# Software Requirements Specification for

# Student Smart Printing Service

**Version 1.0 approved**

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# Table of Contents

# Revision History

| Name | Date | Reason For Changes | Version |
|---|---|---|---|
| Draft Plan | 19/09/2024 | Draft Version | 1.0 |
| Update Domain Context | 20/09/2024 | Update Domain Context | 1.1 |
| Update 1.1.2 & 1.1.3 | 21/09/2024 | Improve 1.1.2 & 1.1.3 by reconsidering stakeholders | 1.2 |
| Update 1.1.4 & 1.1.5 | 22/09/2024 | Improve 1.4 & 1.5 by adding more requirements | 1.3 |
| Update Use case | 25/09/2024 | Update use case | 2.0 |
| Further Elaboration on use case | 27/09/2024 | Improvement | 2.1 |
| Beautify use case diagrams | 30/09/2024 | Improve on diagrams | 2.2 |

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

## 1.1 Domain Context

The HCMUT Smart Printing Service for Students (HCMUT-SPSS) is designed to streamline document printing for students at Ho Chi Minh City University of Technology (HCMUT). By offering on-campus printing, students can save time, avoid travel, and conveniently access nearby printing facilities.

Currently, the limited number of print points (only 3-4 across both campuses) cannot meet the high demand, especially during midterms and finals, leading to long waiting times. Manual printer operations further limit efficiency, while restricted working hours prevent students from printing at their convenience.

In traditional off-campus printing, students face even more difficulties. The number of students far exceeds the number of print shops, resulting in long queues and extended waiting times during high-demand periods. Additionally, customizing print formats can be challenging due to miscommunication between students and shop owners. Security is also a concern, as there is no guarantee that sensitive information in the documents won't be disclosed when shared with print shops. Moreover, sending files through multiple platforms (e.g., email, Zalo, Messenger) increases the risk of errors and makes file management more complicated.

The HCMUT-SPSS resolves these issues by providing an online platform where students can upload documents, customize print settings, and submit jobs remotely. They only need to pick up their materials when ready, reducing waiting times and manual intervention. The platform's accessibility allows students to manage their printing anytime, improving control and reducing errors. This smart solution addresses key pain points while creating a more efficient and reliable printing experience.

## 1.2 Stakeholders and Needs

### 1.2.1 Students

**Description**: Students are the primary users of the system. They rely on it for printing academic and personal documents across campus using available printers. Each student has an account with a limited number of printing pages provided by the university, which they can manage through the system.

**Needs**:

- Upload documents and specify printing preferences (paper size, double-sided, etc.).
- Monitor and manage their page balance, and purchase more pages if needed.
- View their personal printing history and usage summary.
- Securely log in using the university's SSO system.

### 1.2.2 Student Printing Service Officer (SPSO)

**Description**: The SPSO manages the technical and operational aspects of the printing service. They are responsible for configuring system settings, managing printers, and overseeing system usage by students.

**Needs**:

- Manage printers (add, enable, disable) and system configurations (e.g., default page limits, accepted file types).
- Access and filter the printing logs of students by date or printer.
- View automated reports on system usage (monthly and yearly).
- Provide troubleshooting and technical support for system issues.

### 1.2.3 University Administration

**Description**: The administration oversees the system's alignment with university policies and ensures it operates smoothly to meet student needs. They are also concerned with financial and operational aspects of the service.

**Needs**:

- Ensure the printing service is effective and meets university policy standards.
- Monitor system efficiency and cost management (e.g., page allocation, student payments).
- Ensure compliance with privacy and data protection regulations.

### 1.2.4 BKPay Payment System Provider

**Description**: BKPay is the university's online payment platform integrated with HCMUT_SSPS. It allows students to purchase additional printing pages and ensures secure transactions.

**Needs**:

- Enable secure and seamless payment processing within the printing system.
- Maintain accurate transaction logs for both students and the system.
- Ensure payment security and prevent fraud.

### 1.2.5 Printer Manufacturers

**Description**: Printer manufacturers supply and maintain the printers located around the university's campuses. They ensure the hardware functions smoothly and integrates with the HCMUT_SSPS system.

**Needs**:

- Ensure printers are compatible with the system's requirements.
- Provide regular maintenance and troubleshooting services for the printers.

### 1.2.6 HCMUT_SSO Authentication Service

**Description:** HCMUT_SSO is the university's Single Sign-On authentication service that provides secure access to the HCMUT_SSPS system for both students and staff.

**Needs:**

- Provide secure, reliable login for all users accessing the printing system.
- Ensure smooth integration between the authentication system and HCMUT_SSPS.

## 1.3 Benefits of the System

### 1.3.1 Students:

- ❖ Convenient document printing with flexible options.
- ❖ Easy management of printing page balance and history.
- ❖ Secure access through HCMUT_SSO.

### 1.3.2 Student Printing Service Officer (SPSO):

- Full control over printer management and system settings.
- Access to detailed logs and automated reports.
- Streamlined oversight of system usage and student activity.
- Ensures system stability and quick troubleshooting.

### 1.3.3 University Administration:

- Ensures compliance with printing policies and privacy regulations.
- Improves cost management and operational efficiency.
- Data-driven insights from automated reports.

### 1.3.4 BKPay Payment System Provider:

- Increased transaction volume through student purchases.
- Accurate and secure payment tracking.
- Opens doors for potential future partnerships with the university for other services.

### 1.3.5 Printer Manufacturers:

- Promotes their printers as reliable and compatible with the university's system.

### 1.3.6 HCMUT_SSO Authentication Service:

- Provides secure and seamless login for all users.
- Simplified integration with the printing system.

## 1.4 Functional Requirements

***For Students:***

**User Registration and Authentication**

- Students must be able to register and log in using their university credentials (student ID and password), ensuring only authorized users can access the service by enforcing **HCMUT Single Sign-On (SSO)** authentication.

**Document Upload**

- Students must be able to upload documents in various formats (PDF, DOCX, PPT, etc.). Specifying limits on formats could improve system performance.
- Batch upload functionality should be available for multiple documents to be uploaded simultaneously.

**Printing Customization**

- Students should have options to customize print settings, including:
    - Number of copies
    - Paper size (A4, A3, etc.)
    - Single-sided or double-sided printing
    - Color or black-and-white
    - Orientation (portrait or landscape)
    - Binding options (e.g., stapling)
- A real-time print preview should be provided to verify the job before submission. It should also offer **cost estimations** based on customization.

**Payment Integration**

- Students must be able to make payments through integrated options like university accounts, e-wallets, or credit/debit cards.
- The system should display an itemized cost breakdown based on the selected print settings.

**Print Job Status Tracking**

- Students should be able to track the progress of their print jobs, including statuses like "submitted," "in progress," "completed," and "ready for pickup."

- The system must send notifications (via email or app) when their print job is ready for pickup.

**Document Security and Privacy**

- Students must have the assurance that their uploaded documents are securely stored and accessible only by authorized personnel.
- Encryption should be used to ensure secure file uploads and storage.

**Error Handling and Reprinting**

- Students must have the option to request reprints in case of *system* errors (e.g., formatting mistakes, incomplete prints).
- The system should assist in preventing *user* errors (e.g., wrong settings) through warning messages.
- The system should facilitate free reprinting if errors are due to the system or print service, without charging students again.

**Document History and Management**

- Students must have access to their document history, allowing them to view previous jobs, reprint documents, or download receipts.
- The system should offer the option to automatically delete files post-printing after a certain number of days to maintain security and privacy.

***For SPSO:***

**Printer Management**

- The system must allow the SPSO to add, enable, disable, and manage printers across campus.

**Printer Configuration**

- The system must be able to modify the default number of printing pages assigned to students and configure the specific dates for distributing these page credits each semester.
- The system also has the ability to manage and update the types of file formats allowed for printing, ensuring compliance with system constraints.

**System Maintenance and Troubleshooting**

- The system must provide tools for SPSO staff to diagnose and fix printer issues or malfunctions quickly. Remote diagnostics could be useful for large, distributed campuses like HCMUT.
- The system should enable maintenance tasks like printer calibration and updating software without interrupting active print jobs.

**Report Generation and Usage Insights**

- The system must generate reports detailing print job volume, total revenue, and print service usage, allowing SPSO staff to monitor service performance. These reports can be exported in various formats (CSV, PDF) or integrated with other university systems for analytics.
- Usage statistics should provide insights for optimizing printing services, identifying trends, and ensuring resource efficiency.

**Student Printing History Access**

- The system must provide the SPSO with the ability to view the printing history of all students or a specific student for a selected time period.

**Efficient Resource Management**

- The system must provide real-time data on printer resources, such as paper levels and ink/toner status.
- Alerts should be generated when resources (paper, ink) are running low to ensure timely replenishment.

## ***For University Administration:***

### Access to Aggregate Printing Reports

- The system must provide university administrators with access to comprehensive, aggregate reports on printing activities. This includes tracking overall usage trends, print volume per department, system performance, and identifying patterns in student printing behaviors (e.g., preferred printing times, document types).

### Revenue Monitoring

- Administrators must be able to monitor the revenue generated from paid printing services, with clear financial reports. The system should offer insights into total revenue, revenue breakdown by user groups (students, faculty), and cost analysis to help inform pricing strategies and resource allocation.

### University-Wide Policy Management

- The system must offer tools for administrators to set and enforce university-wide printing policies, such as:
    - **Printing quotas** for students (e.g., free prints per semester or paid prints beyond a certain limit).
    - **Printing fees** for different types of printing (e.g., black-and-white vs. color, single-sided vs. double-sided).
    - **Content restrictions**, ensuring that only permissible content can be printed, in line with university policies.

### Global System Configuration

- The system must allow administrators to configure global system settings, including:
    - **Default printer page allocations** for students, staff, and faculty.
    - **Printer maintenance schedules**, ensuring that printers are regularly serviced and have minimal downtime.
    - **User access levels**, determining which users have access to certain printers or settings (e.g., high-quality or specialty printers).

**Peak Time Reporting and Optimization**

- The system must provide detailed reporting on peak printing times (e.g., during exams or project submission periods) to help optimize printer distribution and resource allocation across campus. This could include:
    - Data on which printers are used most frequently.
    - Recommendations for redistributing resources or adding printers in high-demand areas.
    - Insights for adjusting maintenance schedules during non-peak times to avoid disruptions.
    - Dynamic resource allocation (moving jobs to available printers) to further improve overall performance.

***For HCMUT_SSO Authentication Service:***

- The system must be integrated with the HCMUT_SSO authentication system.
- All user login operations must go through the HCMUT_SSO authentication system.
- The system should offer multi-factor authentication for added security.

***For BKPay Payment System Provider :***

- The system must integrate with at least one electronic payment method.
- The system must send a payment receipt to students via email.
- Transaction logging/history is available.

## 1.5 Non - Functional Requirements

### Security

- Account recovery options such as password resets should also be addressed.
- Sensitive data, such as payment transactions and personal student information, must be encrypted both in transit and at rest to ensure confidentiality and data integrity.

### Reliability

- The system should guarantee high uptime (e.g., 99.9% availability) with minimal downtime for maintenance or updates.
- Maintenance (downtime) should be scheduled during non-peak hours to avoid disruptions, ensuring the system is available during critical periods such as exam seasons, thesis submissions, or other peak student usage times. It is handled through notice periods or compensation.

### Usability

- The system must feature a user-friendly interface on both web and mobile platforms, allowing for easy navigation and functionality.
- The system should cater to users of varying technical proficiency, providing clear instructions, intuitive design, and support for common tasks such as document uploading, print customization, and payment processing.
- Predictive analytics for HCMUT SPSO is included to anticipate when supplies will run out.
- Refund policies and transaction failure handling should be implemented for smoother user experience.

### Compatibility

- The system should be compatible with a wide range of devices and operating systems, allowing students to access the service from laptops, desktops, smartphones, and tablets.

- It must support modern web browsers (e.g., Chrome, Firefox, Safari) and mobile operating systems (iOS and Android), ensuring that students can print from different platforms with consistent performance.

## Scalability

- The system must be capable of scaling to accommodate increased user load, particularly during peak periods like exam times or major academic events (e.g., thesis submissions, project deadlines), without performance degradation or delays. Automatically prioritize print jobs based on urgency.
- It should dynamically adjust to handle a high number of concurrent users and large file uploads to maintain system efficiency and user satisfaction.

# 2. Task 1: Use-case Diagrams (1.3)

## 2.1 Use-case table

| Use case ID | Use case Name | Description |
|---|---|---|
| UC001 | Login | The user login to the system |
| UC002 | Print documents | The user uses the printing service |
| UC003 | Buy printing pages | The user buys more printing pages |
| UC004 | Document upload | The user uploads a document |
| UC005 | Customize printing options | The user configuring the printing options |
| UC006 | Track printing status | The user tracks the printing status of the documents |
| UC007 | Manage printer | SPSO manages the printer |
| UC008 | Add printer | SPSO adds a printer |
| UC009 | Enable printer | SPSO enables a printer |
| UC010 | Disable printer | SPSO disables a printer |

## 2.2 Use-case Diagram for the Whole System

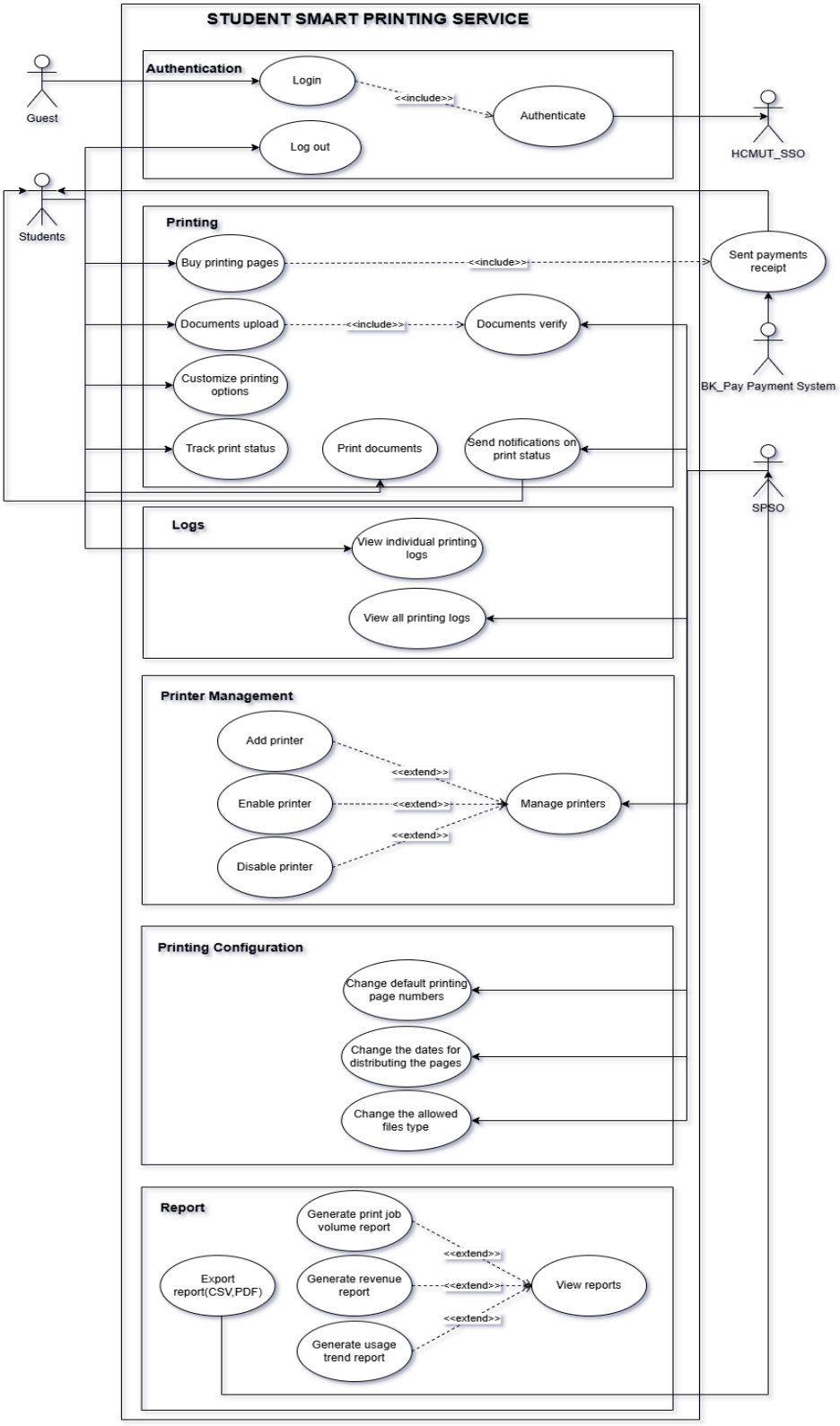


*Figure 1.1: Use case diagram for the whole system*

## 2.3 Module: Authentication

### The Use Case Diagram in Authentication Module

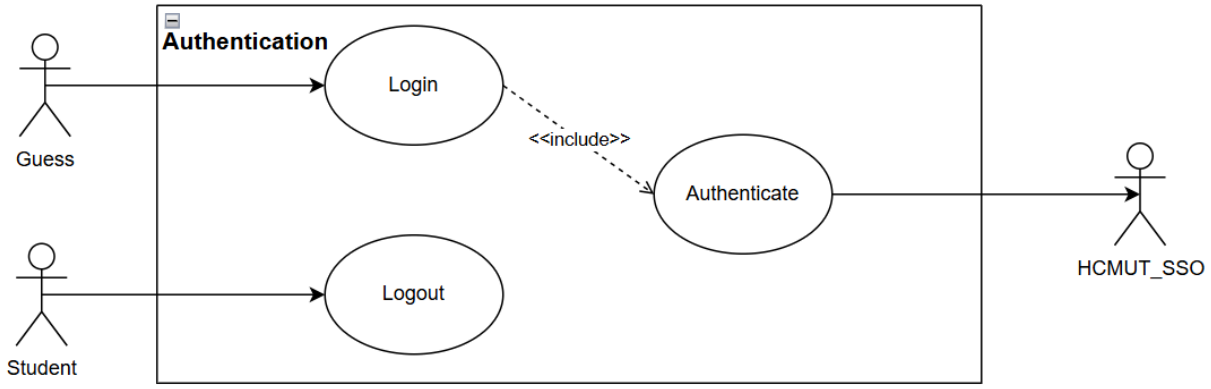


*Figure 1.2: Use case diagram for the Authentication module*

### The Use Case Scenario: Authentication/Login

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC001** | | |
| **Use case name:** | **Login** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 25/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Guest (Unauthenticated User),<br>Student (Authenticated User),<br>HCMUT_SSO (Single Sign-On System) | | |
| **Description:** | This use case allows an unauthenticated guest to log into the system using their HCMUT_SSO credentials. Users can log in with their accounts to access the system's features. | | |
| **Trigger:** | The user (guess or student) initiates the login process by clicking the "Login" button on the main interface of the website or application. | | |

| | |
|---|---|
| **Preconditions:** | - The guest has not logged into the system.<br>- The user possesses valid credentials for HCMUT_SSO.<br>- The login account has been assigned student permissions.<br>- The user's device is connected to the internet.<br>- The system is online and available for login attempts. |
| **Postconditions:** | - The user is successfully authenticated.<br>- The system has recorded the successful application login.<br>- The system has created a session for the user.<br>- The user gains access to their personalized features based on their role (guest or student). |
| **Normal Flows:** | 1. The user accesses the application (web).<br>2. The user selects the login method using an account.<br>3. The system prompts the user to enter their username and password.<br>4. The user enters the username & password, then clicks the login button.<br>5. The system successfully verifies the login information and grants the user access to the application.<br>6. The system logs the successful application login activity.<br>7. The system updates the interface according to the information of the Guest account. |
| **Alternative Flows:** | **A1: At step 4**<br>4.1. The user selects the option to save the login information before clicking the login button, and the system automatically saves the username and password for future logins.<br>4.2. Return to step 5. |
| **Exceptions:** | **E1: At step 6** |

| | |
|---|---|
| | ***6.1. Invalid Credentials***<br>If the user enters an invalid username or password:<br>- The system displays a generic error message (e.g., "Invalid username or password").<br>+ This avoids revealing whether the username or password was incorrect for security reasons.<br>***6.2. Options for the User***<br>The user has the following options:<br>- Retry: They can go back and re-enter their username and password. The system returns to Step 3 in the normal flow.<br>- Forgot Password: The system should provide a link for users to reset their password if they've forgotten it.<br>- Cancel: The user can cancel the login process and return to the main page. |
| **Note and issues:** | **Note**: Implement strong session management, enforce 2FA, allow users to monitor active sessions, and notify users of new logins.<br>**Issues**: Multiple active sessions could increase the chance of unauthorized access if one device is compromised. |

## 2.4 Module: Printing

### The Use Case Diagram in Printing Module

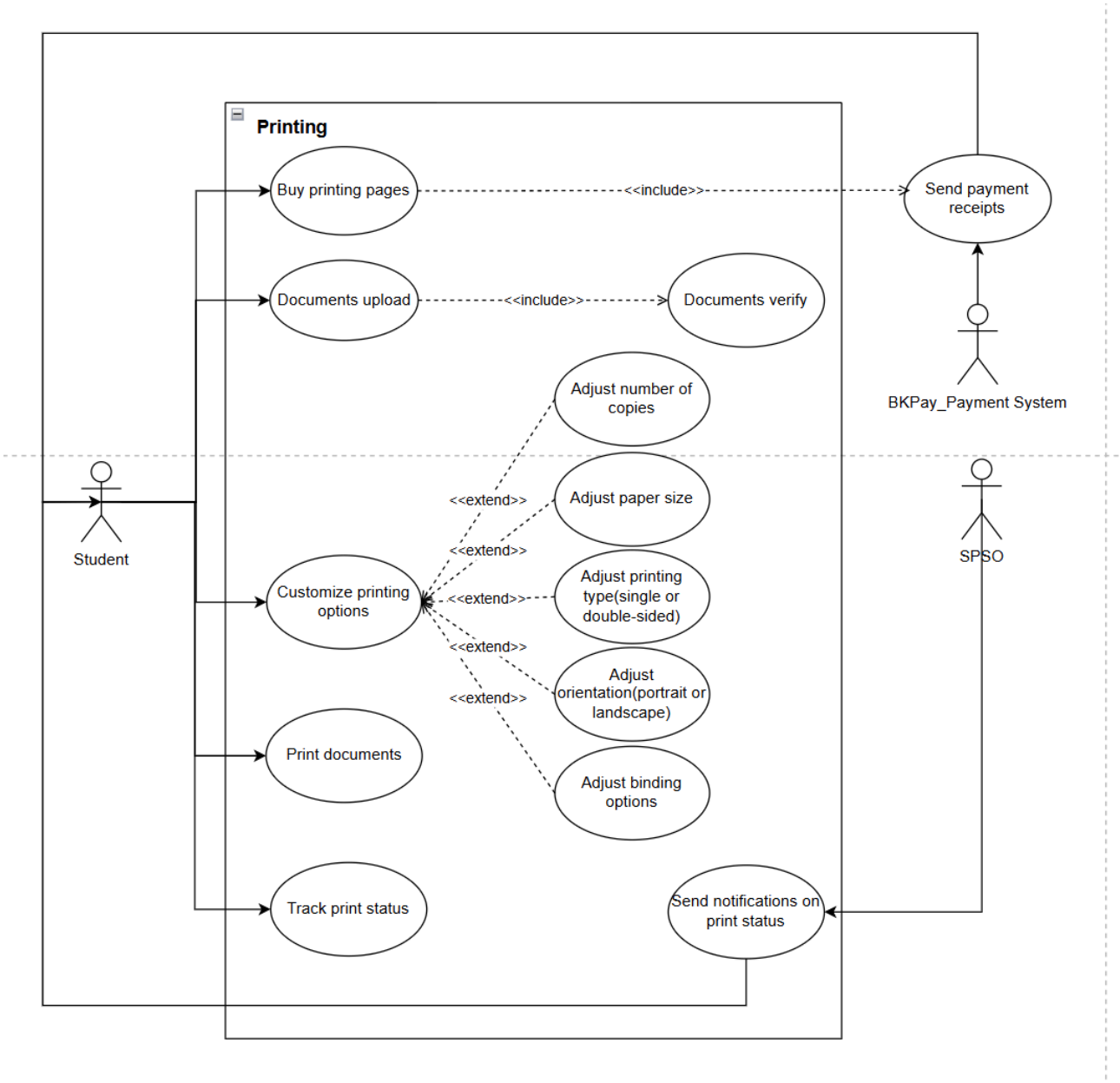


*Figure 1.3: Use case diagram for the Printing module*

## The Use Case Scenario: Printing Documents

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC002** | | |
| **Use case name:** | **Print documents** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 25/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Student | | |
| **Description:** | This use case allows users to upload documents and print them after approval. | | |
| **Trigger:** | The user clicks the "Print Now" button on the navigation bar. | | |
| **Preconditions:** | - The user must have an account on the system.<br>- The document must be successfully uploaded and approved.<br>- The user must have sufficient print credits.<br>- The user selects the time, location, and printing configurations before submitting the print request. | | |
| **Postconditions:** | The user will be placed in the print queue for the selected printer. | | |
| **Normal Flows:** | 1. The user clicks "Print Now" on the navigation bar.<br>2. The system displays the interface for selecting a printer (building, floor, room).<br>3. The system filters and displays available printers with details like location and number of pending print jobs.<br>4. The user selects an available printer based on capacity and preferences. The system allocates the job to the selected printer.<br>5. The user uploads the file for printing, if not done previously. | | |

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| | 6. The system begins to verify the uploaded file for formatting and print requirements.<br>7. The user selects the time and method for printing (e.g., single-sided or double-sided).<br>8. The user confirms and submits the print job. |
| **Alternative Flows:** | **A1: At Step 1:**<br>1.1: If the user is not logged into the system, the system redirects them to the login page.<br>1.2: The user enters their credentials and logs in.<br>1.3: Continue with Step 2 in the Normal Flow.<br>**A2: At Step 4:**<br>4.1: If no printers are available (e.g., under maintenance), the system notifies the user of the unavailability.<br>4.2: The user is notified to select another printer or return later. |
| **Exceptions:** | **E1: At Step 4:**<br>- If all printers do not meet the filtering criteria due to maintenance or other reasons:<br>+ The system notifies the user.<br>**E2: At Step 7:**<br>- The system detects that the uploaded file does not meet the verification criteria (file format, content issues, etc.):<br>+ The system notifies the user of the issue and requests a re-upload.<br>**E3: At Step 8:**<br>- The system detects that the user's remaining print credits are insufficient for the print job:<br>+ The system notifies the user of the issue and redirects them to the "Buy Print Credits" use case to purchase additional credits. |

| | |
|---|---|
| **Note and issues:** | No notes or issues identified. |

### The Use Case Scenario: Buy printing pages

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC003** | | |
| **Use case name:** | **Buy printing pages** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 26/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Student | | |
| **Description:** | Allows the user to purchase additional print pages for their account through the integrated BK Pay payment system. The purchased pages will be available for printing. | | |
| **Trigger:** | The user clicks the "Buy More Pages" button in the Printing Module interface. | | |
| **Preconditions:** | - The user is logged into the system.<br>- The user's account is linked with BK Pay.<br>- The user has selected a printer or a print job requiring additional pages. | | |
| **Postconditions:** | - The user's print page balance is increased, and a payment receipt is sent to both the system and the BK Pay Payment System.<br>- The user can now proceed with printing. | | |
| **Normal Flows:** | 1. The user accesses the Printing Module and clicks the "Buy More Pages" button. | | |

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| | 2. The system checks whether the user has a linked BK Pay account.<br>3. The system displays the Buy More Pages interface, allowing the user to input the desired number of pages for purchase.<br>4. The user selects the number of pages to purchase and confirms the payment via BK Pay.<br>5. The system processes the payment and sends a receipt to the user's account and to the BK Pay Payment System.<br>6. Once the payment is confirmed, the system updates the user's print page balance and redirects them back to the printing options. |
| **Alternative Flows:** | **A1: BK Pay Account Not Linked:**<br>- If the user does not have a linked BK Pay account:<br>+ The system prompts the user to link their account to BK Pay.<br>+ The user follows the instructions to link the payment method and is then redirected back to complete the transaction. |
| **Exceptions:** | **E1: Payment Failure:**<br>- If the payment fails due to insufficient funds, expired account details, or a system error:<br>+ The system notifies the user of the payment failure and provides the option to retry the payment.<br>+ The system maintains the print job in the queue but does not proceed until sufficient funds are available in the BK Pay account.<br>**E2: System Unavailability:**<br>- If BK Pay is temporarily unavailable:<br>+ The system notifies the user that the payment cannot be processed at the moment.<br>+ The user is asked to try again later when BK Pay is back online. |
| **Note and issues:** | - The system should ensure that sensitive payment information is securely processed using BK Pay. |

| | |
|---|---|
| | - The user should receive a notification if their print job is delayed due to lack of pages or failed payment.<br>- A clear record of page purchases and payment history should be available in the user's account for tracking purposes. |

**The Use Case Scenario: Document upload**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC004** | | |
| **Use case name:** | **Document upload** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 26/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Student | | |
| **Description:** | Allows the user to upload documents for printing through the system. The uploaded document will be verified before proceeding to print. | | |
| **Trigger:** | The user clicks the "Upload Document" button in the Printing Module interface. | | |
| **Preconditions:** | - The user is logged into the system.<br>- The user has access to a document ready for upload.<br>- The document meets the acceptable file format criteria. | | |
| **Postconditions:** | - The document is uploaded and verified for printing.<br>- The user can proceed to customize printing options once the document is verified. | | |
| **Normal Flows:** | 1. The user clicks "Upload Document" in the Printing Module. | | |

| | |
|---|---|
| | 2. The system opens a file selection dialog for the user to choose a document.<br>3. The user selects a file and confirms the upload.<br>4. The system verifies the document format, size, and content.<br>5. If the document is verified successfully, the system confirms the upload.<br>6. The user can now proceed to customize printing options. |
| **Alternative Flows:** | **A1: Unsupported File Format:**<br>- If the uploaded document is in an unsupported format:<br>+ The system notifies the user and suggests supported formats (e.g., PDF, DOCX).<br>+ The user is prompted to upload a compatible document.<br>**A2: Document Too Large:**<br>- If the document exceeds the allowed file size:<br>+ The system notifies the user of the size limit and prompts them to upload a smaller document. |
| **Exceptions:** | **E1: Upload Failure:**<br>- If the upload process fails due to network or system issues:<br>+ The system displays an error message and suggests retrying the upload or checking the network connection. |
| **Note and issues:** | - The system should allow the user to see a preview of the uploaded document to ensure accuracy.<br>- The document verification process should be quick to avoid user delays.<br>- Any failed uploads should be logged, and the user should receive feedback on why the upload was unsuccessful. |

**The Use Case Scenario: Customize printing options**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC005** | | |
| **Use case name:** | **Customize printing options** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 26/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Student | | |
| **Description:** | Allows the user to adjust printing preferences such as paper size, number of copies, and binding options before submitting the document for printing. | | |
| **Trigger:** | The user clicks the "Customize Printing Options" button after uploading a document in the Printing Module. | | |
| **Preconditions:** | - The user is logged into the system.<br>- The document has been successfully uploaded and verified.<br>- The user has available print pages for the selected options. | | |
| **Postconditions:** | The user's printing preferences are saved, and the document is ready for printing. | | |
| **Normal Flows:** | 1. The user selects "Customize Printing Options" after uploading a document.<br>2. The system displays a set of available printing options, including:<br>- Adjust the number of copies.<br>- Select paper size (A4, A3, etc.).<br>- Choose the printing type (single or double-sided).<br>- Set page orientation (portrait or landscape).<br>- Adjust binding options (if available). | | |

| | |
|---|---|
| | 3. The user selects the desired options for their print job.<br>4. The system calculates the total number of print pages and verifies that the user has enough pages available.<br>5. The user confirms the settings and proceeds to print or save the configuration for later use. |
| **Alternative Flows:** | **A1: Insufficient Print Pages:**<br>- If the user does not have enough print pages to accommodate the selected options:<br>+ The system notifies the user of the shortage and provides the option to purchase more pages via BK Pay. |
| **Exceptions:** | **E1: System Error During Customization:**<br>- If a system error occurs while the user is selecting or confirming options:<br>+ The system notifies the user of the issue and suggests retrying the customization or saving the settings for later. |
| **Note and issues:** | - The system should provide a real-time cost estimate based on the selected printing options to help users make informed choices.<br>- Ensure that the user is notified if any selected options (e.g., paper size or binding) are unavailable at the selected printer.<br>- The system should allow users to save their preferred printing configurations for future use. |

**The Use Case Scenario: Track print status**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC006** | | |
| **Use case name:** | **Track printing status** | | |
| **Created by:** | Nguyen Quang Vinh | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 26/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | Student | | |
| **Description:** | Allows the user to track the status of their submitted print job in real-time through the system. This helps the user stay informed of their print job's progress. | | |
| **Trigger:** | The user clicks the "Track Print Status" option after submitting a print job in the Printing Module interface. | | |
| **Preconditions:** | - The user is logged into the system.<br>- The user has submitted a print job for printing.<br>- The system is connected to the printers to receive real-time updates. | | |
| **Postconditions:** | - The user can view the current status of their print job (e.g., in queue, printing, completed).<br>- The user receives a notification when the print job is completed. | | |
| **Normal Flows:** | 1. The user submits a document for printing and selects the "Track Print Status" option.<br>2. The system retrieves the current status of the print job from the printer.<br>3. The system displays the print job's status, which can include:<br>- In Queue: The print job is waiting in line.<br>- Printing: The document is currently being printed.<br>- Completed: The print job has finished. | | |

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| | - Error: There is an issue with the print job (e.g., paper jam, insufficient ink).<br>4. The user can choose to receive notifications on the progress of the print job.<br>5. Once the print job is completed, the system sends a notification to the user. |
| **Alternative Flows:** | **A1: Print Job Delay:**<br>- If the print job is delayed due to high volume or printer maintenance:<br>+ The system notifies the user of the expected wait time or delay.<br>+ The user can choose to cancel the job or continue waiting. |
| **Exceptions:** | **E1: Printer Error:**<br>- If a printer error occurs (e.g., paper jam, ink error):<br>+ The system notifies the user of the issue and suggests possible solutions (e.g., contact SPSO for support).<br>+ The print job status is updated accordingly (e.g., paused or canceled).<br>**E2: Network/Connection Failure:**<br>- If the system fails to retrieve the print status due to a network issue:<br>+ The system notifies the user and suggests trying again later. |
| **Note and issues:** | - The user should be able to track multiple print jobs simultaneously if they have submitted more than one.<br>- Notifications should be timely and accurate to avoid confusion.<br>- Ensure that the user can view detailed error messages if the print job fails, and provide actionable steps for resolution. |

## 2.5 Module: Printer Management

### The Use Case Diagram in Printer Management Module

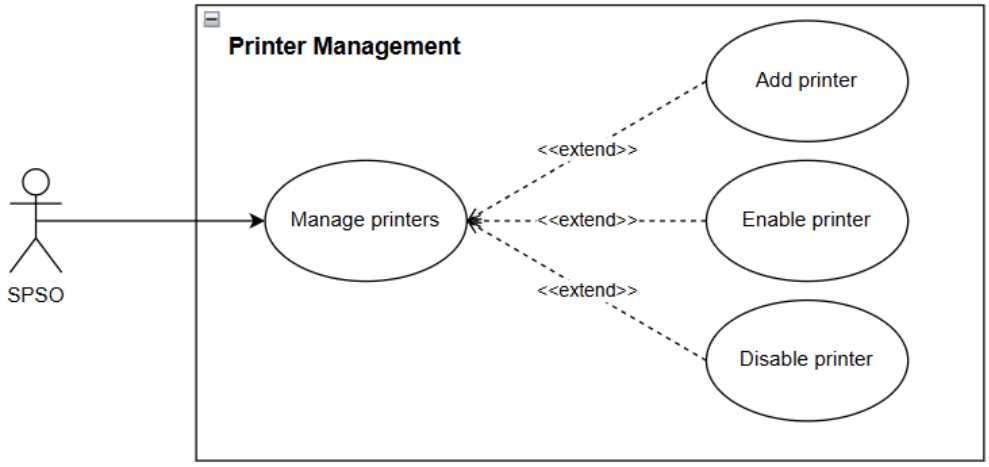


*Figure 1.4: Use case diagram for the Printing Configuration module*

### The Use Case Scenario: Manage printers

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC007** | | |
| **Use case name:** | **Manage printers** | | |
| **Created by:** | Nguyen Nhat Khoi | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 25/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | SPSO | | |
| **Description:** | Allows SPSO to manage printers around the campus | | |
| **Trigger:** | The user clicks on the “Manage printers” on the navigation bar | | |
| **Preconditions:** | - SPSO must be authenticated or authorized within the system<br>- SPSO already login to the website<br>- SPSO’s device connected to the internet | | |
| **Postconditions:** | The printer management interface pops up for SPSO. | | |
| **Normal Flows:** | 1. SPSO chooses “Manage printers” on the navigation bar.<br>2. The printer management interface pops up with the list of all the printers around the campus and the options to add, enable and disable a printer. | | |
| **Alternative Flows:** | None | | |
| **Exceptions:** | None | | |
| **Note and issues:** | No notes or issues identified. | | |

**The Use Case Scenario: Add Printer**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC008** | | |
| **Use case name:** | **Add printer** | | |
| **Created by:** | Nguyen Nhat Khoi | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 25/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | SPSO | | |
| **Description:** | Allows SPSO to add an additional printer to the system | | |
| **Trigger:** | The user clicks on the “Add printer” printer management interface | | |
| **Preconditions:** | - SPSO must be authenticated or authorized within the system<br>- SPSO already login to the website<br>- SPSO’s device connected to the internet | | |
| **Postconditions:** | The data of the new printer is added to the system database and the list of printers | | |
| **Normal Flows:** | 1. SPSO choose the option “Add printer” on the printer management interface<br>2. The system display the information of the new printer and SPSO fill in the new printer’s details<br>3. The system asked for confirmation<br>4. SPSO confirms the operation<br>5. The system updates the changes to the database | | |
| **Alternative Flows:** | None | | |

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| **Exceptions:** | **E1: At step 5**<br>- SPSO does not confirm the operation<br>- The system does not save the changes that has been made by the SPSO |
| **Note and issues:** | No notes or issues identified. |

**The Use Case Scenario: Enable printer**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC009** | | |
| **Use case name:** | **Enable printer** | | |
| **Created by:** | Nguyen Nhat Khoi | **Lasted updated by:** | Nguyen Quang Phu |
| **Dated created:** | 25/09/2024 | **Dated last updated:** | 30/09/2024 |
| **Actors:** | SPSO | | |
| **Description:** | Allows SPSO to enable a printer | | |
| **Trigger:** | The user clicks on the “Enable printer” printer management interface | | |
| **Preconditions:** | - SPSO must be authenticated or authorized within the system<br>- SPSO already login to the website<br>- SPSO’s device connected to the internet | | |
| **Postconditions:** | The data of the printer is updated to the system database and the list of printers | | |
| **Normal Flows:** | 1. SPSO choose the option “Enable printer” on the printer management | | |

| | |
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| | interface<br>2. The system asked for confirmation<br>3. SPSO confirms the operation<br>4. The system updates the changes to the database |
| **Alternative Flows:** | None |
| **Exceptions:** | **E1: At step 3**<br>- SPSO does not confirm the operation<br>- The system does not save the changes that has been made by the SPSO |
| **Note and issues:** | No notes or issues identified. |

**The Use Case Scenario: Disable printer**

| | | | |
|---|---|---|---|
| **Use Case ID** | **UC010** | | |
| **Use case name:** | **Disable printer** | | |
| **Created by:** | Nguyen Quang Vinh | Last updated by: | Nguyen Quang Phu |
| **Dated created:** | 26/09/2024 | Date last updated: | 30/09/2024 |
| **Actors:** | SPSO | | |
| **Description** | Allows SPSO to disable a printer, making it temporarily unavailable for users via the printer management interface. | | |
| **Trigger:** | The SPSO clicks the "Disable" button on a printer in the printer management interface. | | |
| **Preconditions:** | - SPSO has a valid account with appropriate permissions. | | |

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| | - SPSO has successfully logged into the system.<br>- The SPSO's device is connected to the internet.<br>- The printer is registered and online. |
| **Postconditions:** | The printer is marked as disabled in the system, and it is no longer available for print jobs until re-enabled. |
| **Normal Flows:** | 1. The SPSO selects "Disable" for a specific printer.<br>2. The system prompts the SPSO for confirmation.<br>3. The SPSO confirms the action.<br>4. The system updates the printer's status in the database, marking it as disabled.<br>5. The printer is removed from the list of available devices in the user interface. |
| **Alternative Flows:** | **A1: SPSO Cancels Action:**<br>- The SPSO chooses not to confirm the action.<br>- The system cancels the disable request, and the printer remains active and available. |
| **Exceptions:** | **E1: Network or Database Failure:**<br>- If the system fails to update the printer status due to a network or database error:<br>+ The system displays an error message to the SPSO and logs the failure.<br>+ The printer's status remains unchanged. |
| **Note and issues:** | No notes or issues identified. |