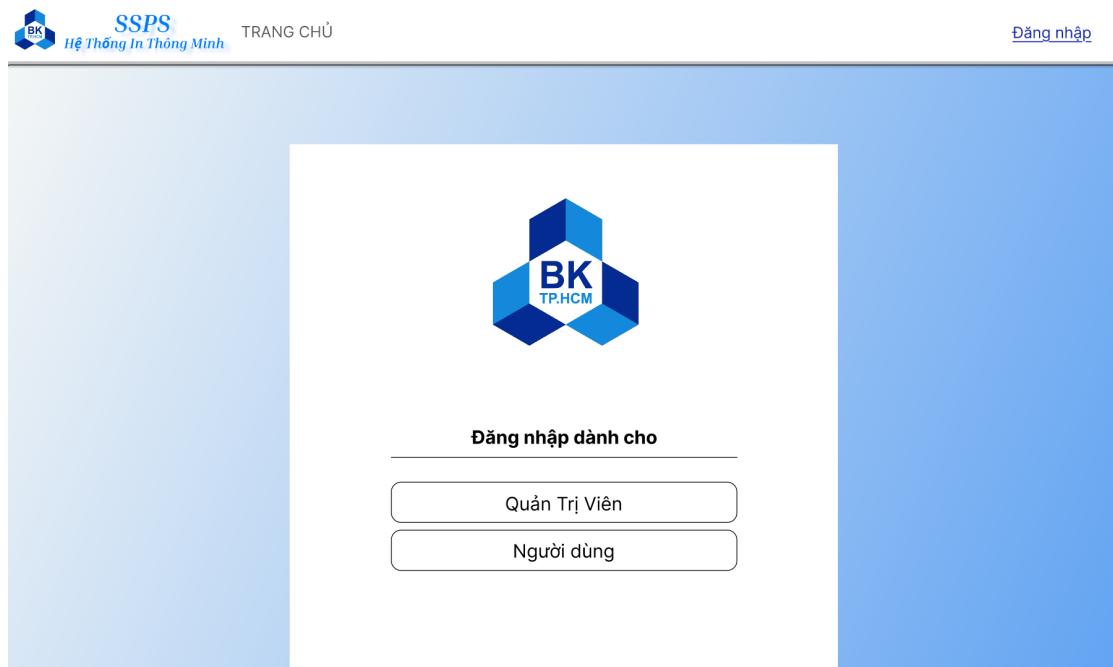


Figure 15: The Choose Role page of HCMUT-SSPS

4.3. User-login page

The user-login page features a simple and user-friendly layout, providing two main fields: one for the BKNetID and another for the password. This form allow students to securely enter their university credentials to access the printing service. A "Login" button below the forms completes the process, enabling students to authenticate and proceed to the main menu of the platform.

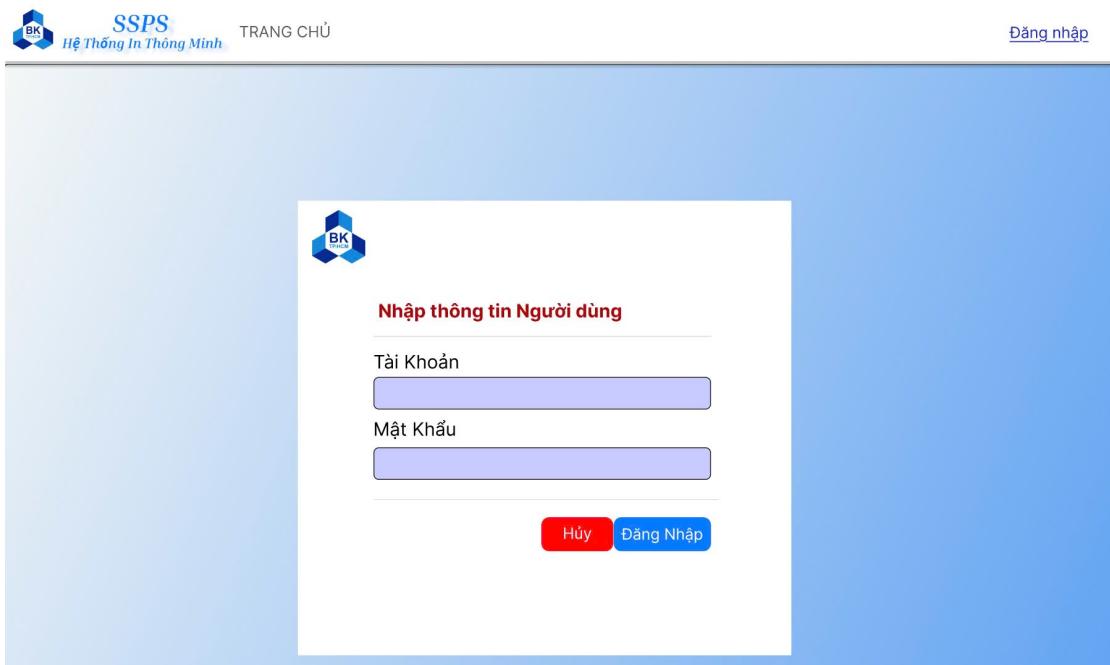


Figure 16: The User-login page of HCMUT-SSPS

4.4. User-main page

The user's main page is where the bulk of the services functions are accessed. It shares many similarities with the homepage page provides familiarity and quick navigation to options like "Print" to initiate print request, "Buy Page" for purchasing additional balance, "History" to view past print jobs, and icons with dropdown menus for notifications and profile settings.



Thông báo chung

[Thông báo chi tiết về các quy định chung khi sử dụng ứng dụng in thông minh](#)

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Thông tin về các quy định và hướng dẫn sử dụng ứng dụng in thông minh và máy in

Figure 17: The User-main page of HCMUT-SSPS

4.5. Print-Upload page

The Upload page is part of the Print process. Here, the student can input the title of the printing request for easy record tracking, and a choose file button to open a system window to select files for printing. After which, the user presses "Next" to proceed to the Customize page.



In / Tải lên

Back

Tiêu đề

File *

Choose file

[+]

Next

Figure 18: The Print-Upload page of HCMUT-SSPS

4.6. Print-Customize page

The Customize page is part of the Print process. It implements a minimalistic interface to specify printing options, which are paper size, choose pages, number of copies, orientation, whether the page is in color and whether they are printed on both sides. A preview is prominently featured on the left side of the interface, giving the student an glimpse of the finished print. The user presses "Next" to select a printer for the print job.

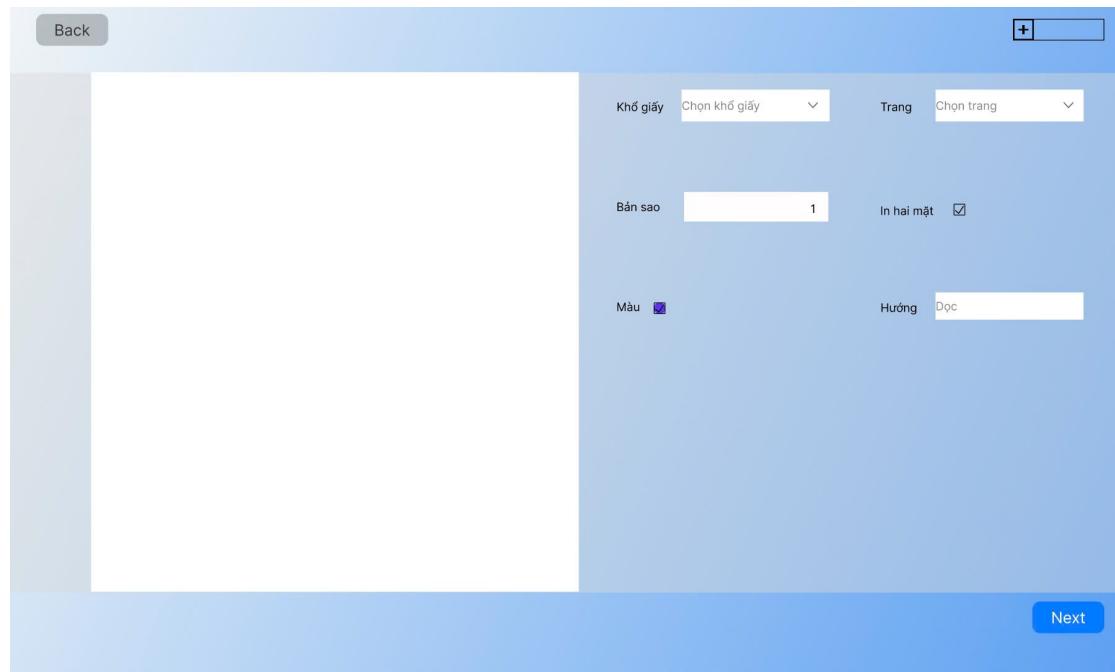


Figure 19: The Print-Customize page of HCMUT-SSPS

4.7. Print-Choose printer page

In the "Choose Printer" page, users are presented with a list of available printers, allowing them to select the one that best suits their requirements from the previous step. Each printer's details are displayed, including its ID, location, status, and type. This information aids users in making an informed decision to choose the most appropriate printer for their needs:



The screenshot shows a web-based printing interface. At the top, there are navigation links: TRANG CHỦ, IN, GIAO DỊCH, and LỊCH SỬ. On the right side, there are icons for a bell and a user profile.

The main content area is titled "In / Chọn máy in". It displays three printer options, each with a checkbox:

- Máy in:** P-A3-04
Địa điểm: tòa nhà B1, cơ sở Lý Thường Kiệt
Tình trạng: Bận
Loại: Máy in laser
- Máy in:** P-A3-05
Địa điểm: tòa nhà A4, cơ sở Lý Thường Kiệt
Tình trạng: Đang hoạt động
- Máy in:** P-A3-02
Địa điểm: tòa nhà A3, cơ sở Lý Thường Kiệt
Tình trạng: Ngưng hoạt động

A note at the bottom left states: *Chỉ được phép chọn 1 máy/lần. A "Print" button is located at the bottom right.

Figure 20: The Print-Choose printer page of HCMUT-SSPS

4.8. Print-Printing page

On this screen, users can view the complete details of their printing request, including the document name, number of copies, request title, date, printer ID, and location. By clicking the "Confirm" button, the user can initiate the print job:



In / Xác nhận lại yêu cầu

Back

Tiêu đề: Đề cuối kì môn SE Bản sao: 15

File: SoftwareEngineerFin212.pdf

Thời gian yêu cầu: 12:10:20, 1/12/2024

Mã máy in: P-A4-02

Địa điểm: Tòa nhà A4, cơ sở Lý Thường Kiệt

Confirm

Figure 21: The Print-Printing page of HCMUT-SSPS

4.9. Print-Preview page

After completing the print job, students have the option to return to the homepage or cancel the request if they notice any issues during the process:



The screenshot shows a 'Print Preview' dialog box with the following details:

Tiêu đề:	Đề cuối kì môn SE	Bản sao:	15
File:	SoftwareEngineerFin212.pdf		
Thời gian yêu cầu:	12:10:20, 1/12/2024	Thời gian xác nhận:	12:11:00, 1/12/2024
Mã máy in:	P-A4-02		
Địa điểm:	Toà nhà A4, cơ sở Lý Thường Kiệt		
Tình trạng:	Đang chờ		Cancel

At the bottom right of the dialog box is a red 'Cancel' button. Below the dialog box is a blue footer bar with a 'Trang chủ' button.

Figure 22: The Print-Preview page of HCMUT-SSPS

4.10. Admin-Login page

Additionally, admin will have another UI and rights to the system which can be access at the "Choose Role" page:



The screenshot shows the login interface for the HCMUT-SSPS system. At the top, there's a header bar with the university's logo, the text "SSPS Hệ Thống In Thông Minh", and a "TRANG CHỦ" link. On the right side of the header is a "Đăng nhập" button. The main body of the page is a white box titled "Nhập thông tin Quản trị viên". Inside this box, there are two input fields: one for "Tài Khoản" and one for "Mật Khẩu", both represented by redacted purple rectangles. At the bottom of the input area are two buttons: a red "Hủy" button and a blue "Đăng Nhập" button.

Figure 23: The Admin-Login page of HCMUT-SSPS

4.11. Admin-main page

On the main page, admin users have access to the printing history, reports submitted by coworkers or students, and detailed information about the printers.



The screenshot shows the main administrative interface of the SSPS system. At the top, there is a navigation bar with the logo 'SSPS Hệ Thống In Thông Minh', 'TRANG CHỦ' (Home), 'LỊCH SỬ' (History), 'BÁO CÁO' (Report), 'MÁY IN' (Printer), and notification icons for messages and user status.

Thông báo chung

Thông báo chi tiết về các quy định chung khi sử dụng ứng dụng in thông minh

Thông báo chi tiết về các quy định chung khi sử dụng ứng dụng in thông minh

Thông tin về các quy định và hướng dẫn sử dụng ứng dụng in thông minh và máy in

Figure 24: The Admin-main page of HCMUT-SSPS

4.12. Admin-History page

In this history page, admin can view the print history for the last 20 days and able to interrupt the on going print job:

The screenshot shows the Admin-History page with a title 'Lịch sử giao dịch hệ thống trong 20 ngày'. It displays three recent print jobs with details and a 'Hủy bỏ' (Cancel) button for each.

Mã In:	Mã máy:	Bản sao:	Tác vụ
SK1234	P-A3-04	2	Hủy bỏ
SK1235	P-A6-02	4	Hủy bỏ
SK1236	P-A12-19	1	Hủy bỏ

Figure 25: The Admin-History page of HCMUT-SSPS

Task 3: Architecture design

1. Architectural diagram

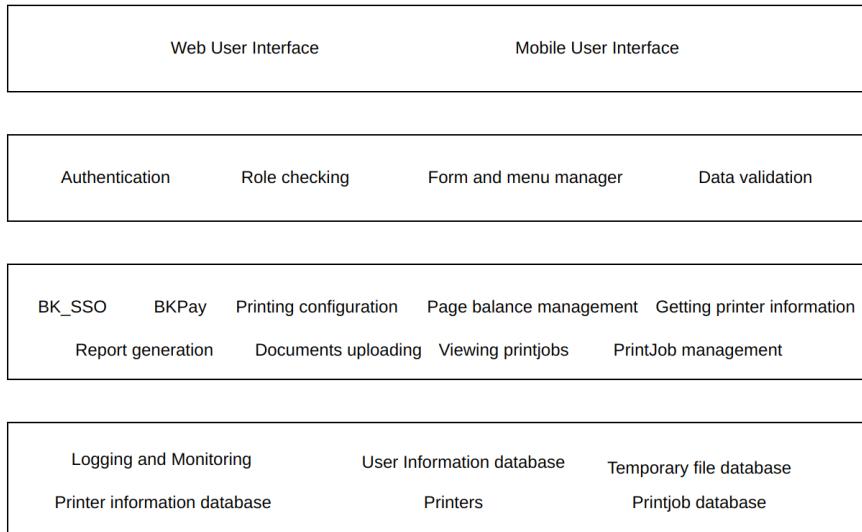


Figure 26: Architectural diagram of Printing module

- **Presentation strategy:** The User Interface is a web-based platform designed to be simple and easy to use, built with a minimalist design philosophy, it emphasizes intuitive navigation, where users can quickly locate functions like initiating print jobs or accessing their account details. The chosen method of implementation uses a modern front-end framework. The UI will have to call the backend server to do actions.
- **Data Storage Strategy:** For our data storage strategy, we will use hard-coded classes and data structures like arrays to store information and queues to store print jobs. There would be 2 queues used, a waiting queue and print jobs that are processed (like printing, finished or canceled) will be stored in an array. Reports are generated on demand and downloaded directly to the SPSO's device after being generated.
- **API strategy:** Our application interacts with external services via secure API calls, enabling smooth integration with systems like BKSSO and BKPay. For authentication, we send the username and password to the BKSSO API, receiving a session for access. Similarly, for payments, we use the BKPay API, sending check information and pricing details and awaiting confirmation before proceeding with any further processing.

2. Component diagram

The component diagram represents the Student Smart Printing Service, illustrating how students interact with the system to print documents. The Student Interface serves as the access point for uploading documents, setting print specifications, and managing requests. Uploaded files are

handled by the Documentation Management component, while the Specification Management allows customization of print settings like color and paper size. Once configured, the Print Job component queues the request, coordinating with Printer Hardware to execute the print. The Cancellation Management handles job cancellations, and the Student Balance Management ensures sufficient funds before processing. This setup enables efficient and streamlined printing for students.

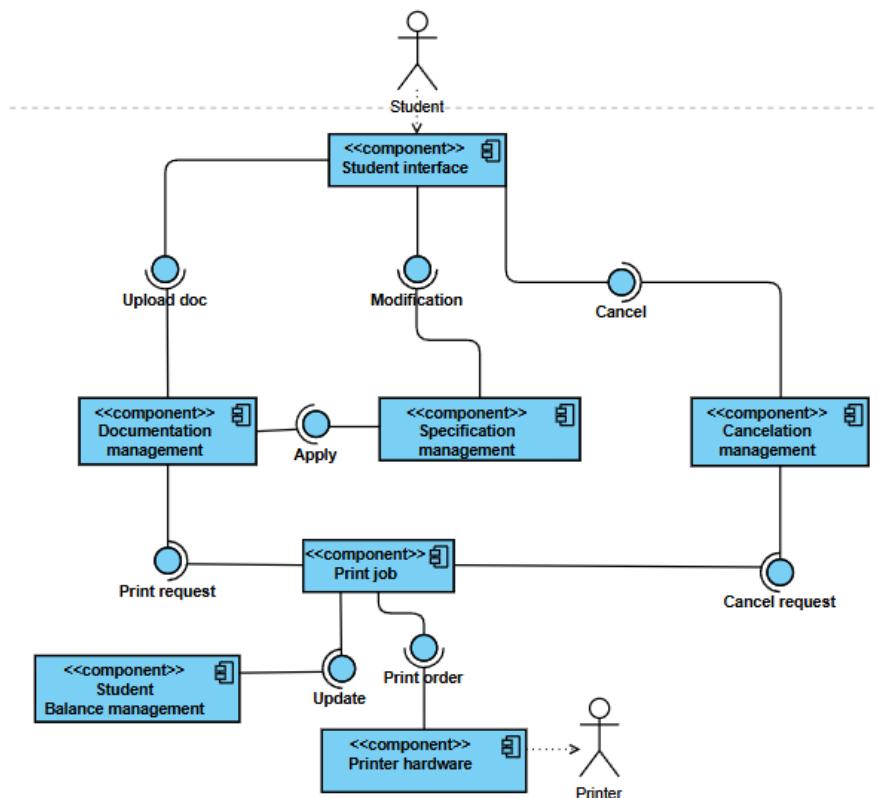


Figure 27: Component diagram of Printing module

Task 4: Implementation

4.1. Online repository

(<https://github.com/Tuong-hcmut/Software-Engineering-Gr2>)

4.2. Usability Test

4.2.1 Introduction

The Student Smart Printing System is designed to provide a seamless and efficient way for students to manage their printing needs on campus. With features such as document upload, print job specifying, print job tracking, and print job cancellation, the system aims to simplify the



process of accessing and utilizing campus printing resources. As with any new system, it is essential to ensure that it is user-friendly and that students can navigate the platform with ease to complete tasks such as submitting print jobs, adjusting print settings, and managing their accounts.

This usability test was conducted to assess the overall user experience of the Student Smart Printing System website. The primary goal was to identify any usability issues that may hinder students' ability to complete tasks efficiently and effectively. The testing focused on several key user actions, including document uploading, selecting print preferences, tracking print jobs, cancellation, logging in and out. Through a series of carefully designed tasks, the test sought to evaluate how intuitive and easy-to-use the system is for typical users, and to gather feedback on potential improvements. The findings from this report provide valuable insights into the strengths and weaknesses of the website, along with recommendations for optimizing the user experience.

Khảo sát chất lượng thử nghiệm Hệ Thống In Thông Minh cho sinh viên

leanhkhoi2004@gmail.com [Chuyển đổi tài khoản](#)

Không được chia sẻ

* [Biểu thị câu hỏi bắt buộc](#)

Giới thiệu

Nhằm đảm bảo chất lượng và phát triển lượng Hệ Thống In Thông Minh cho sinh viên (SSPS), nhóm 2 gửi đến bạn một số câu hỏi khảo sát tập trung vào đánh giá sự hài lòng của bạn trong suốt quá trình trải nghiệm hệ thống.

Figure 28: Usability Testing



4.2.2 Participants and Tasks

The usability test involved a total of 11 participants, who were selected to represent the target users of the Student Smart Printing System. The participants were primarily students from HCMUT, aged between 18 and 20. They were chosen based on their familiarity with basic web-based systems and general experience with printing services. The participants had varying levels of experience with online printing systems, with some having used similar services before, while others were completely new to such platforms.

Participants were asked to perform a series of typical actions, including:

- Logging in and out
- Uploading a document for printing.
- Selecting print preferences
- Choosing printer
- Tracking the status of print job
- Submitting the print job
- Canceling the print job
- Checking validation cases

4.2.3 Post-test Questions

After completing the usability tasks, participants were asked a series of post-test questions to gather their feedback on the overall user experience. These questions aimed to identify areas for improvement, assess the participants' satisfaction, and uncover any specific pain points encountered during the test. The questions were designed to complement the usability metrics and provide qualitative insights into the participants' experience with the system.

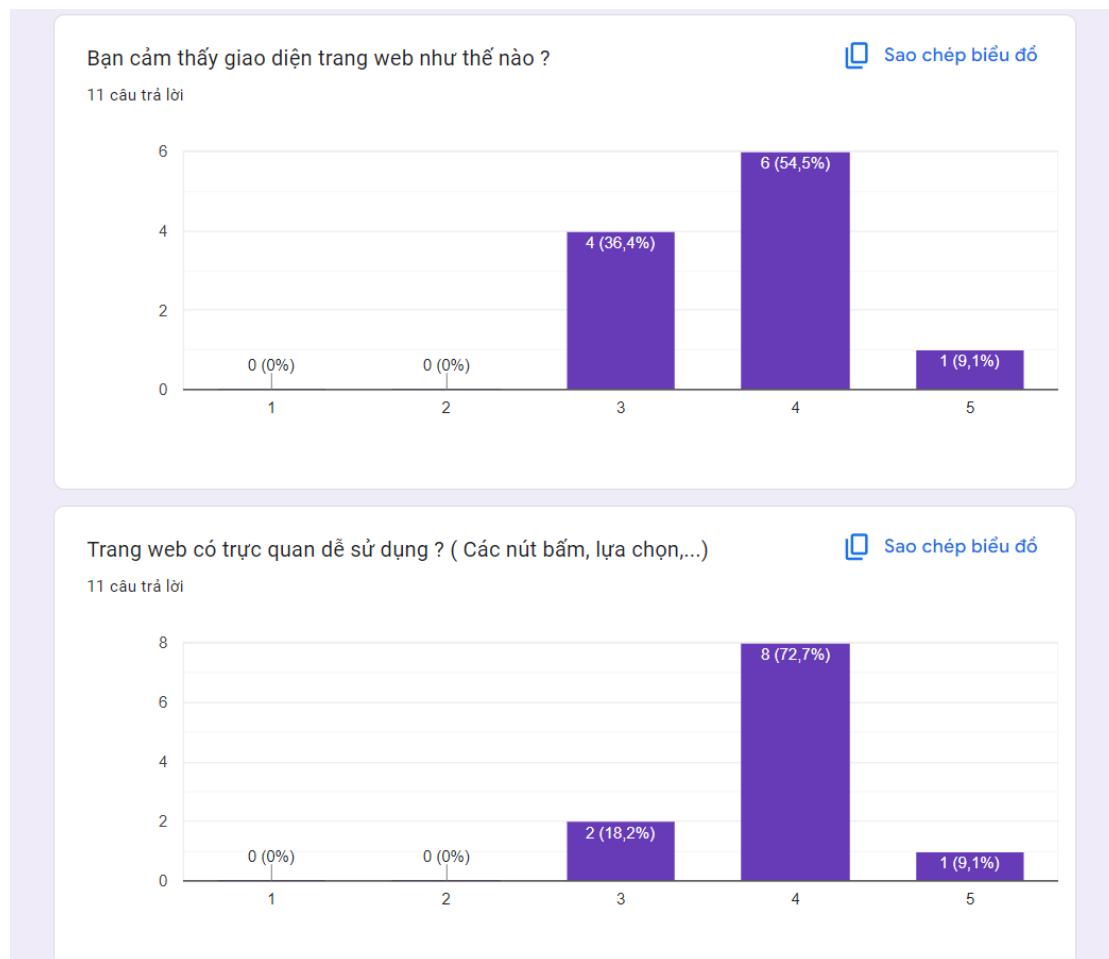
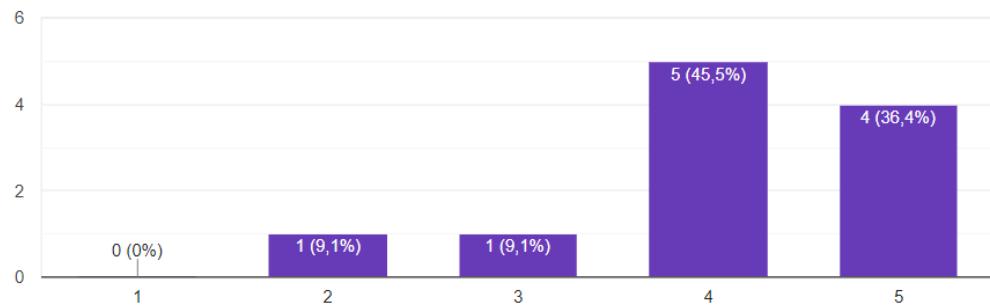


Figure 29: Questions for the interface

Bạn có tìm thấy các tính năng mong muốn dễ dàng ?

Sao chép biểu đồ

11 câu trả lời



Các mô tả có giúp bạn dễ hiểu các tính năng ?

Sao chép biểu đồ

11 câu trả lời

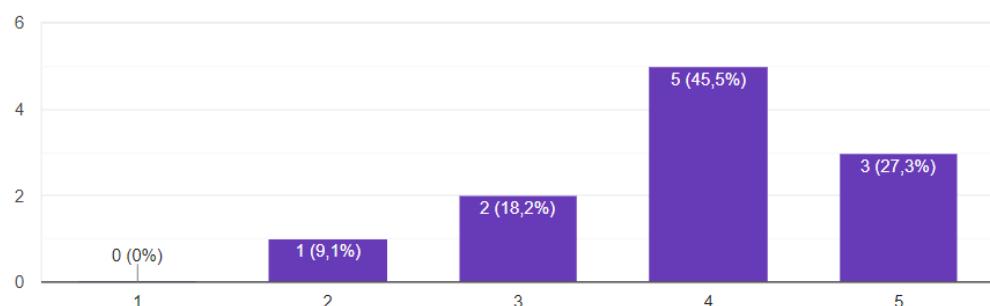


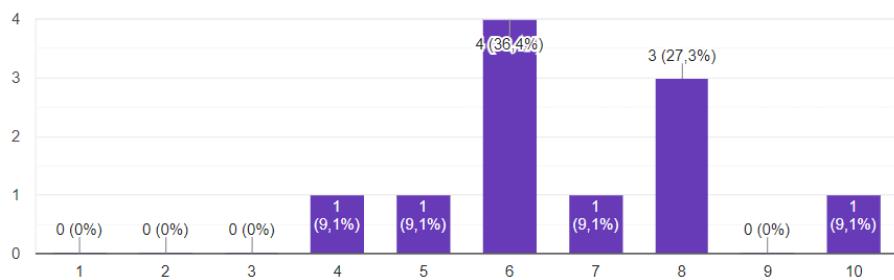
Figure 30: Questions for the functions

Đánh giá tổng quan hệ thống

Bạn đánh giá tổng quan về giao diện hệ thống như thế nào ?

 Sao chép biểu đồ

11 câu trả lời



Bạn đánh giá tổng quan về độ thân thiện người dùng ?

 Sao chép biểu đồ

11 câu trả lời

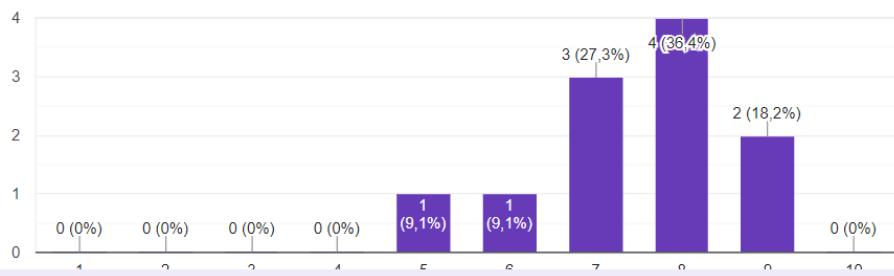


Figure 31: Overview Questions



4.2.4 Summary

Overall, the core functions of the system, including account creation, document upload, print job submission, and print tracking, were generally well-received by participants. The process for uploading documents and adjusting print preferences was intuitive for most users, with a high success rate in completing these tasks. The print queue and job tracking features also worked as expected, allowing users to monitor the status of their print jobs without major issues. While the system is functional, the interface is just around 6/10 and requires significant improvements to enhance the user experience.

In conclusion, the Student Smart Printing System performs well in terms of functionality but falls short in its interface design. While the system's core functions are solid, the interface needs a major overhaul to improve its visual appeal, user-friendliness, and overall accessibility.