Software Requirements Specification

for

Student Smart Printing Service

Version 1.0 approved

Prepared by TN01-05 group:

1. **Nguyễn Phúc Gia Khiêm – 2211573**
2. **Nguyễn Quang Huy – 2211235**
3. **Nguyễn Quang Minh – 2212063**
4. **Nguyễn Tiến Khoa – 2211632**
5. **Nguyễn Trần Đăng Khoa – 2211635**

Department of Software Engineering

Faculty of Computer Science and Engineering

Ho Chi Minh City University of Technology – VNU-HCM

21/09/2024

Contents

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

1.1 Domain Context

1.1.1 Business Domain

Education The smart printing system is aimed at serving the higher education sector, specifically within the Ho Chi Minh City University of Technology (HCMUT). The primary goal is to facilitate an efficient, user-friendly, and manageable printing service for students across various campuses of the university. The system aims to streamline the printing process, making it more convenient for the student body.

1.1.2 Technical Domain

Web and Mobile Applications Technically, the system will be a web-based application accessible from multiple platforms. It will integrate with HCMUT's Single Sign-On (SSO) for secure user authentication. Payments for additional printing pages will be processed through specific online payment gateways, such as BKPay. This ensures a seamless and secure experience for the users.

1.1.3 User Domain

The system caters to two main types of users. Students will be able to upload documents for printing, view their printing logs, and purchase additional printing pages. On the other hand, System and Printer Service Operators (SPSO) will have administrative capabilities, such as managing printers, configuring system settings, viewing logs, and generating as well as viewing monthly and yearly reports.

1.1.4 Functional Domain

From a functional perspective, printers are identified by multiple attributes including ID, brand, model, a short description, and location details like campus name, building, and room number. The system allows for various printing properties to be configured, such as paper size, pages to print, and the number of copies. Additionally, the system maintains detailed logs of printing activities, including relevant details like student ID, printer ID, file name, and printing times. The system also enforces account balance restrictions, providing a default number of A4-size pages each semester, with the option to buy additional pages. It adheres to legal and regulatory guidelines by complying with data protection laws and financial regulations related to online payment systems like BKPay.

1.2 Stakeholders and Needs

1.2.1 Students and Staffs

The key stakeholders are the students and staffs, who need a system that allows them to conveniently print documents from various locations on campus. They also require the ability

to view their printing history and monitor the number of pages they have printed. When their default printing quota is exhausted, they should have the option to purchase additional pages. A user-friendly interface accessible through both web and mobile platforms is crucial to meet their requirements.

1.2.2 Student Printing Service Officers (SPSO)

The Student Printing Service Officers (SPSO) are responsible for the management and operation of the printing service. They need the ability to manage printers, including adding, enabling, and disabling them across various campuses. SPSOs also require access to detailed logs of all printing activities for monitoring and troubleshooting. Configuration options are important for them, such as setting permitted file types and defining the default number of

printing pages for each student. Additionally, they must have the capability to generate and view monthly and annual usage reports for administrative purposes.

1.2.3 University Administration

The University Administration has a vested interest in providing a reliable and efficient printing service that meets the needs of the student body. Detailed reporting tools are essential for budgeting and planning. The system must comply with all relevant regulations and standards, and maintainability is crucial, requiring minimal downtime and clear documentation for troubleshooting and future updates. Integration capabilities with existing systems, such as HCMUT's Single Sign-On (SSO) for authentication and BKPay for payment method, are vital for seamless operation.

1.2.4 Development Team/Technician Support

The Development Team is responsible for maintaining the system's functionality and ensuring reliable service across all printers. Remote management capabilities allow technicians to quickly enable, disable, and troubleshoot printers without the need for on-site visits. Automated logging and monitoring tools are essential for identifying issues and maintaining system performance with minimal downtime. Scalability is crucial, as the system must accommodate future growth in users and printers. Integration with external systems, such as BKPay and HCMUT's SSO, ensures seamless operations and reduces the manual workload for technicians.

1.3 Benefits of the System

The system has been designed to meet the needs of stakeholders and offer them numerous advantages. These benefits encompass enhanced efficiency and productivity, improved decision-

making capabilities, streamlined processes and workflows, increased accessibility to information, and cost savings. Consider each of the stakeholders listed below.

- **Students**: The HCMUT Student Smart Printing Service offers students a convenient way to access printing services across campus. Students can monitor their printing pages, purchase additional pages as needed, and view their printing history and account balance, enabling them to manage their resources effectively. The system also secures students' uploaded documents, protecting their privacy and academic work.
- **Student Printing Service Officers**: The SPSO (Student Printing Service Office) can experience increased administrative efficiency through the system's tools for managing student accounts, and printers, configuring system settings, and automating report generation. This has significantly reduced manual tasks for SPSO personnel. Moreover, the system ensures the security and integrity of printing data, thereby enhancing the overall reliability of the system and maintaining the trust of users. Furthermore, the system provides tools and access to system data, enabling effective support for students in resolving printing-related issues and addressing their queries. This comprehensive approach to managing the printing service benefits both SPSO and students alike.
- **University Administration**: The system contributes significantly to sustainability initiatives by reducing paper waste and promoting eco-friendly printing practices. This is in line with the university's commitment to environmental responsibility. The system supports meeting external regulatory requirements related to printing services, helping the university maintain compliance. The usage data and reports generated serve as effective budget planning tools, empowering the university management to allocate resources wisely and make informed financial decisions. With the presence of existing systems such as HCMUT SSO or BKPay, the SSP system can be easily integrated into the university's overall ecosystem and used by students.

1.4 Functional Requirements

1.4.1 Students

- Students can upload documents to the system (files must be in the system configuration created by SPSO).
- When printing, students can choose the properties of the printed page (paper type, number of pages, number of copies).
- Students cannot print when the remaining pages are not enough to meet the number of pages of the document on the corresponding paper type.
- Students can choose the available printer to print via the printer ID.
- Students can review their printing history including the number of printed pages on different paper types.
- Students can purchase additional printed pages on the system according to the paper types and pay online, then the system have to update the number of pages automatically.
- Students can track their remaining page balance through the system.

1.4.2 SPSO

- SPSO can turn on and off existing printers.
- SPSO can add a new printer to the system.
- SPSO can check the printing history of all students on all existing printers.
- SPSO can configure the system (default number of printed pages, page delivery time, types of documents allowed to be printed).
- SPSO can review the overall report of the entire system monthly and annually.

1.4.3 Development Team/Technician Support

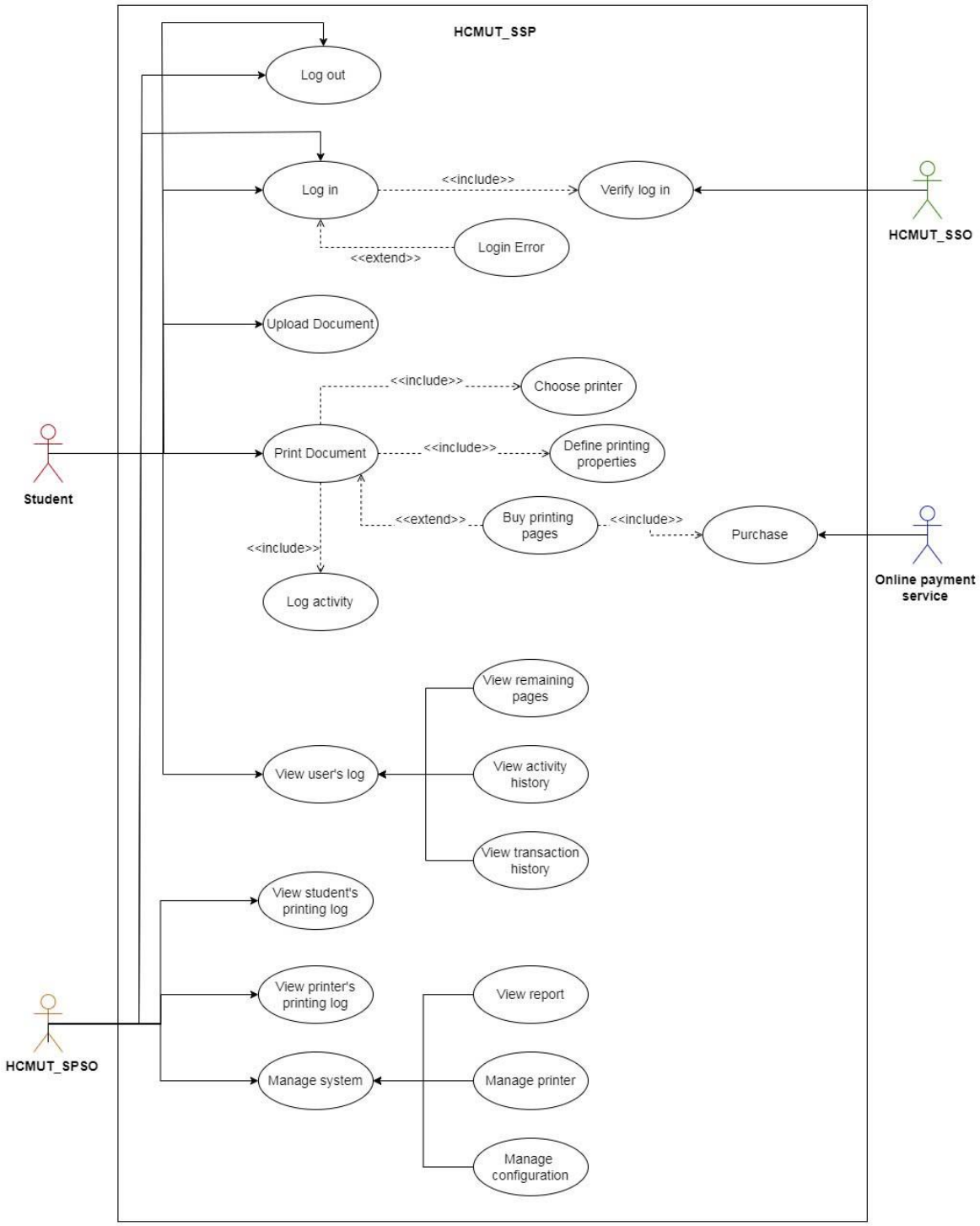
- Developers can interact with database and server to hanlde errors when they occur.
- Developers are not allowed to see the information of any users.

1.5 Non- Functional Requirements

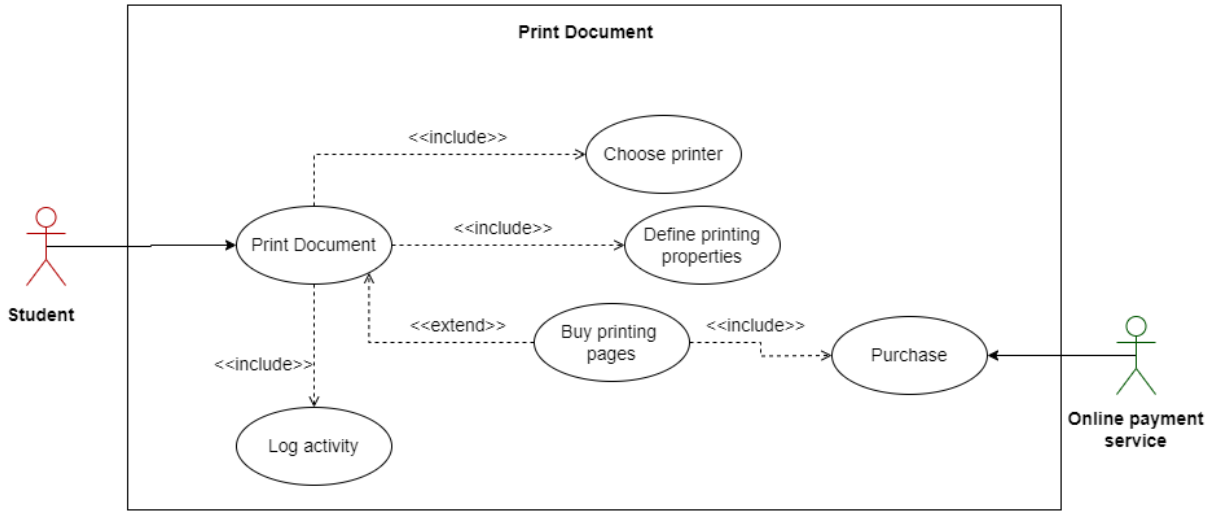
- The system are provided through a web-based.
- The students can get their documents after 1 minute submitting on the system app.
- It can accommodate up to 30,000 registered users.
- The system can serve 5,000 students simultaneously.
- Students should wait no more than 1 minute to be served by the system after submitting a login request.
- Documents must be printed according to the user's request, and the printing error rate must not exceed 5%.
- The system can serve in both English and Vietnamese.
- The printing system must be available for students to print documents from 6 AM to 8 PM everyday, except holidays.
- Students and SPSO can use the system's app at any time.
- The system must operate normally at least 95% of the time each week.
- The system should function normally and only require maintenance after a minimum of 6 months.
- The system interface must be visually appealing, user-friendly, and easy to use (users can easy hanlde in the first time).
- The system must limit the information accessible to each user and ensure security for user information.
- The system must ensure high security during online payment method linking and authentication user.

2. Use-case diagrams (1.3)

2.1 Use-case Diagram for the Whole System



2.2 Use-case Diagram for Print documents module



2.3 The details of use-case in print documents

2.3.1 Print documents

Use Case ID	PR001
Use-case name	Print documents
Actors	Student, Online payment service
Description	The process of printing documents when a student want to print documents.
Trigger	Click the “Print documents” button.
Preconditions	The student has been authenticated by the HCMUT_SSO and has logged into the system. The student has uploaded the documents to print onto the system.
Postconditions	The documents are printed according to the printing properties configured by the student.
Normal Flow	1. Student selects “Print documents” button on the system app. 2. System presents a page with choices of documents uploaded by the student. 3. Student selects one or many documents among the choices.

	4. The system displays a page that allows students to configure printing properties. 5. Student specify the printing properties such as paper size, pages (of the file) to be printed, one-/double-sided, number of copies, etc. 6. System presents a page with choices of available printer in the university's campus. 7. Student selects a printer among the choices. 8. Student selects "Print now" button on the system app. 9. The system checks the student's remaining pages. 10. Documents are printed by the printer chose by the student. 11. System saves the printing history (log).
Alternative Flows	*Alternative 1: at step 3* 3a. Student upload new documents onto the system. 3b. System presents a page with choices of documents uploaded include the new documents. *Continue step 3 in the normal flow*
Exceptions	*Exception 1: at step 2: there are no documents uploaded* 2a. System presents a page saying that the student has no documents and require student to upload documents. *After uploading documents, use case continue from step 2* *Exception 2: at step 6: There are no printer available at that time* 6a. System presents a page saying that there are no printer available and the student has to wait. *When there is a printer available, use case continue from step 4* 6b. If the student cancel the printing activity, usecase return to the homepage. *Use case end and return to the homepage* *Exeption 3: at step 10: The student's remaining pages are not enough to*

	print the documents 10a. System presents a page saying that the student's remaining pages are not enough to print the documents and the student has to buy more pages through the online payment system. 10b. If the student purchase successfully, the system saves this activity. *Use case continue from step 9* 10c. If the student purchase failed, the system ask student to purchase again or cancel the printing activity. *Use case end and return to the homepage* 10d. If the student decline to purchase, the system cancel the printing activity. *Use case end and return to the homepage*
Notes and Issues	If technical issues arise during the printing process, such as paper jams, printer errors, or network problems, the system will take the following actions: 1. System identifies the problem and presents an error message to the user. 2. If there are alternative printers available, the system notifies the student to select one. 3. The student has the option to either retry the print job or cancel it. 4. If the issue is resolved, the printing process will continue.

2.3.2 Choose the printer

Use Case ID	PR011
Use Case Name	Choose a printer
Actor	Student
Description	The student selects a printer from a list of available printers to print.
Trigger	After the student clicks the "Print documents" button.
Preconditions	The student has already chosen the documents to print and started the printing

	process.
Postconditions	The selected printer is set as the target for the current print job; otherwise, no printer is selected, and the printing job will shut down.
Normal Flow	1. The system displays a dialog showing a list of available printers. 2. Student reviews the available printers and selects a preferred printer. 3. Student confirms the selection by clicking "OK". 4. The system displays a success message confirming that the print job was sent.
Exceptions	*Exception 1: At step 1: There are not any available printers* 1a. The system must log a notion "No available printers".

2.3.3 Define the printing properties

Use Case ID	PR012
Use-case name	Define printing properties
Actors	Student
Description	The student will specify the printing properties for their document, including paper size, specific pages to print, one-sided or double-sided printing, and the number of copies. Once specified, the system will confirm the properties before processing the print job.
Trigger	After the student clicks the button "Choose the printer".
Preconditions	• The student has already uploaded the document to the system. • The selected printer is available and online.
Postconditions	• The printing job is successfully queued with the specified properties if and only if the available pages of the student are enough for the job. • The printing properties are logged for future reference in the student's printing history.
Normal Flow	1. The student uploads or selects an existing document for printing.

	2. The system displays a screen to specify printing properties: • Paper size (A4, A3, etc.). • Pages to be printed (all pages or a specific range). • Single-sided or double-sided printing. • Number of copies. 3. The student fills in the printing properties and confirms the selection. 4. The system displays a confirmation message that the print job has been successfully queued.
Exceptions	*Exception 1: At step 4: Insufficient printing pages:* 5a. The system detects that the student does not have enough printing credits to complete the job and shows a windows for purchasing. 5c. If the student accepts and buys more printing pages. *Use-case continue at step 4* 5d. If the student cancel the purchasing process. *Use-case end and back to the homepage*
Notes and Issues	• Ensure that the system supports a variety of paper sizes and printer configurations. • Future versions might include more advanced options like color printing or document scaling.

2.3.4 Buying printing pages

Use Case ID	PR013
Use Case Name	Buy printing pages
Actor	Student, Online payment service
Description	Student can buy more pages for their printing activities
Trigger	Student clicks the “Print Immediately” button or students click on “Buying more papers” button.

Preconditions	After choosing printing properties, student clicks “Print Immediately” button but the remaining pages are insufficient, or student intends and navigate to account page to purchase additional pages.
Postconditions	The student’s new remaining pages are updated.
Normal Flow	1. The system displays a window containing information on the price per page, the quantity of pages needed, and issues relevant warnings. 2. The student enters the number of pages. 3. The system automatically adjusts the total price. 4. The student choose “Checkout” button to make a transaction with Online payment service.
Exceptions	*Exception 1: At step 1* 1a. If the student click the “Cancel Transaction” button instead of the “Buy more pages” button, go back to the printing window. *Use-case end and back to home page.*

2.3.5 Purchase

Use Case ID	PR101
Use Case Name	Purchase
Actor	Student, Online payment service
Description	After the student confirms the number of the specific kinds of pages they want to purchase, proceed with the payment process using Online service payment.
Trigger	The student presses the "pay now" button after confirming the quantity to buy.
Precondition	The number of pages the student wants to buy is greater than 0
Postcondition	Update the number of student's existing printing pages if payment is successful
Normal Flow	1. Students select "Pay Now" after selecting the number of printed pages they want to buy 2. Online payment service processes a transaction. 3. Update the number of student's existing printing pages.

	4. Notification of payment status.
Exceptions	*Exception 1: At step 2: The transaction is not successful.* 1a. A message will appear requesting confirmation of transaction cancellation 1b. The system backs to the buying printing pages window. 1b. If the student restart the purchasing. *Use-case continue at step 1* 1c. If the student cancel the buying process. *Use-case end and back to home page*

2.3.6 Log activities

Use Case ID	PR015
Use Case Name	Log activities
Actor	Student
Description	When the document is printed successfully, the system logs this activity and stores it into system database.
Trigger	The printing process is successfully finished.
Precondition	The document is successfully printed.
Postcondition	The system has successfully saved the recently printed job
Normal Flow	1. The system logs the recently printed job.