Software Requirements Specification

for

A smart printing service for students at HCMUT

Version 1.0 approved

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Revision History

Name	Date	Reason For Changes	Version
All members	22/09/2024	Complete Requirement elicitation (Task 1.1, 1.2)	1.0
All members	29/09/2024	Complete Use-case Diagrams (Task 1.3)	1.0

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

1.1 Domain Context

The Ho Chi Minh City University of Technology (HCMUT) is developing the HCMUT Student Smart Printing Service (HCMUT-SSPS) to provide a convenient and efficient solution for students to print their documents across various campuses. The service integrates multiple printers, a web-based application, a mobile app, and a management system, streamlining the printing process, reducing costs, and enhancing the overall student experience. Aimed at improving academic services and convenience, HCMUT-SSPS will enable students to print documents quickly and efficiently for their academic and research needs, offering a fast, time-saving printing service within the campus.

1.2 Stakeholders and Needs

- **HCMUT Students (Users):** As the primary users, students need a convenient, fast, and reliable way to print their academic documents across different campuses. They require easy access to printers through a web or mobile app, the ability to upload documents, choose printer settings, and track their printing history. Students also need a system that manages their printing quotas and allows for seamless online payments when additional pages are needed.
- **Student Printing Service Officers (SPSO):** These administrators manage the printing system, including the configuration of printers and student accounts. They need access to logs of student print jobs, the ability to adjust settings like allowed file types, manage printer statuses, and oversee the allocation of printing quotas. They also require automatic generation of reports on system usage for administrative purposes.
- **HCMUT Managers:** The university leadership requires the system to improve overall student services, enhance campus efficiency, and optimize resource usage. They need the system to be cost-effective, reduce administrative burden, and provide insights into printing system usage to make informed decisions regarding resource allocation and improvements.

1.3 Benefits of the System

- **For HCMUT Students:** The system provides a fast, convenient, and efficient way to print academic documents, saving time by allowing them to select printers and

configure print settings directly through a web or mobile app. It also helps them manage their printing quotas easily and make online payments when necessary. Furthermore, students can track their printing history and usage, ensuring transparency and control over their print jobs.

- **For Student Printing Service Officers (SPSOs):** The system simplifies the management of printers and printing services. SPSOs benefit from having centralized control over printer configurations, monitoring student print activity, and accessing detailed reports on system usage. This automation reduces manual work and enables better service oversight and resource management.
- **For HCMUT Managers:** The system enhances overall campus service efficiency, providing a streamlined printing solution that reduces costs and administrative overhead. It also helps the university improve the student experience by offering a modern and user-friendly service, while the data collected from the system can be used to optimize printer distribution and resource allocation, ultimately enhancing campus operations

1.4 Functional Requirements

- **Students:**
  - Students are able to upload document files onto the system.
  - Students can choose which printer they want to print documents.
  - Students are allowed to customize printing properties such as paper size, number of printing pages, one-/doubled-sized, number of copies, etc.
  - Students can view their printing log for time period and information about the number of printed pages for each page size.
  - Students can buy more printing pages through the Buy Printing Pages feature of the system.
  - Students are able to pay for buying more printing pages through an online payment system like the BKPay system of the university.
  - A student will be not allowed to print if the printing action exceeds his/her account balance.
- **Student Printing Service Officer (SPSO):**
  - SPSO can configure file types allowed to be printed.
  - SPSO can modify the default number of pages.
  - SPSO can set the dates to update the default number of pages to all students.

- SPSO is able to view the printing log of all students or a student for specified time (date to date) and for some printers or all of them.
- SPSO can add a printer to the system.
- SPSO can disable or enable a particular printer.
- SPSO is able to view the activity reports of the system.

- **General requirements:**
  - The system should log all the printing actions (student ID, printer ID, file name, printing start and end time, number of pages for each page size) of all students.
  - The system should automatically generate activity reports at the end of each month and each year.
  - The reports should be stored in the system.
  - All users must be authenticated by HCMUT_SSO authentication before using the system.

1.5 Non- Functional Requirements

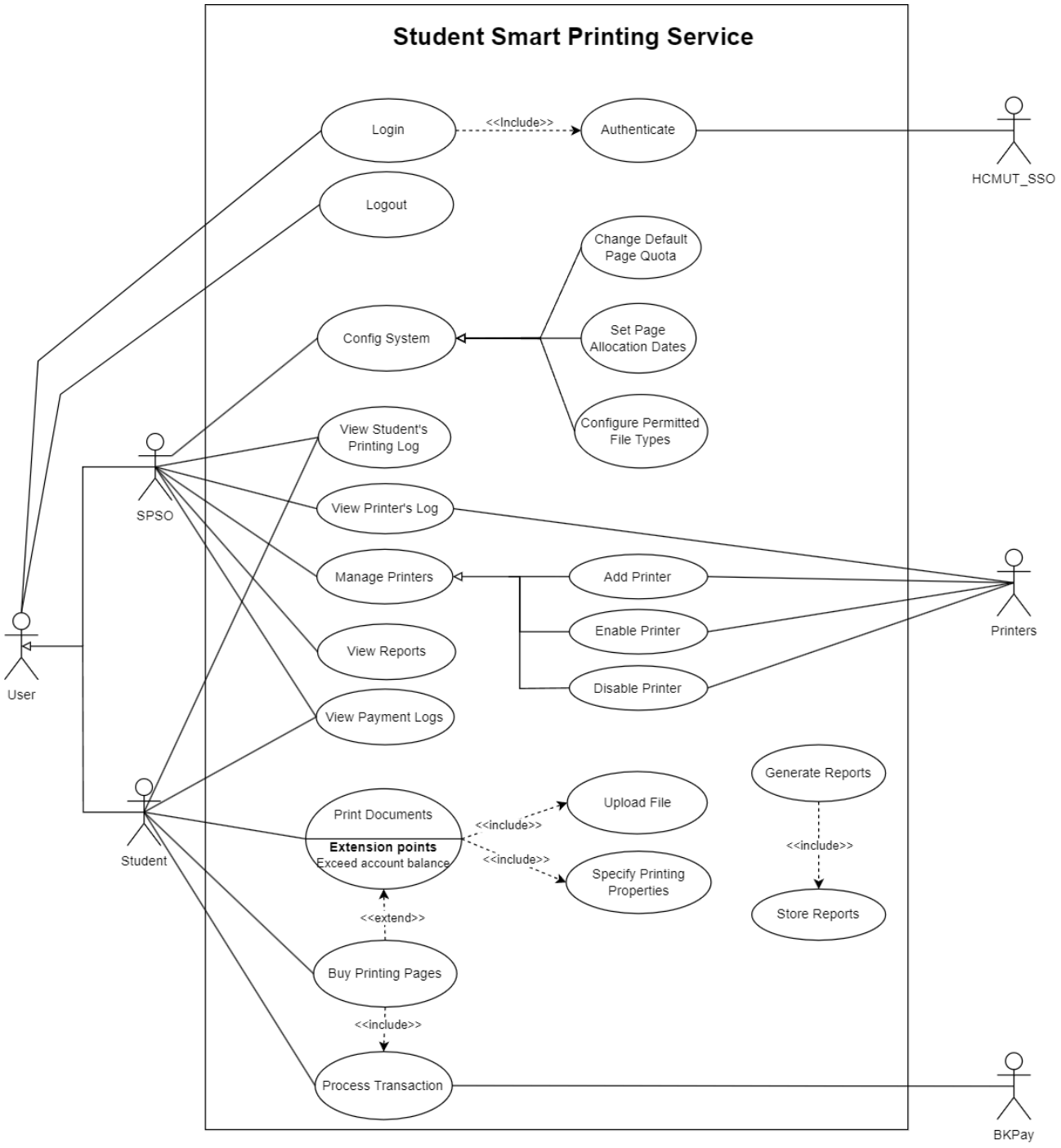
- **Speed:**
  - The system must ensure a response time of no more than 3 seconds for file uploads, submitting print requests, and printer selection.
  - Printing logs and history must be displayed to users within 3 seconds of their request.
  - Monthly and yearly reports must be automatically generated at the end of each period and should be accessible for viewing within 5 seconds upon request by the SPSO.
  - The system must be capable of handling at least 1,000 concurrent users without performance degradation.
- **Size:**
  - Each document uploaded must not exceed 100 MB in size, with total system storage scalable to 50 terabytes of documents and logs.
  - The system must be able to store printing logs for each student for at least 4 years (or until they graduate) without performance degradation.
- **Ease of Use:**
  - Users and SPSO can access the web-based app at any time.

- The web-based app must adapt its user interface based on the screen size and orientation of the device.
- The web-based app must function seamlessly across popular web browsers (Chrome, Safari, Firefox, and Edge) without requiring additional plugins.

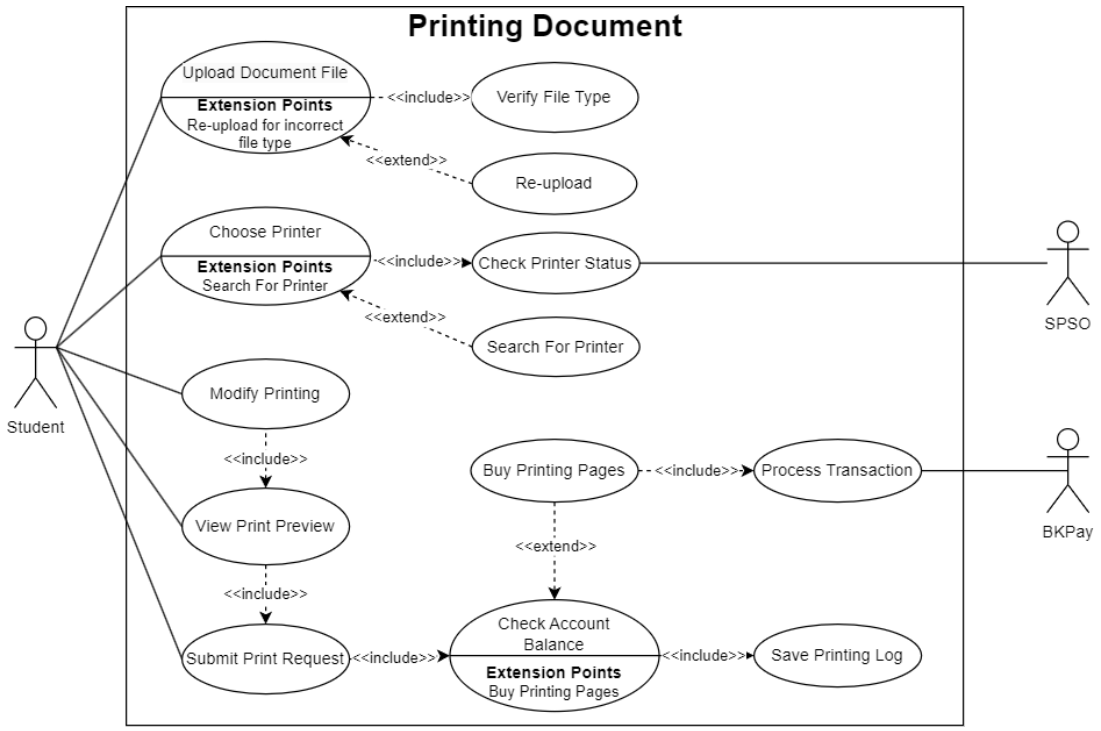
- **Reliability:**
  - The printing service should be available from 7:00 to 20:00 on every working day (Monday to Friday) and from 7:30 to 17:00 on Saturday.
  - The system must operate properly (no errors, no crashes, no failures) during working days from Monday to Saturday. If there is an error from the printers, it will automatically try to restart up to three times.
- **Robustness:**
  - The system must maintain data integrity and accuracy in logging student activities and printer usage.
  - The system must back up data regularly, with a backup schedule of at least once daily to prevent data loss.
- **Portability:**
  - Printers must be placed in each faculty office and in the library.
  - Each faculty office must have at least one printer, and the library must have at least five.
  - The web-based app must be designed to be accessible from a variety of devices, including desktops, laptops, tablets, and smartphones.

2. Use-case Diagrams (1.3)

2.1 Use-case Diagram for the Whole System



2.2 Use-case Diagram for Printing Module



2.3 The Details of Usecases in Printing Document Module

1. Usecase Upload Document File

Use Case ID	UC-PD01		
Use-case name	**Upload Document File**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	Student want to upload document file for printing		
Description	Student select file(s) on his device and upload them to the system for printing		
Preconditions	- The student has logged into the system		

	- The student's device can connect to the internet and the system
Postconditions	A completely new file is uploaded to the system
Normal Flow	1) The student selects the "Upload file" button 2) The system opens the interface to select the file to upload 3) The student selects the file to upload 4) The student clicks the confirm button
Alternative Flows	1) In step 2.1, the student can access the web interface provided by the printing system and upload files directly from their computer or cloud storage (e.g., Dropbox, Google Drive, etc.) 2) In step 2.2, the student can drag and drop the file into the designated area on the web interface for a quick upload
Exceptions	Exception 1: At step 5, the file upload fails because the file size is too big

2. Usecase Re-upload

Use Case ID	UC-PD02		
Use-case name	**Re-upload**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Update**	29/9/2024
Actor	Students		
Trigger	The student wants to re-upload the desired file. Or the system requires re-uploading the file when he uploads the incorrect file type.		
Description	Select a new file and upload it to the system for printing		
Preconditions	- The student has logged into the system - The student's device can connect to the internet and the system		
Postconditions	A completely new file is uploaded to the system.		
Normal Flow	1) The student selects the "Re-upload" button 2) The system opens the interface to select the file to upload		

	3) The student selects the file to upload 4) The student clicks the confirm button
Alternative Flows	After step 2, the system displays 3 buttons: "Select," "Cancel," and "Upload new file": 1) In step 2.1, the student clicks "Cancel" if they cannot find the file to print. 2) In step 2.2, the student clicks "Upload new file" to upload a new file.
Exceptions	None

3. Usecase Verify File Type

Use Case ID	UC-PD03		
Use-case name	**Verify File Type**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	The file upload process by the student is completed and the system will verify file type.		
Description	Once the student uploads a document to the system, the system automatically initiates the "Verify File Type" use case to ensure that the uploaded file format is allowed by the system, based on the configurations set by the SPSO.		
Preconditions	- The student has selected a file to upload. - The file must be in a supported format (e.g., PDF, DOCX, JPEG).		
Postconditions	A completely new file is uploaded to the system		
Normal Flow	1) The student selects the file to upload. 2) The system checks the file type. 3) If the file type is supported, the system proceeds with the upload. 4) If the file type is invalid, the system prompts the user to select a valid file format.		

Alternative Flows	The system offers a list of supported file types before uploading, so the student is aware of acceptable formats.
Exceptions	The system rejects the file because it is of an unsupported format (e.g., an executable file or an unknown format).

4. Usecase Search For Printer

Use Case ID	UC-PD04		
Use-case name	**Search For Printer**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	The student needs to find a specific printer on campus		
Description	The student can search for a specific printer based on information such as location, printer ID, printer brand, or model		
Preconditions	- The student has successfully logged into the system - The student has uploaded the document to be printed to the system		
Postconditions	The student has found a suitable printer		
Normal flow	1) The student selects the "Search printer" option if they need to find a suitable printer on campus 2) The system displays a search interface with multiple search criteria, such as location, printer ID, and wait time 3) The student enters the search criteria to find a printer 4) The system displays search results based on the student's entered criteria and provides a list of suitable printers 5) The student reviews the results in the list and selects the most appropriate printer		
Alternative flow	None		

Exceptions	Exception 1: At step 4, a system error occurs during the search process. The system displays an error message and asks the student to try again Exception 2: At step 4, the student cannot find a suitable printer in the list. The system displays a message stating that no printer matches the search criteria and suggests adjusting the search criteria

5. Usecase Choose Printer

Use Case ID	UC-PD05		
Use-case name	**Choose Printer**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	The student has uploaded the document to the system and needs to choose a printer		
Description	The student can select a printer from a list of available printers to print their document		
Preconditions	- The student has successfully logged into the system - The student has uploaded the document to be printed to the system		
Postconditions	- The student has successfully chosen a printer - The system confirms that the printer has been selected		
Normal flow	1) The system displays an interface with a list of available printers for the student 2) The student reviews the printer information from the list 3) The student selects a printer from the list 4) The student confirms the selected printer 5) The system records the student's selection		
Alternative flow	None		

Exceptions	Exception 1: At step 2, a system error occurs while displaying the list of available printers. The system displays an error message and asks the student to try again Exception 2: At step 3, the selected printer is already in use or encounters an error. The system notifies the student and offers options to either choose another printer or cancel the print job

6. Usecase Check Printer Status

Use Case ID	UC-PD06		
Use-case name	**Check Printer Status**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students, SPSO		
Trigger	The student or SPSO wants to know the current status of a specific printer		
Description	The student or SPSO can check the status of a printer		
Preconditions	The student or SPSO has successfully logged into the system		
Postconditions	The student or SPSO has obtained the current status information of the selected printer		
Normal flow	1) The student selects the "Check printer status" option to view the current status of a specific printer 2) The system displays an interface with a list of printers that the student or SPSO can check 3) The student or SPSO selects a printer from the list to check 4) The system then displays the current status of the printer 5) Based on the status information, the student can decide which printer to use, or SPSO can proceed with maintenance or repairs 6) If the student or SPSO determines the printer to be used, they can select "Choose printer" to interact with the chosen printer		
Alternative flow	None		

Exceptions	Exception 1: If a system error occurs while retrieving the status information, the system displays an error message and asks the student or SPSO to try again

7. Usecase Modify Printing

Use Case ID	UC-PD07		
Use-case name	**Modify Printing**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	Student want to modify some printing properties		
Description	The student can change the printing properties (such as paper size, pages to print, number of copies, or one-/double-sided printing).		
Preconditions	1) The system is operational 2) The database is connected to SSPS 3) Internet connection is available 4) The student is successfully logged in and authenticated 5) The student has uploaded the file to be printed		
Postconditions	None		
Normal flow	1) The student selects the file for which they want to modify the print settings 2) The student selects the "Modify printing" button 3) The system displays a modification dialog box 4) The student updates and selects the desired print settings 5) The student clicks the "Finish" button to complete the modification process		
Alternative flow	1) In the step 5.1: After step 5, if the student wants to modify the settings again, the student selects the "Modify printing" button to continue adjusting the settings		

	2) In the step 5.2: The student selects the "Refresh" button, and the system displays a new modification dialog box, allowing the student to make further adjustments
Exceptions	None

8. Usecase View Print Preview

Use Case ID	UC-PD08		
Use-case name	**View Print Preview**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students		
Trigger	The student wants to see how the document will look based on the selected printing settings		
Description	The student previews the print layout before submitting a print request and the system then generates and displays a visual representation of the document based on the selected printing options		
Preconditions	1) The system is operational 2) The database is connected to SSPS 3) Internet connection is available 4) The student is successfully logged in and authenticated 5) The student has uploaded the file to be printed		
Postconditions	None		
Normal flow	1) The student selects the file to preview 2) The student clicks the "Preview" button 3) The system presents the print preview 4) The student clicks the "Print" button to print the file		
Alternative flow	1) In step 1, the student can select a file that has already been uploaded or click "Preview" after completing the **Modify Print Settings**		

	2) After step 3, the system displays two buttons for selection: "Edit" and "Print": 3.1. The student selects the "Edit" button to modify the print settings 3.2. The student selects the "Preview" button to review the print layout again 3.3. The student selects the "Print" button to print
Exceptions	None

9. Usecase Buy Printing Pages

Use Case ID	UC-PD09		
Use-case name	**Buy Printing Pages**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students, BK Pay		
Trigger	The student attempts to submit a print request but discovers an insufficient balance of printing pages		
Description	The student can purchase additional printing pages using BK Pay		
Preconditions	1) The system is operational 2) The database is connected to SSPS 3) Internet connection is available 4) The student is successfully logged in and authenticated 5) The student has uploaded the file and selected to print it		
Postconditions	None		
Normal flow	1) The system notifies the student of the number of additional pages needed for printing 2) The student selects the "Buy more pages" button 3) The system presents a dialog box for purchasing pages and informs the student of the required payment amount		

	4) The student enters the necessary information as required by the system to complete the transaction 5) The student selects the "Confirm" button to finalize the transaction
Alternative flow	After step 1, the system displays two buttons: "Buy more pages" and "Cancel": 2.1. The student selects the "Cancel" button to cancel the print job
Exceptions	None

10. Usecase Submit Print Request

Use Case ID	UC-PD10		
Use-case name	**Submit Print Request**		
Created by	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Update**	29/9/2024
Actor	Students		
Trigger	The student wants to send the print job request to the system		
Description	The student submits a request to print a document that has been successfully uploaded to the system.		
Preconditions	- The student has successfully uploaded a document to the system. - The student is logged into the system.		
Postconditions	A print request is submitted. Ready to check account balance.		
Normal Flow	1) The student selects the "Submit" button. 2) The system confirms the print request has been submitted successfully.		
Alternative Flows	None		
Exceptions	None		

11. Usecase Check Account Balance

Use Case ID	UC-PD11		
Use-case name	**Check Account Balance**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Update**	29/9/2024
Actor	Student		
Trigger	The student wants to verify their remaining printing pages or buying additional pages		
Description	Students check account balance and BK Pay ensures sufficient funds for printing or other services.		
Preconditions	- The student is logged into the system. - The student's account contains information regarding available funds.		
Postconditions	The system displays the student's account balance and notify students whether they have enough money to make the transaction or not.		
Normal Flow	1) The student selects the "Check Balance" button. 2) The system retrieves the account balance from the database. 3) The system displays the account balance to the student.		
Alternative Flows	None		
Exceptions	None		

12. Usecase Process Transaction

Use Case ID	UC-PD12		
Use-case name	**Process Transaction**		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy

Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	Students, BKPay		
Trigger	The student requests to buy printing pages, prompting the system to process the payment.		
Description	This use case describes the process of purchasing printing pages by interacting with the payment system (BKPay).		
Preconditions	1) The student must have selected the option to buy printing pages. 2) The system must be connected to the BKPay payment gateway.		
Postconditions	The printing pages are added to their account.		
Normal flow	1) The student initiates the process to buy printing pages. 2) System checks the student's account balance via BKPay. 3) BKPay processes the payment transaction. 4) The system confirms the transaction and updates the account balance.		
Alternative flow	In step 2, if there are insufficient funds, the student is prompted to add more funds.		
Exceptions	Exception 1: If the payment fails, the system notifies the student, and the transaction is not processed.		

13. Usecase Save Printing Log

Use Case ID	UC-PD13		
Use-case name	Save printing log		
Created By	Tuấn Huy	**Last Updated By**	Nhật Huy
Date Created	25/9/2024	**Date Last Updated**	29/9/2024
Actor	SPSO		
Trigger	The system successfully processes a print request		

Description	This use case describes the logging of print job information for future reference or auditing.
Preconditions	The print job must have been successfully submitted
Postconditions	The print job information is saved in the system logs
Normal flow	1) After the student submits a print request, the system completes the printing process. 2) The system records the details of the print job (e.g., file name, pages printed, timestamp, printer used). 3) The print log is saved in the system for future auditing or user reference. 4) The system sends a confirmation to the student indicating that the print job was successful and the log has been saved.
Alternative flow	In step 1.1, if the print job fails, the system logs the error details.
Exceptions	None