

VIETNAM NATIONAL UNIVERSITY HO CHI MINH CITY  
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY  
FACULTY OF APPLIED SCIENCE



---

# **Software Requirements Specification for Smart Printing Service for students at HCMUT**

---

**Version 1.0 approved**

**Prepared by:**

- 1. LÊ QUỐC BẢO – 2252065**
- 2. LƯU BẢO LONG – 2252442**
- 3. LƯU MINH TÚ – 2252880**
- 4. MAI HOÀNG PHÚC – 2252635**
- 5. MAI NAM PHƯƠNG – 2252656**

**Department of Software Engineering  
Faculty of Computer Science and Engineering  
Ho Chi Minh City University of Technology – VNU-HCM**

**16/9/2024**

## **Table of Contents**

<b>1. Task 1: Requirement elicitation (1.1, 1.2)</b>	<b>3</b>
1.1 Domain Context	3
1.2 Stakeholders and Needs	3
1.3 Benefits of the System	4
1.4 Functional Requirements	5
1.5 Non- Functional Requirements	6
<b>2. Use-case Diagrams (1.3)</b>	<b>7</b>
2.1 Use-case Diagram for the Whole System	7
2.2 Use-case Diagram for Printing Service Module	8
2.3 The Details of Use-cases in Printing Service Module	9

## **Revision History**

<b>Name</b>	<b>Date</b>	<b>Reason For Changes</b>	<b>Version</b>

## **1. Task 1: Requirement elicitation (1.1, 1.2)**

### **1.1 Domain Context**

The Student Smart Printing Service (HCMUT\_SSPPS) at Ho Chi Minh City University of Technology (HCMUT) is designed to offer a convenient, efficient, and controlled document printing solution for students across its campuses. The system is integrated with a network of printers located throughout the university, with each printer uniquely identified by ID, brand, model, a brief description, and precise location (campus, building, and room). Students can easily print their documents by uploading files to the system, selecting a printer, and customizing printing options such as paper size, page range, single- or double-sided printing, and number of copies. The permitted file types are regulated by the Student Printing Service Officer (SPSO). To ensure accountability, the system logs all printing actions, including details such as student ID, printer ID, and file name, printing times, and page counts. Both students and the SPSO can view printing logs and reports for specific time periods, with a summary of pages printed by size. Each semester, students receive a default quota of A4 pages, and additional pages can be purchased through the system using the university's BKPay online payment system. The system enforces that students cannot print more than their available balance, with A3 pages counting as two A4 pages. The SPSO has administrative control over printer management, including the ability to add, enable, or disable printers, as well as configure default page quotas, allowable file types, and system settings. Monthly and annual reports on printing usage are automatically generated and stored for administrative review. All users are authenticated through the HCMUT Single Sign-On (SSO) system, and the service is accessible through both a web-based and mobile app, ensuring ease of use and accessibility for students and staff alike.

### **1.2 Stakeholders and Needs**

**1. Students:** As the primary users, students are central to the Student Smart Printing Service (HCMUT\_SSPPS). Their needs include a user-friendly interface that allows them to efficiently print documents through both a mobile app and web platform. Key features they rely on include the ability to locate active printers across campus, view detailed information such as printer ID, location, and availability, and customize print settings such as paper size, number of copies, and single- or double-sided printing. Additionally, students need seamless access to payment services that enable them to purchase additional printing pages when they exceed the default quota provided by the university each semester. A system that supports convenient payment integration, like BKPay, is crucial for this purpose.

**2. Student Printing Service Officers (SPSO):** SPSOs play a critical role in managing the printing system and ensuring smooth operations for students. They require robust administrative tools to regulate and control the service, including the ability to determine which file types are allowed for printing and configure system-wide settings, such as default printing quotas. Monitoring student printing activities is essential, as SPSOs need access to logs that track the usage history of individual students, printers, and overall system performance. Additionally, the system must generate automated periodic reports, providing insight into usage trends and allowing for performance reviews. SPSOs also need tools to manage printers directly, including the ability to add new printers to the network, enable or disable specific printers, and oversee maintenance requirements.

**3. Computer and Technology Center:** This department is responsible for the technical infrastructure and maintenance of the HCMUT\_SSPPS system. Their primary concerns are ensuring the system's reliability, security, and accessibility for all users. The Computer and Technology Center is tasked with regular system

updates, resolving any technical issues, and addressing any system failures or disruptions that may occur. They also work closely with the other stakeholders to ensure system compatibility with existing IT infrastructure, such as the HCMUT Single Sign-On (SSO) for authentication and integration with online payment platforms.

**4. Financial and Accounting Department:** This department is involved in managing the financial aspects of the printing service, particularly the online payment system that allows students to purchase additional printing pages beyond their free quota. The Financial and Accounting Department ensures the smooth functioning of the payment gateway (e.g., BKPay), verifying that all transactions are properly processed and recorded. They are also responsible for handling financial data input and reporting, ensuring that students are charged accurately for their additional printing needs. Additionally, they oversee the reconciliation of payments and manage any financial discrepancies that arise.

**5. Equipment and Facilities Management Office:** This office is responsible for the procurement, installation, and maintenance of the printers used across campus. They collaborate closely with printer manufacturers and vendors to ensure that the printers are functioning optimally. Their role includes performing regular maintenance, troubleshooting hardware-related issues, and replacing faulty equipment when necessary. They also ensure that all printers are compatible with the HCMUT\_SSPPS system and meet the required specifications for student use. This office plays a vital role in ensuring that the physical infrastructure of the printing system operates smoothly, complementing the software components managed by other stakeholders.

### **1.3 Benefits of the System**

The Student Smart Printing Service (HCMUT\_SSPPS) project brings significant advantages to both students and the broader university community. For students, the system enhances convenience by providing easy access to printers via a web platform or mobile application, allowing them to print documents quickly without hassle. They can tailor their printing preferences, such as selecting paper size, single- or double-sided printing, and other customizable options, enabling a more personalized and efficient printing experience. Additionally, the system provides a detailed overview of their printing history, helping students keep track of their usage, make informed decisions, and manage their printing budget effectively, with semester-specific page allocations set by the university.

From the perspective of the Student Printing Service Officers (SPSOs), the system simplifies the management of the entire printing environment. It allows them to monitor student activities, adjust system settings in line with university policies, and generate comprehensive logs and reports for more effective decision-making. Moreover, SPSOs can oversee financial transactions related to the purchase of additional printing pages, ensuring proper financial management and transparency.

In terms of the HCMUT\_SSO authentication service, the system integrates seamlessly as a third-party application, utilizing the university's login capabilities for student account management. It simplifies the authentication process for students, offering a user-friendly interface that eliminates the need for complex command-line logins, while providing an accessible environment for secure access.

Regarding the online payment system, it acts as a bridge between students' bank accounts and the university, streamlining the process of purchasing additional printing pages. This removes the need for students to visit physical payment offices, offering a more convenient, time-saving alternative. Similar to the authentication service, the system helps format payment data properly and provides an intuitive interface for completing financial transactions efficiently.

## **1.4 Functional Requirements**

Based on the provided project description, we can infer the following functional and non-functional requirements for the Student Smart Printing Service (HCMUT\_SSPS):

### **Stakeholder 1: Students**

1. The system shall allow students to upload document files of permitted types for printing.
2. The system shall enable students to select a printer from a list of available printers around the campus.
3. The system shall allow students to specify printing properties, including paper size, number of pages, single- or double-sided printing, and number of copies.
4. The system shall prevent students from exceeding their allocated printing page balance, unless additional pages are purchased.
5. The system shall provide students with access to their personal printing history, including the number of printed pages per page size and printing logs for a specified time period.

### **Stakeholder 2: Student Printing Service Officers (SPSOs)**

1. The system shall allow SPSOs to manage printers by adding, enabling, disabling, or removing printers.
2. The system shall enable SPSOs to configure file types that are permitted for printing.
3. The system shall provide SPSOs access to view the printing history logs of all students or specific students for a given time period.
4. The system shall generate and store monthly and yearly reports on printing usage, which can be accessed by SPSOs at any time.
5. The system shall allow SPSOs to configure default page allocations for each student per semester and manage additional page purchases.

### **Stakeholder 3: Computer and Technology Center (CTC)**

1. The system must allow the CTC to add, configure, enable, or disable printers in the network, ensuring that printers are correctly identified by ID, brand, model, and location for efficient management.
2. The CTC must be able to define and modify default printing quotas for students each semester, and control the types of files that are permitted for upload to maintain system efficiency and prevent compatibility issues.
3. The system must seamlessly integrate with the HCMUT Single Sign-On (SSO) system to ensure secure and centralized authentication for all users, including students, staff, and administrators.
4. The system must generate monthly and annual reports on printing usage, logging all activities and providing summaries by printer, file type, page size, and user for administrative review and auditing purposes.
5. The CTC must manage the integration with the BKPay online payment system, ensuring that students can purchase additional printing credits and enforcing the rule that students cannot exceed their available balance during print jobs.

### **Stakeholder 4: Financial and Accounting Department**

1. The system shall allow students to make payments for additional printing pages via the university's online payment system (e.g., BKPay).
2. The system shall track and log all transactions related to page purchases made by students.
3. The system shall generate financial reports summarizing payments and printing-related transactions for the department.
4. The system shall prevent students from purchasing more printing pages than their account balance allows.
5. The system shall integrate with the university's financial systems to securely transfer funds from student accounts to the university's account.

#### **Stakeholder 5: Equipment and Facilities Management Office**

1. The system shall allow the facilities office to monitor the operational status of each printer, including errors and maintenance needs.
2. The system shall provide notifications for printer malfunctions or low supplies (e.g., ink, paper) to the maintenance team.
3. The system shall log all maintenance activities performed on each printer, including repair and supply refills.
4. The system shall allow the facilities office to update printer descriptions and specifications when new equipment is installed.
5. The system shall track printer usage statistics to assist in decision-making about printer replacement or relocation.

### **1.5 Non- Functional Requirements**

#### **1. Performance**

- The system shall process print job requests and display print status updates within 3 seconds to ensure a responsive user experience.
- The system shall be capable of handling up to 1,000 concurrent print requests without degradation in performance.

#### **2. Scalability**

- The system shall support the addition of up to 200 new printers with minimal changes to the existing architecture.
- The system shall accommodate an increase in the number of users to 15,000 students, maintaining performance levels within acceptable limits.

#### **3. Maintainability**

- The system shall provide comprehensive documentation, including user manuals and technical guides, to support maintenance and troubleshooting activities.
- The system shall employ modular design principles to facilitate straightforward updates and enhancements, minimizing disruptions to ongoing operations.

#### **4. Data Integrity**

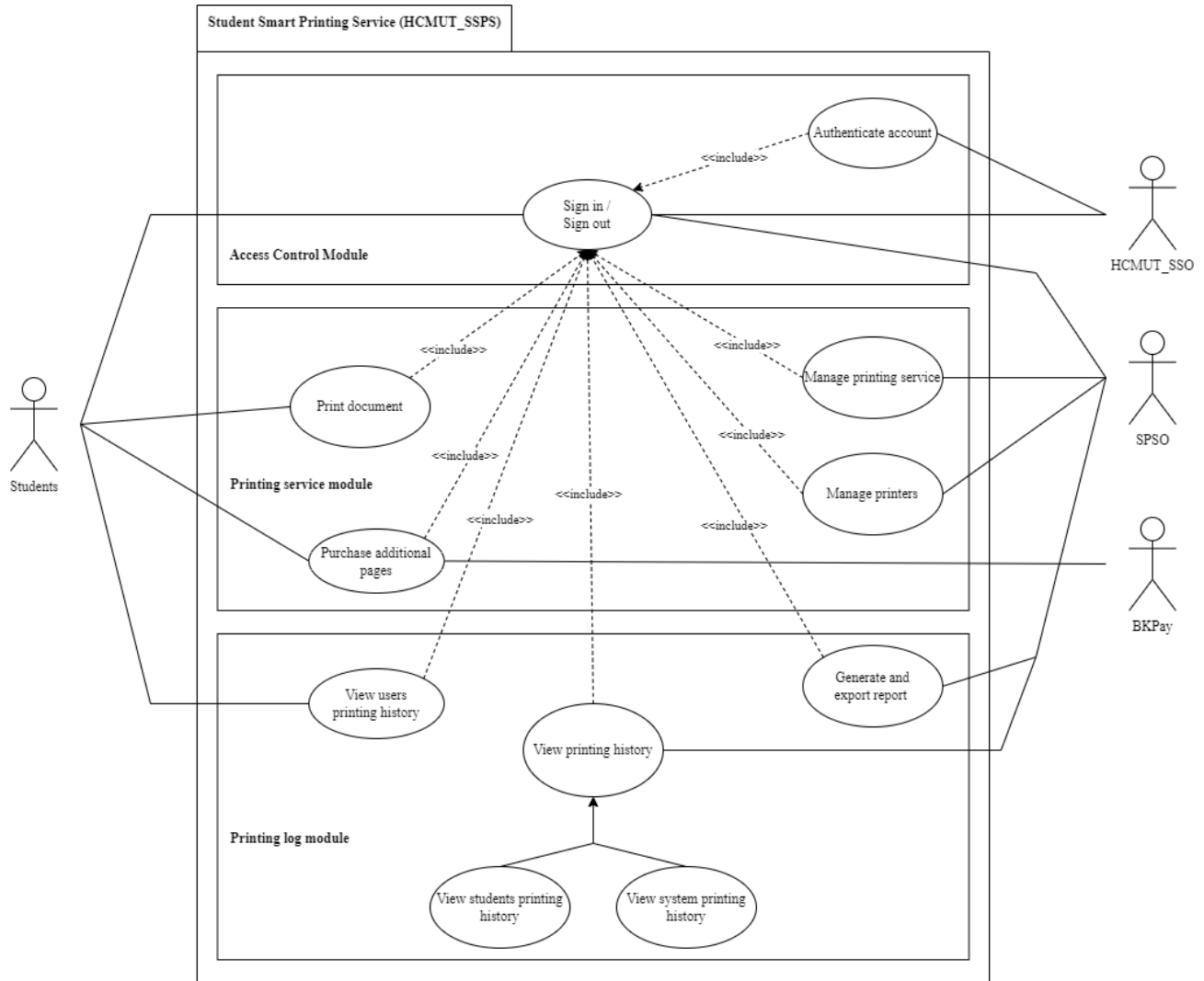
- The system shall enforce validation rules for all input data, including print job details and payment information, to prevent errors and ensure data accuracy.
- The system shall implement automatic data consistency checks and reconciliation processes to detect and correct discrepancies or anomalies in the data.

#### **5. Accessibility**

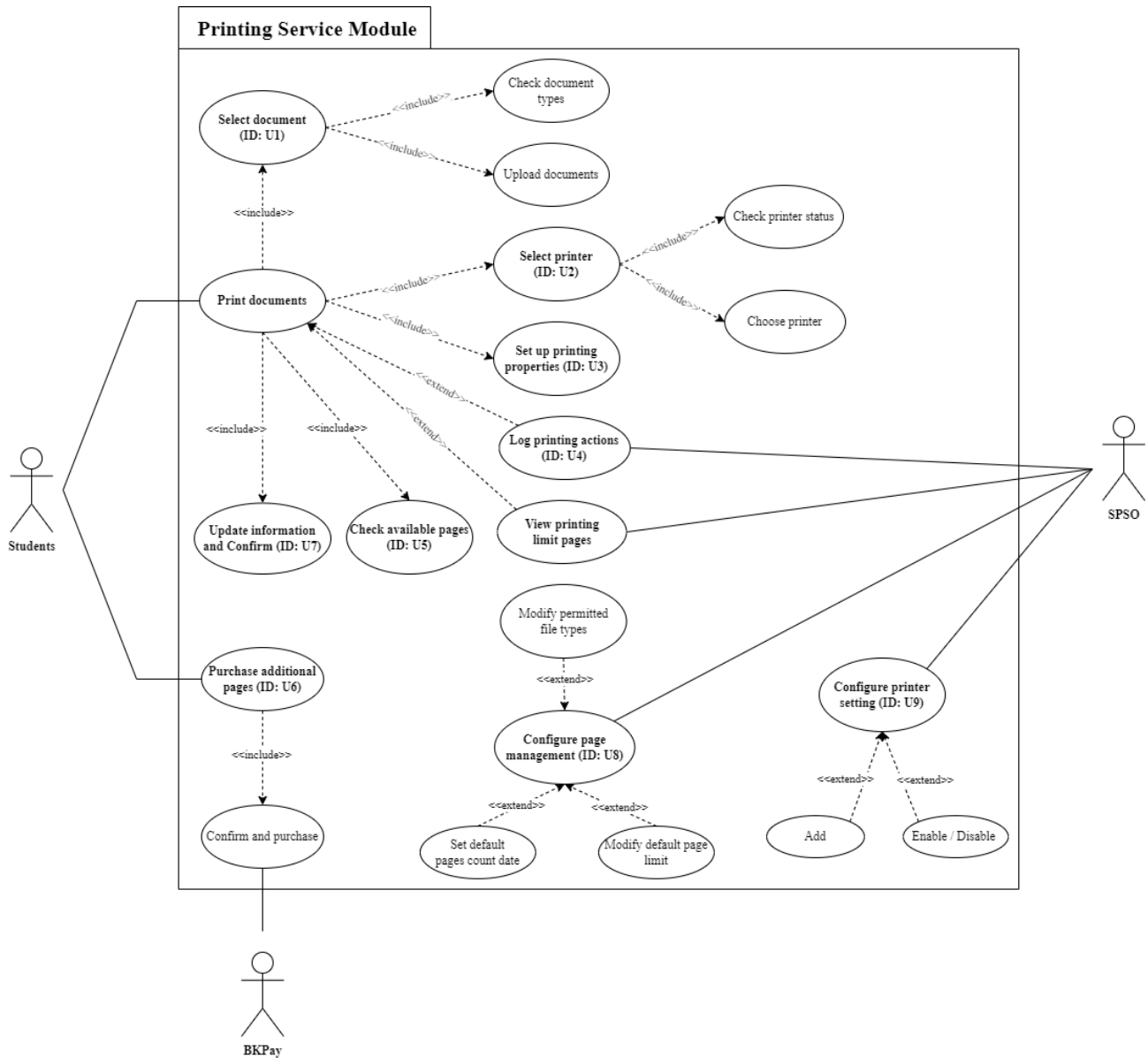
- The system shall support localization and internationalization features to cater to users from different regions and language preferences.
- The system shall be designed to operate effectively across varying network conditions, ensuring that users with limited bandwidth can still access essential features and complete tasks.

## 2. Use-case Diagrams (1.3)

### 2.1 Use-case Diagram for the Whole System



## 2.2 Use-case Diagram for Printing Service Module





## 2.3 The Details of Use-cases in Printing Service Module

### 1. Use-case Select Document

Use-case ID Use-case Name	U1 Select Document
Use-case overview	Students are enabled to upload a document file for printing through the HCMUT_SSPPS system.
Actors	Students
Trigger	The student clicks on the “Select document” option in the navigation bar.
Pre-conditions	<ul style="list-style-type: none"><li>- The students have logged into the HCMUT_SSPPS system</li><li>- The student possesses the required permissions to upload documents.</li><li>- The system and database are functional.</li><li>- Internet connectivity is available.</li></ul>
Post-conditions	The document files have been uploaded successfully.
Normal flow	<ol style="list-style-type: none"><li>1. The student clicks on the “Upload file” option in the user interface.</li><li>2. The system displays a file upload interface, which allows the student to search, select, and approve the desired document file from their local device.</li><li>3. The system starts the upload process, showing the progress to the student.</li><li>4. Upon completion of the upload, the system provides confirmation of a successful upload.</li></ol>
Alternative flow	None.
Exception flow	In case of an unexpected system error (such as loss of connection) during the upload process: The system shows an error message to the student, explaining the problem. The student has the option to attempt the upload again.

## 2. Use-case Select Printer

Use-case ID Use-case Name	U2 Printer Selection
Use-case overview	This use case enables a student to pick a printer from the available options within the HCMUT_SSPS system.
Actors	Student
Trigger	The student selects the “Select printer” option in the user interface.
Pre-conditions	<ul style="list-style-type: none"><li>- The student is logged into the HCMUT_SSPS system.</li><li>- The student has uploaded a document file for printing.</li><li>- The system and database are operational.</li><li>- Internet access is available.</li></ul>
Post-conditions	The student has successfully chosen a printer for their printing request.
Normal flow	<ol style="list-style-type: none"><li>1. After the student uploads a document file, the system provides a printer selection interface.</li><li>2. The system shows a list of available printers, including their ID and location.</li><li>3. The student examines the printer options and picks a preferred printer for their printing task.</li><li>4. The system acknowledges the printer choice and informs the student that the selection has been successfully made.</li></ol>
Alternative flow	In the event that no printers are available: The system presents a message to the student stating that there are no printers currently available for printing. The student is recommended to try again later or reach out to the Student Printing Service Officer (SPSO) for help.
Exception flow	In case of an unexpected system error (such as loss of connection) during the printer selection process: The system shows an error message to the student, detailing the problem. The student has the option to attempt the process again.

### 3. Use-case Set up Printing Properties

Use-case ID Use-case Name	U3 Printing Properties Selection
Use-case overview	This use case permits a student to choose printing settings for their document within the HCMUT_SSPS system.
Actors	Student
Trigger	The student selects the “Select print settings” option in the user interface.
Pre-conditions	<ul style="list-style-type: none"><li>- The student is authenticated and logged into the HCMUT_SSPS system.</li><li>- The student has chosen a printer for their print job.</li><li>- The system and database are operational.</li><li>- Internet access is available.</li></ul>
Post-conditions	The student has successfully chosen the desired print settings for their document.
Normal flow	<ol style="list-style-type: none"><li>1. After selecting a printer for the print job, the system provides the student with options to adjust print settings.</li><li>2. The system presents the available print setting options, including:<ul style="list-style-type: none"><li>- Paper size (such as A4, A3, letter, etc.)</li><li>- Number of pages (of the file) to be printed.</li><li>- Single-sided or double-sided printing.</li><li>- Number of copies to be printed.</li></ul></li><li>3. The student selects from the available print setting options.</li><li>4. The system acknowledges the chosen print settings.</li></ol>
Alternative flow	None
Exception flow	In case of an unexpected system error (such as loss of connection) during the print settings selection process: The system presents an error message to the student, detailing the problem. The student is then given the opportunity to retry the process.

#### 4. Use-case Log Printing actions

Use-case ID Use-case Name	U4 Log Printing Actions
Use-case overview	This use case enables the Student Printing Service Officer (SPSO) to maintain a structured database of printing requests within the HCMUT_SSPPS system.
Actors	SPSO
Trigger	Students confirm their printing requests.
Pre-conditions	<ul style="list-style-type: none"><li>- The student is logged into the HCMUT_SSPPS system.</li><li>- The student has finalized and confirmed their print settings.</li><li>- The system and database are operational.</li><li>- Internet access is available.</li><li>- The chosen printer is operational.</li></ul>
Post-conditions	The printing action is completed, and the SPSO has detailed records of the printing request, including student ID, printer ID, file name, printing start and end times, and number of pages per size.
Normal flow	<ol style="list-style-type: none"><li>1. After the student confirms the print settings, the information is sent to the designated printer.</li><li>2. The printer completes the printing task, recording the time taken.</li><li>3. The system gathers action data from both the student and the printer.</li><li>4. The system consolidates this information and updates the database.</li></ol>
Alternative flow	None
Exception flow	If the printer encounters issues such as printing errors or timing log discrepancies, the data integration may be compromised, requiring the SPSO to manually verify and upload the correct data into the system.

## 5. Use-case Check Available pages

<b>Use-case ID</b> <b>Use-case Name</b>	<b>U5</b> <b>Check available pages</b>
<b>Use-case overview</b>	This use case allows a student to check the number of available pages for printing in their account within the HCMUT_SSPPS system.
<b>Actors</b>	Student
<b>Trigger</b>	Student chooses the “Check Available Pages” in the user interface.
<b>Pre-conditions</b>	<ul style="list-style-type: none"><li>- The student has logged into the HCMUT_SSPPS system.</li><li>- The student has selected printing properties.</li><li>- The system and database are available.</li><li>- The internet is available.</li></ul>
<b>Post-conditions</b>	The student is presented with the number of available pages for printing in their account.
<b>Normal flow</b>	<ol style="list-style-type: none"><li>1. The student selects the "Check Available Pages" option in the user interface.</li><li>2. The system retrieves the student's account information and displays the current number of available pages for printing.</li><li>3. The system presents the available page information to the student, specifying the number of A4-size pages remaining for the current semester.</li></ol>
<b>Alternative flow</b>	None
<b>Exception flow</b>	If there is an unexpected system error (connection lost) during the checking available pages process: The system displays an error message to the student, indicating the issue. The student can retry the process.

## 6. Use-case Purchase Additional pages

Use-case ID Use-case Name	U6 Purchase Additional Pages
Use-case overview	Students can buy extra print pages for use within the HCMUT_SSPS system when their demand is insufficient.
Actors	Student, BKPay
Trigger	The student selects the “Purchase Additional Pages” option in the user interface.
Pre-conditions	<ul style="list-style-type: none"><li>- The student is logged into the HCMUT_SSPS system.</li><li>- The student has reviewed their available print credits and determined a need for more.</li><li>- The system and database are operational.</li><li>- Internet connectivity is ensured.</li></ul>
Post-conditions	The student successfully purchases additional print credits, and the new balance is updated in their account.
Normal flow	<ol style="list-style-type: none"><li>1. The student clicks on the “Purchase Additional Pages” option in the user interface.</li><li>2. The student selects the desired print pages package from the system display screen.</li><li>3. The selection is added to the Cart. By clicking on the “Cart” icon, the student navigates to the Cart UI.</li><li>4. After reviewing the order in the Cart, students confirm the purchase by clicking on the Purchase button, which initiates the payment process through an integrated payment gateway.</li><li>5. Students are redirected to the BKPay interface to complete the payment.</li><li>6. Upon successful payment verification, the system updates the student’s account with the newly purchased print credits.</li><li>7. The system confirms the successful transaction to the student, displaying the updated credit balance.</li></ol>
Alternative flow	If the student opts not to proceed with the purchase, the student can cancel the transaction at any point before final confirmation, and the system will revert to the previous state without any changes.
Exception flow	If there is a failure in processing or verifying the payment, the system presents an error message to the student, detailing the problem. Students can attempt the process again.

## 7. Use-case Update Information and Confirm

Use-case ID Use-case Name	U7 Update information and confirm
Use-case overview	This use case enables a student to print a document file using the HCMUT_SSPS system.
Actors	Students
Trigger	The student selects the "Print" option in the user interface.
Pre-conditions	<ul style="list-style-type: none"><li>- The student is logged into the HCMUT_SSPS system.</li><li>- The student has configured the printing settings and has sufficient pages available for printing.</li><li>- The system and database are operational.</li><li>- A stable internet connection is available.</li></ul>
Post-conditions	The document is printed successfully on the chosen printer.
Normal flow	<ol style="list-style-type: none"><li>1. The student confirms the printing request.</li><li>2. The system processes the request by verifying the configuration, sending the document file to the selected printer, and initiating the printing job.</li><li>3. The system deducts the corresponding number of pages from the student's account balance.</li><li>4. The system logs the printing activity, recording details such as student ID, printer ID, file name, printing start time, and the number of pages for each page size.</li><li>5. The system informs the student that the print job has been successfully submitted and is in progress.</li><li>6. The printer receives the print request, processes the document file, and prints the document according to the specified settings.</li><li>7. The printed document is placed in the printer's output tray.</li><li>8. The student retrieves the printed document from the output tray.</li></ol>
Alternative flow	If the configuration is invalid, a message will be displayed, prompting the user to adjust their settings to meet the system's requirements.
Exception flow	If a technical error occurs during the printing process, the system will display an error message to the student, explaining the issue. The student will have the option to retry the printing process.

## 8. Use-case Configure Page Management

Use-case ID Use-case Name	U8 Configure page management
Use-case overview	This use case enables the SPSO to configure the page management settings within the HCMUT_SSPS system.
Actors	SPSO
Trigger	The SPSO accesses the page management settings from the Settings menu.
Pre-conditions	<ul style="list-style-type: none"><li>- The SPSO is logged into the HCMUT_SSPS system.</li><li>- The system and database are operational.</li><li>- A stable internet connection is available.</li></ul>
Post-conditions	The page management settings are successfully configured and updated within the system.
Normal flow	<ol style="list-style-type: none"><li>1. The SPSO selects the "Configure Page Management" option in the user interface.</li><li>2. The system displays the current page management settings, including options to change the default number of pages, the dates for distributing the default number of pages to all students, the accepted file types, and other relevant configurations.</li><li>3. If the SPSO wishes to update any settings, the system provides editable fields or options next to each relevant attribute.</li><li>4. The system confirms the updated page management settings.</li><li>5. The system applies the updated page management settings to all relevant processes and functionalities within the HCMUT_SSPS system.</li></ol>
Alternative flow	If the SPSO chooses not to make any changes, they can exit the page management configuration section without saving any updates, and the system will keep the current page management settings intact.
Exception flow	If an unexpected system error occurs (such as a lost connection) during the configuration process, the system will display an error message to the SPSO, detailing the issue. The SPSO will then have the option to retry the configuration process.



**a. Use-case Configure Printer Setting**

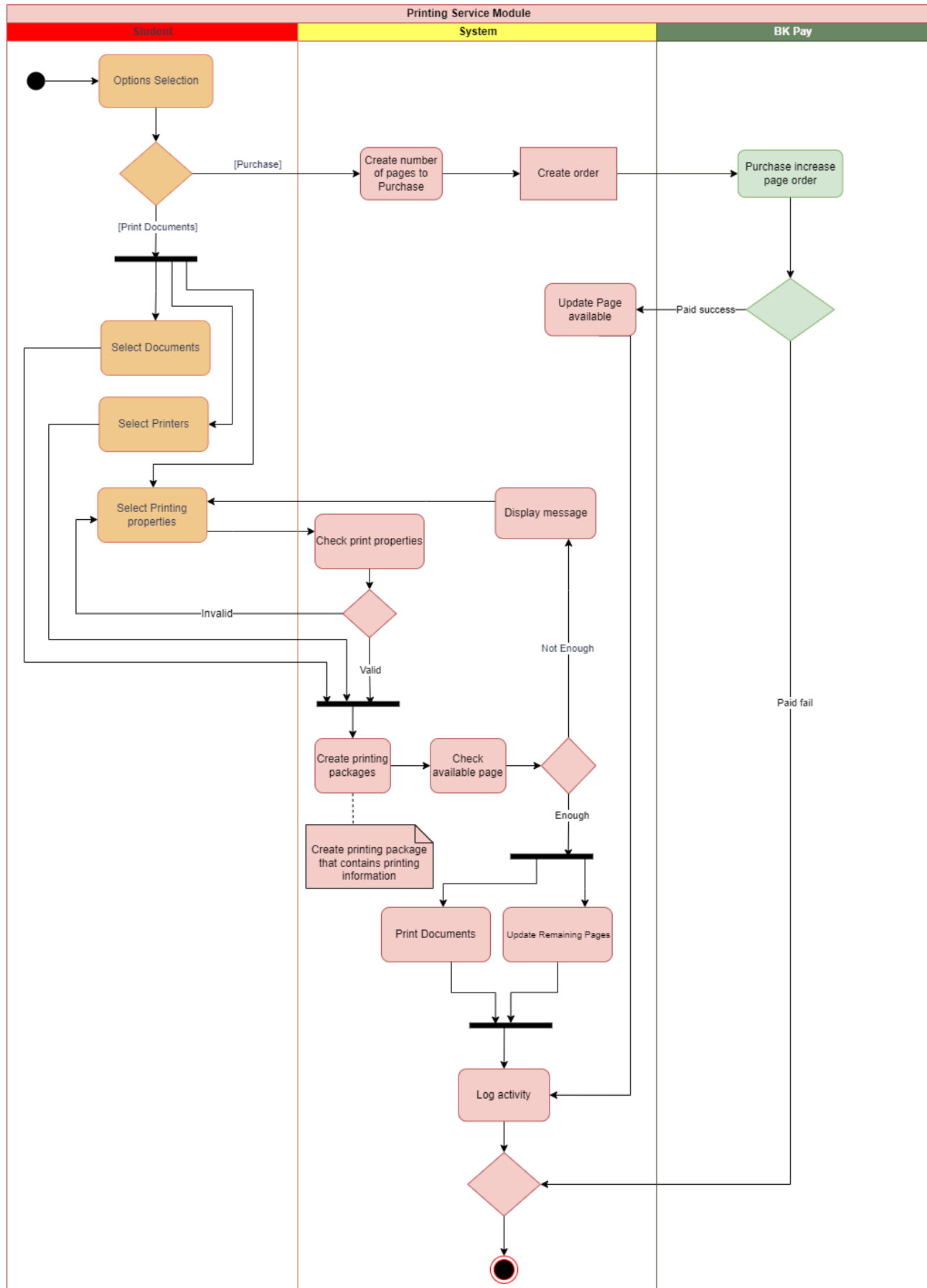
<b>Use-case ID</b> <b>Use-case Name</b>	<b>U9</b> <b>Configure Printer Setting</b>
<b>Use-case overview</b>	This use case enables the SPSO to configure the printer settings within the HCMUT_SSPPS system.
<b>Actors</b>	SPSO
<b>Trigger</b>	The SPSO selects the “Configure Printer Settings” option in the user interface.
<b>Pre-conditions</b>	<ul style="list-style-type: none"><li>- The SPSO is logged into the HCMUT_SSPPS system.</li><li>- The system and database are operational.</li><li>- Internet connectivity is available.</li></ul>
<b>Post-conditions</b>	The printer settings are successfully configured and updated in the system.
<b>Normal flow</b>	<ol style="list-style-type: none"><li>1. The SPSO selects the “Configure Printer Settings” option in the user interface.</li><li>2. The system displays the current printer settings, including a list of available printers and other relevant configurations.</li><li>3. The SPSO makes the necessary changes to the printer settings, such as adding, enabling, or disabling printers.</li><li>4. The system confirms the updated printer settings.</li><li>5. The system applies the updated printer settings to all relevant processes and functionalities within the HCMUT_SSPPS system.</li></ol>
<b>Alternative flow</b>	<ul style="list-style-type: none"><li>- If the SPSO chooses not to make any changes, they can exit the printer settings configuration section without saving any updates, and the system will keep the current printer settings.</li><li>- The SPSO can enable or disable all printers by selecting the “Enable All Printers” or “Disable All Printers” button.</li></ul>
<b>Exception flow</b>	If an unexpected system error occurs (such as a lost connection) during the configuration process, the system will display an error message to the SPSO, detailing the issue. The SPSO will then have the option to retry the configuration process.

## **3. System Modeling**

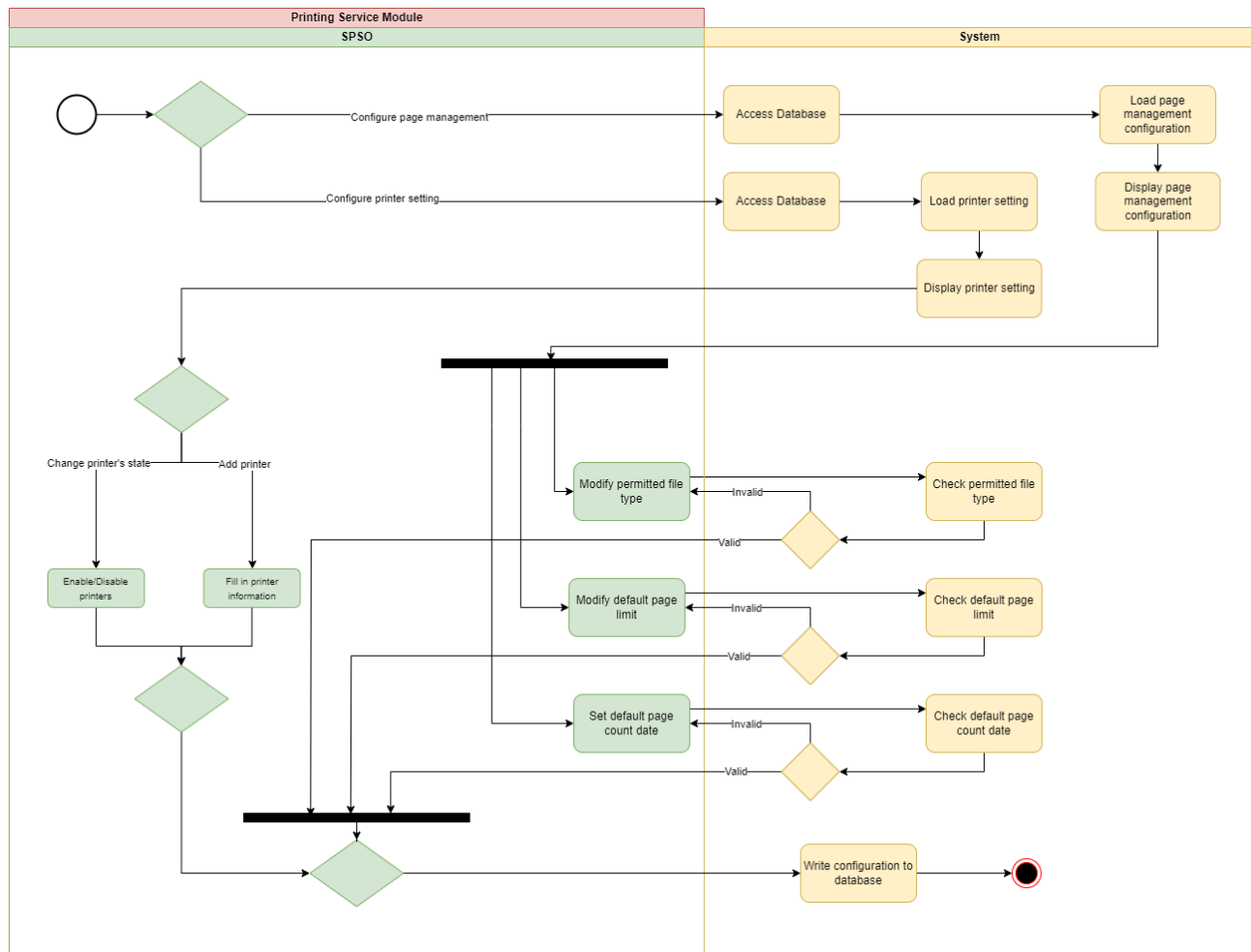
### **3.1 Activity Diagram**

#### **3.1.1 Diagram**

- **Printing service module**



## - SPSO



### 3.1.2 Description

#### 3.1.2.1 Printing service module diagram

- The diagram indicates the interaction between the student and the printing service module.
- Key elements: 3 swimlanes are provided in this case, including:
  - + Student: Initiating actions, such as choosing options (print documents or purchasing additional pages), and configuring print settings.
  - + Printing Service Module (System): Manages the print operations, verifies print settings, checks page availability, and handles printing and logging activities.
  - + BKPay: Handles purchase progress whenever a student sends a purchase request for additional pages.
- Activity flow:
  - + Initial choice:
    - The flow begins with an option from the student: either purchasing additional pages or create a printing request.

- If the student decides to purchase, the flow redirects to the purchasing page, where after finishing the order creation process, a request will be sent to BKPay.
- + Page purchasing:
  - Here, students can adjust the amount of pages they want to buy for additional printing. After confirming their order, a request will be generated and sent to BKPay, then proceed the purchasing process on BKPay website.
- + Printing request generating: As student chooses to print a document, they proceed to:
  - Select document: select a valid file, whose extension is acceptable, to print.
  - Select printer: select a printer where it is compatible with students to receive.
  - Configure print settings: change the printing settings to be compatible with system settings and student's needs.
- + Printing request validation:
  - The **Printing Service Module** checks the validity of print settings (printing properties, pages used for printing).
  - If the print settings is invalid, highlight the invalid settings and do nothing. If the setting is valid, but the remaining pages are insufficient to print, return and prompt the student to buy additional pages.
- + Print and log:
  - After the validation is checked, a print request is sent to corresponding printer, and update the remaining page parallelly. After finishing all the required processes, log the activity.
  - The process concludes with a finish state.

### **3.1.2.2SPSO diagram**

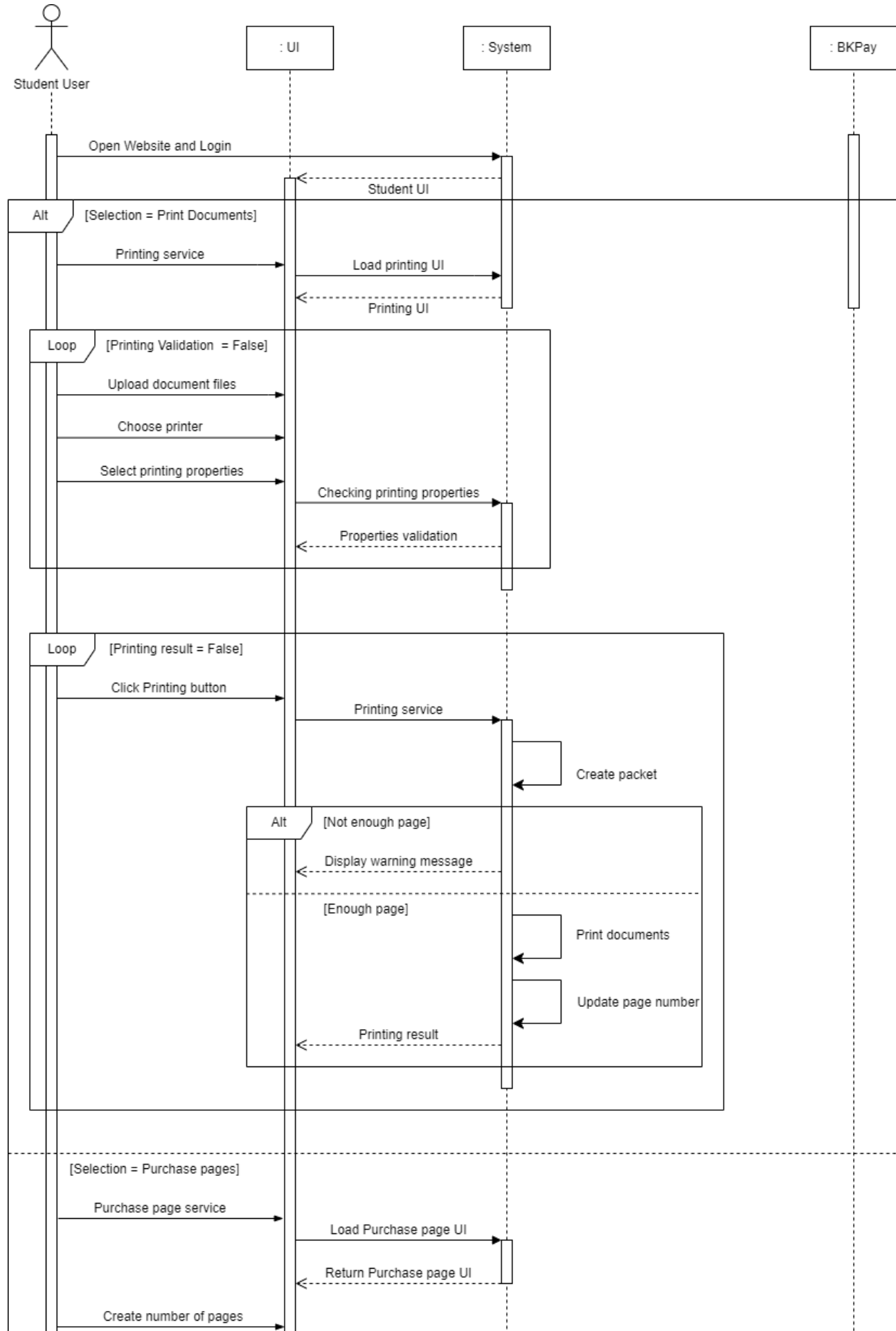
- The diagram indicates the printer configuration workflow within the Printing Service Module. Only 2 swimlanes of the diagram included: SPSO and system.
- Workflow:
  - + Initial choice: as SPSO logs in, the SPSO has the options to choose whether to configure the printer setting or configure the page setting. Both choices require the system to access the database to retrieve needed information, then load them and show available ones in a menu for SPSO to modify.
  - + Configure page management: 3 main settings can be modified:
    - Permitted file type: the system checks whether the type of the selected file is valid, if invalid, it returns error, otherwise continues.
    - Default page limit: system check if number of pages is valid before applying changes.

- Default page count date: checks if the effective date is valid; if invalid, returns error, otherwise continues.
- + Configure printer setting:
  - If SPSO decides to add an available printer, “Add Printer” task is performed, then filling the information of the corresponding printer is required before adding it into the list.
  - In “Printer list”, SPSO can enable/disable printers whenever necessary. If there is no printer available for printing, the printing service is temporarily unavailable.
- + Validation check: for every change, validation check is performed to ensure that new value is correct. Invalid change is marked and returns error to SPSO.
- + Writing configuration into database: once all configurations are validated, the system writes updated value into database. The workflow ends successfully if all changes are valid and stored.

## **3.2 Sequence Diagram**

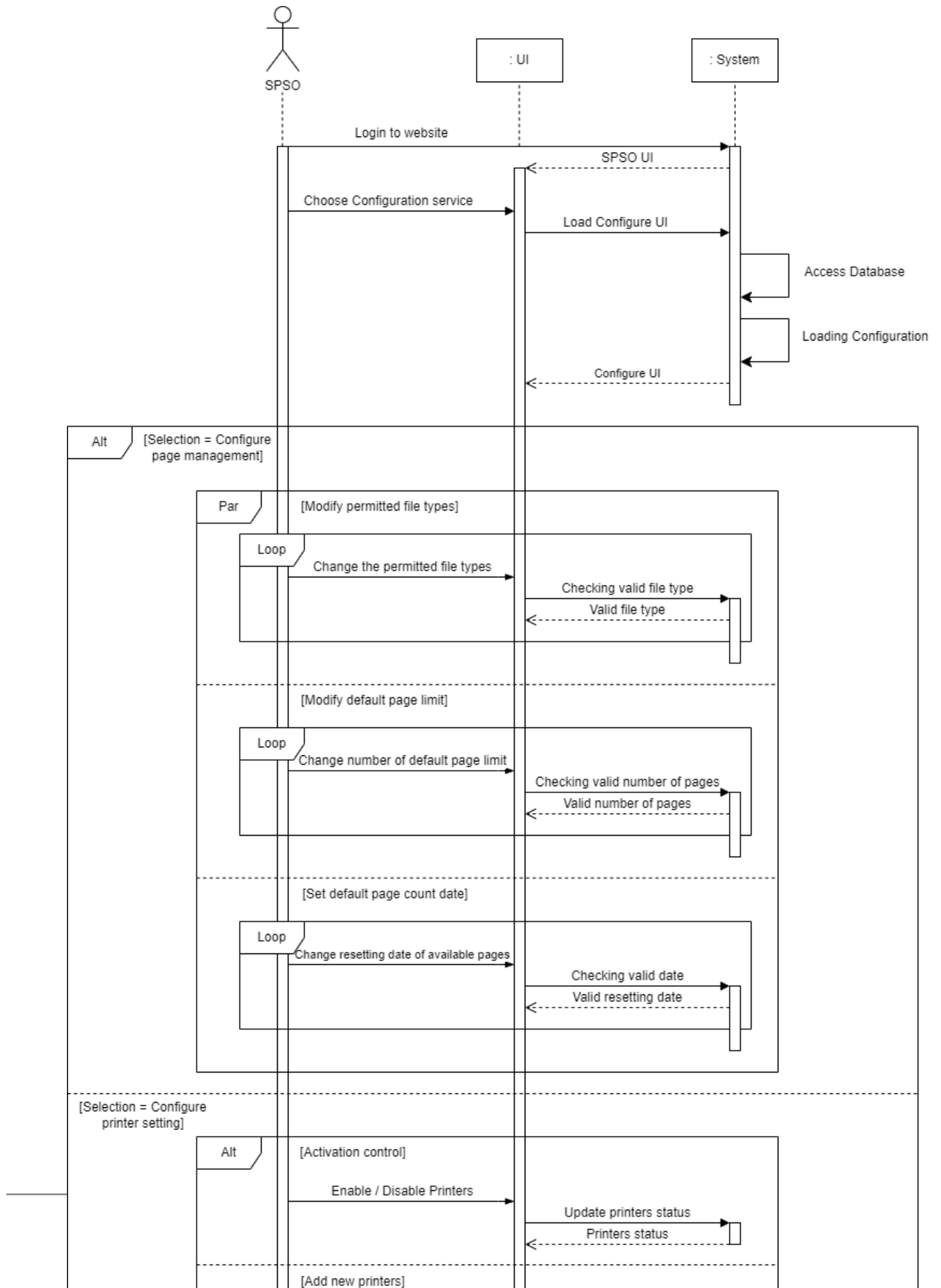
### **3.2.1. Diagram**

*-Student Diagram: further investigation please [click here](#)*





*-SPSO Diagram: further investigation please [click here](#)*



### **3.2.2. Description**

Our sequence diagram is divided into two sub-diagrams of Student and SPSO diagrams.

#### **3.2.2.1 Student Diagram Description**

This Student sequence diagram illustrates the interaction between a Student User, UI, System, and BKPay for printing documents and purchasing pages.

#### **Key components:**

1. Student User
2. UI (User Interface)
3. System
4. BKPay (Payment system)

#### **Main flow:**

##### **1. Login and Initial UI:**

- Student opens the website and logs in
- System loads and displays the Student UI

##### **2. Printing Service:**

- Student selects "Print Documents"
- System loads the printing UI
- Student goes through a loop of actions until printing validation is successful:
  - a. Upload document files
  - b. Choose printer
  - c. Select printing properties
  - d. System validates properties

##### **3. Printing Process:**

- Student clicks the Printing button
- System creates a packet including Student printing information and properties.
- If there are not enough pages: System displays a warning message
- If there are enough pages:
  - a. System prints documents
  - b. System updates page number
- System returns printing result

##### **4. Page Purchase:**

- If the student selects "Purchase pages":
  - a. System loads Purchase page UI
  - b. Student creates number of pages to purchase
  - c. System creates an order and displays status

**5. *Payment Process:***

- Student goes through a payment loop until successful:
  - a. Clicks Pay button
  - b. System sends purchase order to BKPay
  - c. BKPay returns payment status
- If payment is successful: System updates page number

**6. *Finalization:***

- System logs the activity

**3.2.2.2 SPSO Diagram**

This SPSO sequence diagram shows the interaction between an SPSO (presumably a system administrator), UI, and System for configuring various settings.

**Key components:**

1. SPSO (System administrator)
2. UI (User Interface)
3. System

**Main flow:**

**1. *Login and Initial UI:***

- SPSO logs into the website
- System loads and displays the SPSO UI

**2. *Configuration Service:***

- SPSO chooses Configuration service
- System loads Configure UI
- System accesses database and loads configuration

**3. *Page Management Configuration:***

- If SPSO selects "Configure page management":
  - a. Modify permitted file types:
    - SPSO changes permitted file types
    - System checks and validates file types
  - b. Modify default page limit:
    - SPSO changes number of default page limit
    - System checks and validates number of pages
  - c. Set default page count date:
    - SPSO changes resetting date of available pages
    - System checks and validates resetting date

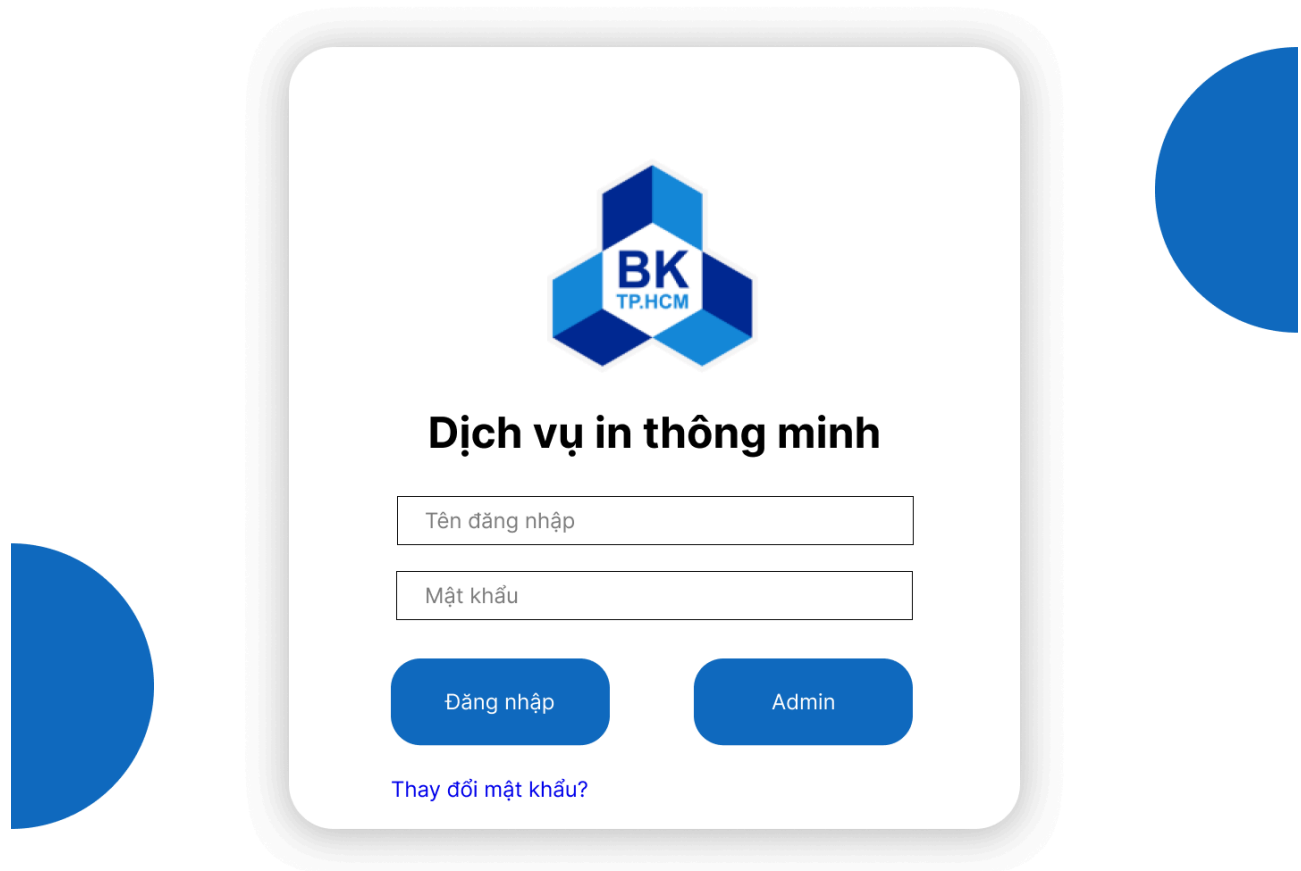
**4. Printer Configuration:**

- If SPSO selects "Configure printer setting":
  - a. Activation control:
    - SPSO enables/disables printers
    - System updates and returns printer status
  - b. Add new printers:
    - SPSO fills in printer information
    - System adds printer and updates result

**5. Finalization:**

- SPSO clicks Update button
- System saves configuration in the database



The image shows a login page for a smart printing service. At the top center is a logo consisting of three blue hexagons arranged in a triangle, with the text "BK TP.HCM" in white. Below the logo is the title "Dịch vụ in thông minh" in bold black font. There are two input fields: "Tên đăng nhập" (Username) and "Mật khẩu" (Password). Below these fields are two blue buttons: "Đăng nhập" (Login) and "Admin". At the bottom left of the form area is a link "Thay đổi mật khẩu?" (Change password?). The entire form is enclosed in a white rounded rectangle with a subtle shadow, set against a light blue background with two large blue semi-circles on the left and right sides.

**Dịch vụ in thông minh**

Tên đăng nhập

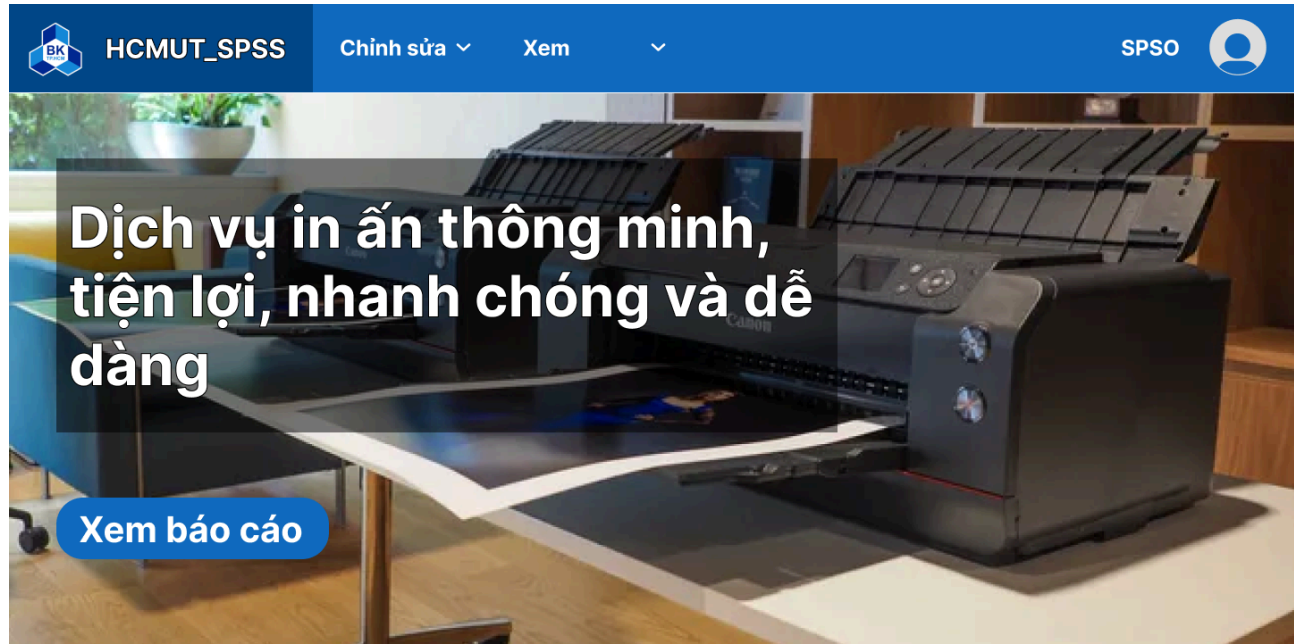
Mật khẩu

Đăng nhập Admin

[Thay đổi mật khẩu?](#)

*Login page*

Login page for both SPSO and students. Student login by clicking on “Đăng nhập” button and Admin login by clicking on “Admin” button.



---

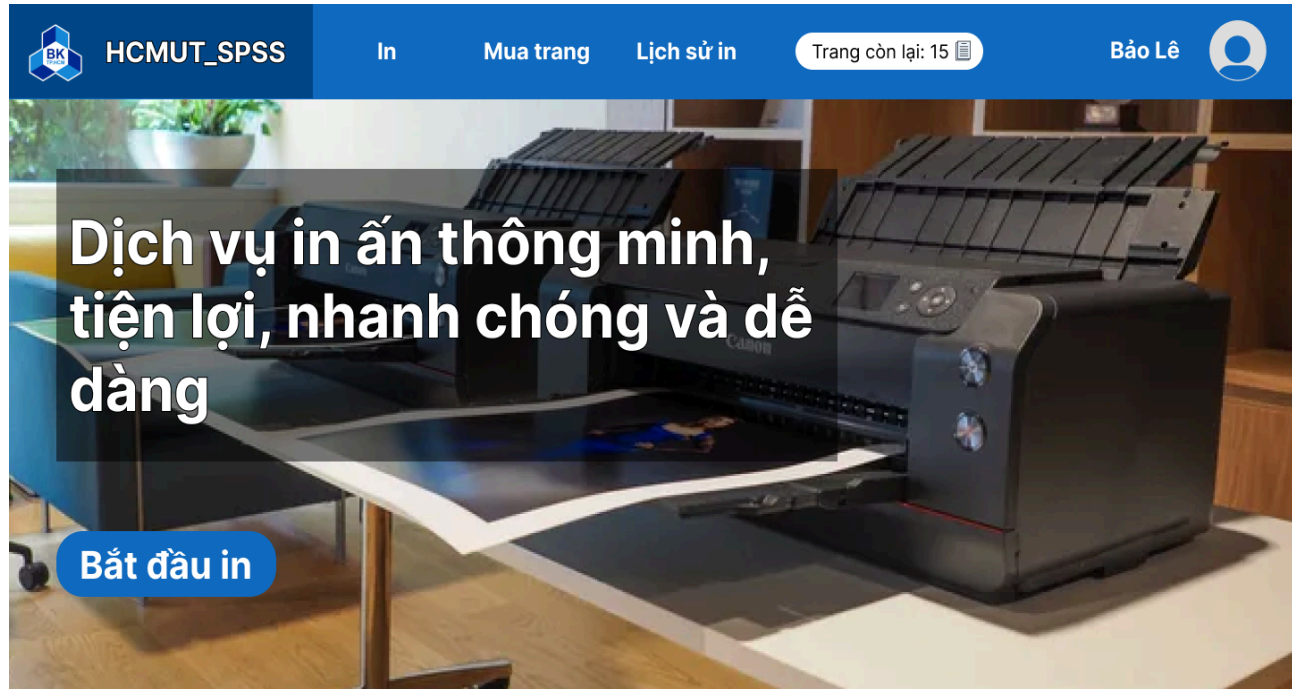
## Chỉnh sửa

---

*SPSO homepage*

SPSO can access all features such as viewing reports, printer configuration, etc. via this page.






In	Mua trang	Lịch sử in
----	-----------	------------

*Student homepage*


Students can start printing documents after logging in. Students can purchase more pages and view their own printing log too using the available button on the page.


 HCMUT\_SPSS

In

Mua trang

Lịch sử in

Trang còn lại: 15 

Bảo Lê 

[< Back to home](#)

Chọn tài liệu

Chưa có tài liệu được chọn

Chọn máy in

Máy in... 

Số bản

0

Kích thước giấy

A4 

Số trang in

0

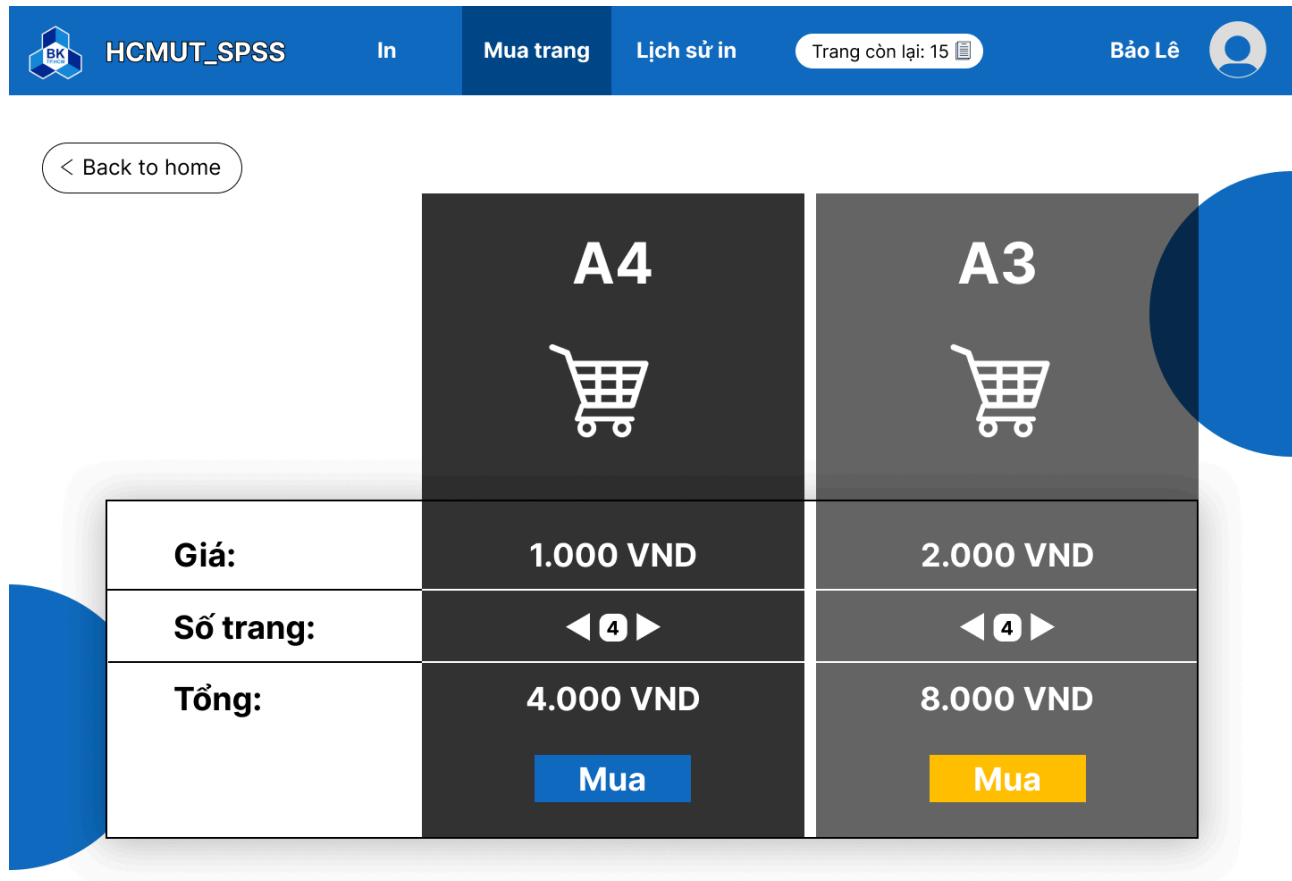
Trang

Một mặt 

In

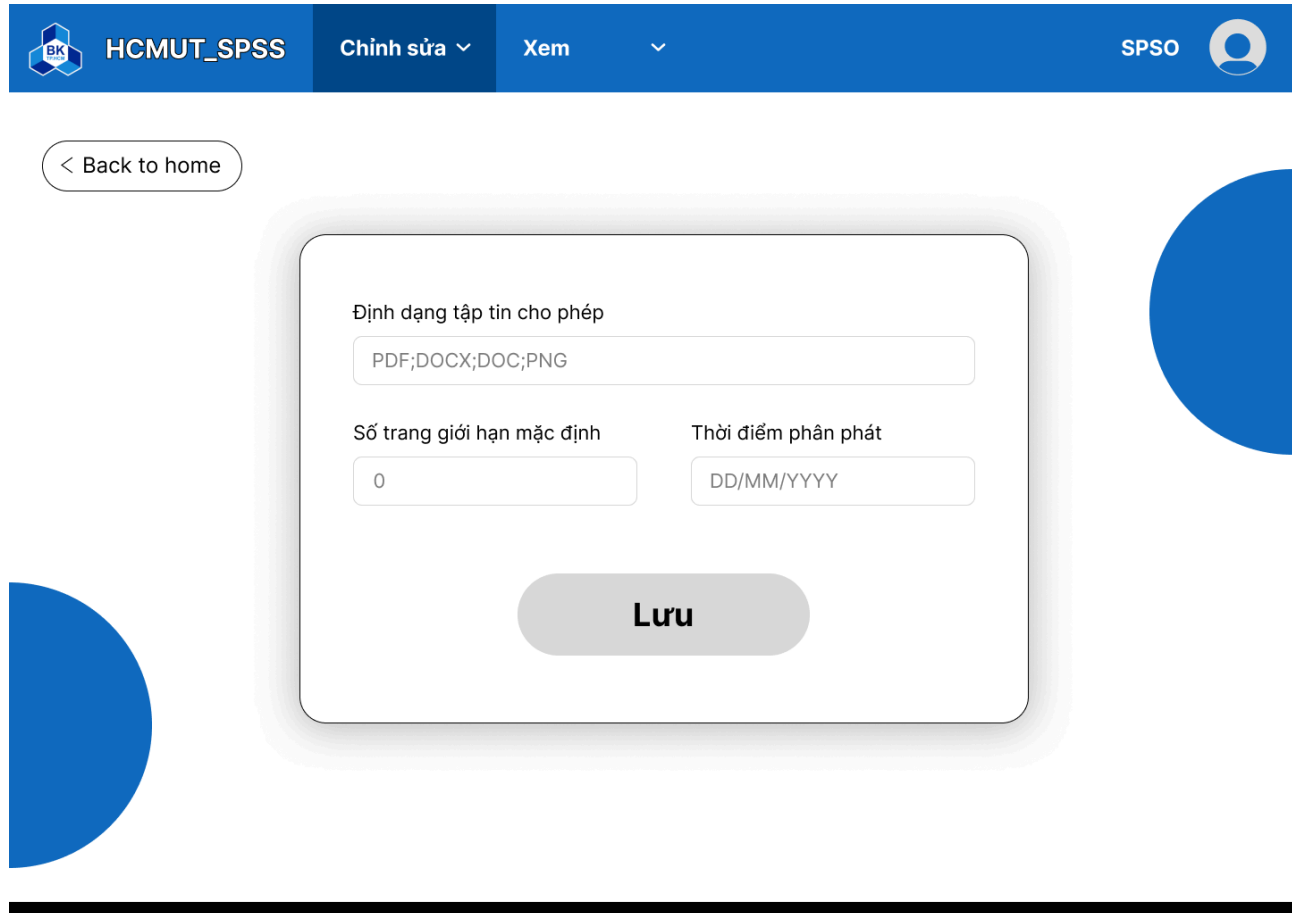
*Printing service page*

Students can start printing after filling in all the required information and click on the “In” button.



*Purchase page*

Students might want to purchase more pages by choosing the desired page and clicking on “Mua”.



The screenshot shows a web interface for HCMUT\_SPSS. The top navigation bar is blue with the HCMUT\_SPSS logo, a 'Chỉnh sửa' (Edit) button with a dropdown arrow, a 'Xem' (View) button with a dropdown arrow, and an 'SPSO' profile icon. Below the navigation bar is a 'Back to home' button. The main content area features a white card with a light blue border. Inside the card, there is a section titled 'Định dạng tập tin cho phép' (Allowed file formats) with a text input field containing 'PDF;DOCX;DOC;PNG'. Below this, there are two input fields: 'Số trang giới hạn mặc định' (Default page limit) with the value '0', and 'Thời điểm phân phát' (Distribution time) with the format 'DD/MM/YYYY'. At the bottom of the card is a large grey button labeled 'Lưu' (Save). The card is flanked by two large blue semi-circles.

### *SPSO configure page management page*

If the SPSO wants to change the default setting, they are required to fill in all the boxes and click the “Lưu” button.

Figma Prototype link for interacting and details:

<https://www.figma.com/proto/HRSfwA6cvBIpqLs40zT6bg/CNPM-V1?node-id=2-2&node-type=canvas&t=zmAF1TFI6axjlztx-1&scaling=min-zoom&content-scaling=fixed&page-id=0%3A1&starting-point-node-id=2%3A2>

References:

Printer image: <https://www.digitalcameraworld.com/buying-guides/best-photo-printer>

Profile icon: [https://en.m.wikipedia.org/wiki/File:Default\\_pfp.svg](https://en.m.wikipedia.org/wiki/File:Default_pfp.svg)

Logo hcmut: <https://lms.hcmut.edu.vn/>

Printer setting icon: <https://icons8.com/icons/set/printer-settings>

Printing setting icon:

[https://www.freepik.com/icon/content-management\\_8021575#fromView=keyword&page=1&position=22&uuid=c0fd9ead-ca78-457b-9146](https://www.freepik.com/icon/content-management_8021575#fromView=keyword&page=1&position=22&uuid=c0fd9ead-ca78-457b-9146)

Log icon: [https://www.flaticon.com/free-icon/logs\\_2721273](https://www.flaticon.com/free-icon/logs_2721273)

Report icon:

[https://www.freepik.com/icon/report\\_11176291#fromView=keyword&page=1&position=11&uuid=56e38a1a-2e69-4bc8-a4e1-f8b3ffda2a69](https://www.freepik.com/icon/report_11176291#fromView=keyword&page=1&position=11&uuid=56e38a1a-2e69-4bc8-a4e1-f8b3ffda2a69)

Printer icon: <https://www.veryicon.com/icons/business/colorful-office-icons/printer-88.html>

Paper icon: [https://www.flaticon.com/free-icon/paper\\_3209937](https://www.flaticon.com/free-icon/paper_3209937)

History icon: [https://www.freepik.com/icon/transaction-history\\_9964360](https://www.freepik.com/icon/transaction-history_9964360)

Paper left icon: [https://pngtree.com/freepng/paper-icon\\_8671270.html](https://pngtree.com/freepng/paper-icon_8671270.html)

Shopping cart icon: <https://www.citypng.com/png-download/21231>