

DEPARTMENT OF SOFTWARE ENGINEERING  
FACULTY OF COMPUTER SCIENCE AND ENGINEERING  
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY - VNU-HCM



**Software Engineer**  
**(CO3001)**

---

**Software Requirements Specification for**  
**SMART PRINTING SERVICE**

---

**Version 2.0 approved**

**Prepared by:**

1. Phạm Nguyễn Viết Trí - 2252845
2. Phan Phước Hưng - 2252282
3. Trần Đăng Khoa - 2252363
4. Trần Gia Huy - 2252264
5. Trần Hoàng Minh Quân - 2053380

HO CHI MINH CITY, SEPTEMBER 19TH 2024



## Contents

<b>Revision</b>	<b>2</b>
<b>1 Requirement elicitation (1.1, 1.2)</b>	<b>2</b>
1.1 Domain context . . . . .	2
1.1.1 Overview . . . . .	2
1.1.2 Actors and Roles . . . . .	2
1.1.3 Key concepts and Interactions . . . . .	2
1.1.4 Domain rules . . . . .	2
1.1.5 Domain events . . . . .	2
1.1.6 Relationships . . . . .	3
1.2 Stakeholders and Needs . . . . .	3
1.3 Benefits of the System . . . . .	3
1.3.1 Students (Users) . . . . .	3
1.3.2 Student Printing Service Officer (SPSO) . . . . .	3
1.3.3 University administration . . . . .	4
1.3.4 HCMUT IT Department . . . . .	4
1.4 Functional Requirements . . . . .	4
1.4.1 For Students . . . . .	4
1.4.2 For Student Printing Service Officer (SPSO) . . . . .	4
1.4.3 For HCMUT Administrator . . . . .	5
1.4.4 IT department . . . . .	5
1.5 Non-Functional Requirements . . . . .	6
1.5.1 For Students . . . . .	6
1.5.2 For students printing Service Officer . . . . .	6
1.5.3 For HCMUT Administrator . . . . .	6
1.5.4 HCMUT IT Department . . . . .	6
<b>2 Use-case Diagrams (1.3)</b>	<b>7</b>
2.1 Use-case Diagrams for the Whole system . . . . .	7
2.2 Use-case Diagram for Printing Job module . . . . .	9



## Revision

Name	Date	Reason For Changes	Version
Viết Trí	29/9/2024	Write report for task 1.3 (Diagram)	2.0

## 1 Requirement elicitation (1.1, 1.2)

### 1.1 Domain context

#### 1.1.1 Overview

Student Smart Printing Service (HCMUT\_SSPS) is a printing system develop for university student at HCMUT for printing purpose. This system contains features like printers, printing management, authenticating methods, pages quotas, online payments, configuration tools and report of usages.

#### 1.1.2 Actors and Roles

- **Student:** printing, purchasing for more pages, view history of printing.
- **Administrator:** handle internal bugs, upgrade system.
- **Student Printing Service Officer (SPSO):** manage printers, report usage.
- **IT department:** User support, system monitoring and responses to incidents.

#### 1.1.3 Key concepts and Interactions

- **Printers:** contain ID, brand/manufacturer name, printer model, short description, location.
- **Printing features:** file uploaded, printing customize.
- **Page quotas:** limit number of A4 pages available.
- **Online payment:** increase quotas.
- **Report:** store all printing activities.

#### 1.1.4 Domain rules

Users are authenticated by the HCMUT\_SSO authentication service. Printers, setting, file types, page quotas and day of receiving page quotas are managed by the SPSO. An A3 page is consider as 2 A4 pages. Reports are generated automatically. Administrators manage users access and system's setting. IT department handle the system's integration

#### 1.1.5 Domain events

Upload files, request service, complete printing, purchasing for more pages, receiving pages after a period of time, SPSO change setting and printers. Administrators determine setting and features. IT department maintaining system's security and functions.



### 1.1.6 Relationships

Students are linked to page quotas and history, printing job connect with printers and preferences, SPSO manage printers and setting, report contains all usage activities. Administrators manage SPSO. IT department maintaining system.

## 1.2 Stakeholders and Needs

- **Students (Users):** The primary users of the system. They access the Student Smart Printing Service (HCMUT\_SSPPS) to print documents, manage their available page balance, and check their printing history.
- **Student Printing Service Officer (SPSO):** The SPSO oversees the system's administration, handling printer management, configuring system settings, and reviewing printing logs and reports.
- **HCMUT Administration:** This group is tasked with ensuring the efficient delivery of printing services to students. They make decisions regarding resource allocation and potential service improvements based on trends in service usage.
- **HCMUT IT Department:** Responsible for maintaining the secure installation and integration of the smart printing service within the university's network. They handle the system's integration with existing services, such as HCMUT\_SSO Authentication Service.

## 1.3 Benefits of the System

The HCMUTSSPS is aimed to make the document printing process more efficient and user-friendly.

### 1.3.1 Students (Users)

- **Convenience:** The HCMUT-SSPS system provides an easy and convenient method to access to the printers across campus through a web-based or mobile app. This enhances flexibility for students, allowing them to easily access any available printer from any location. Moreover, displaying printer locations enables students to identify the nearest available printer, saving them time and effort in finding one.
- **Transparency:** The transparent page-balance management allows students to clearly see and track their remaining pages available for printing, with the option to purchase additional pages through BKPay. Additionally, providing students with a printing log enables them to review their past printing decisions. This ensures that students can efficiently and properly manage their printing needs, preventing any unintentional usage.

### 1.3.2 Student Printing Service Officer (SPSO)

- **Efficient system management:** The HCMUT-SSPS provides SPSO with a user-friendly interface for managing the printer system, allowing them to easily add, enable, or disable printers. This ensures smooth and effective maintenance and control of the service.
- **Configuration management:** The system allows SPSO to configure file-type permissions and set a default number of pages, ensuring that the printing requirements of students are met and aligned with school policies.



- **Usage observation:** The automated generation of monthly and yearly reports helps maintain oversight of system usage trends, facilitating data-driven decisions for service improvements.

### 1.3.3 University administration

- **Resource management:** University admin benefits from streamlined resourced allocation. With detailed reports generated by the system, the administration can track printing usage patterns and optimize printer deployment based on actual demand. This data-driven approach helps in reducing waste, managing costs, and improving the overall efficiency of campus services.
- **Improved service experience:** By offering students a hassle-free printing solution, this also enhances student satisfaction, aligning with its broader goal of improving campus life and supporting academic activities.

### 1.3.4 HCMUT IT Department

- **Management and security:** the system is integrated with HCMUT\_SSO, ensuring that user authentication is secure and streamlined. This reduced the risk of unauthorized access and simplifies user management.
- **Operational monitoring:** the centralized platform allows the IT Department to easily monitor the system's performance, manage updates, and troubleshoot issues remotely. This improves overall operational efficiency and minimizes downtime, ensuring the smooth functioning of the printing services across the campus.

## 1.4 Functional Requirements

### 1.4.1 For Students

- **File uploading:** Students can upload a document file for printing.
- **Printer choosing:** Students can select a printer for printing the document.
- **Printing configuration:** Students can specify printing properties such as paper size, pages (of the file) to be printed, one-/double-sided, number of copies, etc.
- **Printing checking log:** Students can view his/her printing log for a time period.
- **Summary checking log:** Students can view a summary of the number of printed pages for each page size in the student's printing log.
- **Page purchasing:** Students can buy additional printing pages using the online payment system.
- **Page checking balance:** Students can view the remaining pages available for printing.

### 1.4.2 For Student Printing Service Officer (SPSO)

- **History log viewing for one student:** SPSO can view the printing history of a student by one or multiple printers in a specified time period.



- **History log viewing for all students:** SPSO can view the printing history of all students by one or multiple printers in a specified time period.
- **Printer management:** SPSO can add, enable, and disable printers in the system.
- **Default page changing:** SPSO can change the default number of pages.
- **File permitting:** SPSO can specify the permitted file types for uploading.
- **Allocate Default Pages:** SPSO can specify the dates on which the system will allocate the default number of pages to all students.
- **Report viewing:** SPSO can view the monthly and annual reports.

#### 1.4.3 For HCMUT Administrator

- **User Account Management:** The administrator must have the ability to create, modify, disable, or remove user accounts, including those for students and SPSOs (Student Printing Service Officers), ensuring proper account control and system access.
- **Access to Payment History:** The administrator should be able to view and audit the complete payment history for each student account, allowing real-time access for financial oversight and troubleshooting.
- **Report Generation and Access:** The administrator must have the ability to generate and access detailed monthly and yearly reports, comparing printing usage, student statistics, and financial data with previous time periods for strategic analysis.
- **System Configuration Control:** The administrator should have the authority to configure and update system settings, including print quotas, pricing models, and service schedules, to optimize system performance and user satisfaction.
- **Printer Monitoring and Management:** The administrator must be able to monitor the status of all printers, manage printer settings, and address system malfunctions or printer downtimes remotely.
- **Audit Log Access:** The administrator should have access to system audit logs, allowing them to track user activities, identify security breaches, and ensure compliance with institutional policies.

#### 1.4.4 IT department

- **User support:** The IT department can provide technical support and assistants to students, SPSO and administrators to resolve any issues related to the smart printing service.
- **Integration with HCMUT\_SSO:** The IT department can integrate the smart printing service with the HCMUT\_SSO authentication service to ensure secure user's authentication across the network.
- **Incident responses:** The IT department can establish and maintain an incident response plan to address any security problem or system failures.
- **System monitoring:** The IT department can monitor the smart printing service for performance issues, security threats, systems issues.
- **Secure installation:** The IT department can perform secure installation of the smart printing service on university servers to project against unauthorized access.



## 1.5 Non-Functional Requirements

### 1.5.1 For Students

- **Data privacy:** Printed content needs to be kept confidential and know only by the student own that information.
- **User interface:** Students are required to log-in their account. The printer should have a good user interface avoid mis-understanding about all the functions of the printer.
- **System performance:** The system requires to operate stable and continuous 24/24 without interruption. Virus or hazard softwares should not be found in the system.
- **Sheets count:** The system count exactly the number of sheet students used to print documents each time.

### 1.5.2 For students printing Service Officer

- **User's manual:** A detailed guidebook providing the operation and instructions for students to use it properly step-by-step (eg. Pause/Stop printer, configuring sheets to print, specified pages the way students desire, etc).
- **Configuration:** Configuration updates by the SPSO must be applied to all the printer in the system in 1 minutes.

### 1.5.3 For HCMUT Administrator

- **Account Management Efficiency:** Changes in user-account made by the administrator should be update to the printing system within 10 minutes. (eg. Enabled/Disabled some functions the student can/can't use when operating the printer,etc)
- **Availability:** The system must be available 99.9% of the time to ensure that administrative staff can access real-time data and reports at any time.
- **Scalability:** The system should be able to accommodate growing numbers of users and increasing amounts of data over time without degradation in performance.
- **User Access Control:** The system must provide role-based access control, ensuring that only authorized administrative staff have access to sensitive data and system settings.

### 1.5.4 HCMUT IT Department

- **Upgrade:** Any system upgrade and verification in HCMUT\_SSO made by IT Department in university's network also update in the printer.
- **Technical support:** Students technical reports will be save and sent to the supervisor at the end of every week.







of all user's accounts with in the system, especially for those who have administrating accesses and permissions. It give access to major administration's function and give the administrators the power and tools to manage other accounts like creating, redefining, deactivating or deleting user accounts, including those of Student Printing Service Office (SPSO).

- **User Authentication Service:** This service ensure the security of user account as well as the limit the permissions of accessing administration's function and protect the security and stability of the whole system. It utilizes the HCMUT\_SSO authentication service to verify the identity of students and other users before giving the the permission to access more features.
- **Payment Service:** This module is responsible for online payments of students in order to purchasing more page quotas. It is linked to payment systems BKPay of HCMUT for extending the amount of printing pages which is controlled by the system, to make sure the purchasing process is valid and be able to response as soon as they complete purchasing.
- **Printing Service:** The Printing Service is an essential feature that allows students to initiate and oversee print tasks. It manages document uploads, printer selection, setting printing preferences (such as paper size and page range), and tracks the history of print activities. Additionally, it ensures page balance monitoring and alerts users when their balance is low.
- **Report service:** The Reporting Service automatically creates and stores reports that summarize system usage. It gathers data on page consumption, the number of students utilizing the service, and offers comparisons with previous time periods (both monthly and yearly). These reports are essential for evaluating resource usage and aiding in informed decision-making regarding the printing service.

## 2.2 Use-case Diagram for Printing Job module

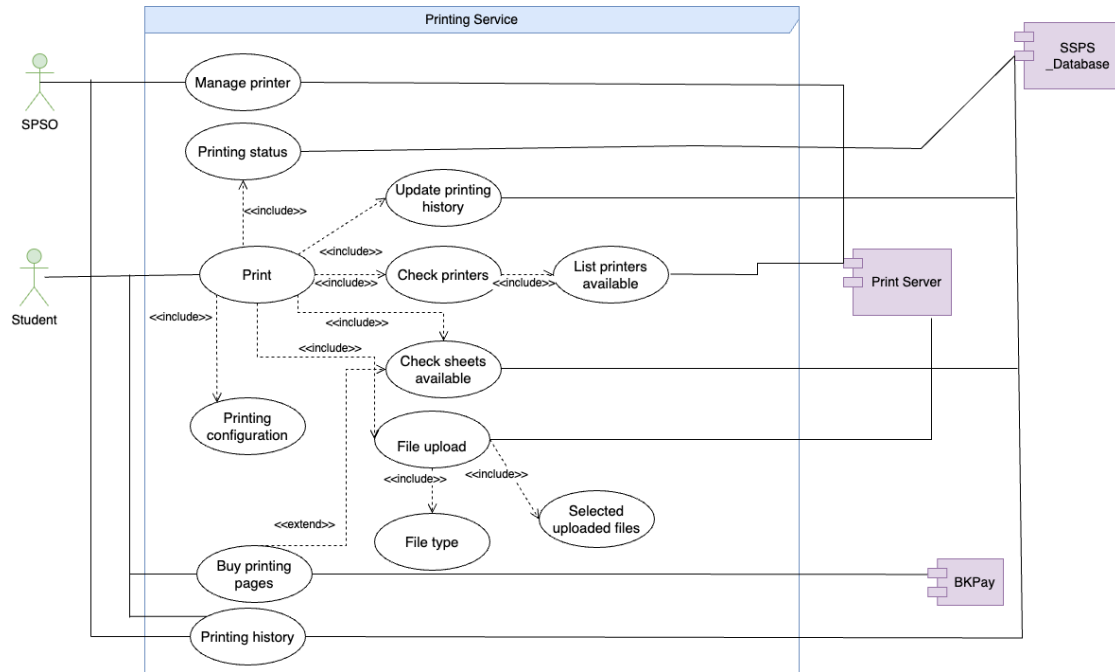


Figure 2. Use-case Diagram for Printing Job module

<b>Use Case Name</b>	Printing Job
<b>Actors</b>	SPSP, Student User, Printing Service, Print Server, BKPay, SSPS Database
<b>Description</b>	Students perform Print function to to print documents in the system.
<b>Trigger</b>	User clicks on "+ New Print" button on the sidebar
<b>Preconditions</b>	User is logged in with an active user session. The document to be printed is uploaded and accessible.
<b>Postconditions</b>	The print job is successfully submitted for processing, and the user is notified when the print job is completed.



<b>Normal Flows</b>	<ol style="list-style-type: none"><li>1. User selects the desired printer for the print job.</li><li>2. User selects the document to be printed.</li><li>3. User specifies printing properties such as paper size, single-/double-sided, number of copies, and other preferences.</li><li>4. User confirms the print job submission.</li><li>5. System processes the print job and adds it to the print queue.</li><li>6. User receives a confirmation message that the print job has been successfully submitted.</li><li>7. User is notified when the print job is completed.</li></ol>
<b>Alternative Flows</b>	<p><b>From 2a.</b> User clicks on Uploaded Files tab: 2a.1. User clicks on their uploaded file from the list. 2a.2. Proceed with step 3 and onwards as in the normal flow.</p> <p><b>From 2b.</b> User clicks on Integrations tab: 2b.1. User clicks on the integration button (e.g., Google Drive, OneDrive). 2b.2. User follows the integration flow to select a file. 2b.3. Proceed with step 3 and onwards as in the normal flow.</p> <p><b>From 7b.</b> If the user runs out of page balance and chooses the Get More Balance button: 7b.1. User clicks the "Get More Balance" button. 7b.2. User is redirected to the page for adding more balance to their account. 7b.3. Proceed with the balance addition process. 7b.4. After successfully adding more balance, return to the print job confirmation step (step 4) and continue with the normal flow.</p>
<b>Exceptions</b>	<p><b>From 5a.</b> If the selected printer is unavailable or offline, display an error message and allow the user to choose an alternative printer.</p> <p><b>From 7a.</b> If the user runs out of page balance and chooses Cancel, display a notification and do not proceed with printing.</p>

Bảng 1: Printing Job module