**Domain Context**

Nowadays, in universities, although learning becomes more paperless, printing is still on demand for students and faculty members. However, there are a few problems for students to find a good printing service, such as:

1. Production cost continues to rise
2. Time-consuming with confirming the layout, materials, design of documents
3. Wasteful, manual, error-prone steps
4. Slow services
5. Out-dated technology

Hence, website HCMUT\_SSPS is built for serving students in HCMUT to print their documents via the printers around the campus. This not only helps students save time by viewing the document, tracking the progress online and integrating with BKPay website; but also helps the Student Printing Service Officer manage the student’s printing activity.

Stakeholders and Needs

1.      Student Printing Service Officer (SPSO)

Description: The SPSO Staff are responsible for managing and supervising student printing activities within the system, as well as the resources used in this system. They also manage what content will be allowed to print, control and moderate the printing activities in the university.

Needs: The SPSO Staff need a tool system that is simple, easy to understand and operate. That system must also have enough functionality to manage and moderate the printing activities like: Can get the student ID, lecturer or other staff who are involved in the printing activities, can check the condition of the printer online, can summarize statistics at each printer.

User story: As a SPSO Staff, I wish to manage and moderate all the printer, printing activities, student, lecturer and other staff. Can turn on/off the printer online.

2.      Student, Lecturer or Staff

Description: All kinds of students in the university: Undergraduate student, Master student, Doctor of Philosophy student, Exchange student, the lecturer and all kinds of staff in the university that have demand to use the printer service. They can use whatever printer in the university as long as it operates normally and is authorized to operate. Also the content printed must be allowed by SPSO. Each semester each student will be given a default number A4 pages. They can buy more A4 pages on the BKPAY if they run out of a given number of pages.

      Needs: They need to print documents, books, references or anything relating to printing.

      User story: As a student, lecturer or staff of the university, I wish to use the printer easily by simply logging in to the BK account. And when I want to print more paper, I also wish to pay through an online payment easily.

3.      Bach Khoa Payment System (BKPAY)

Description: The BKPAY system helps the SPSO collect fees when students, faculty, or staff want to print additional paper. They simply calculate the number of paper the user paid and then update the number paper that can be printed by the account’s user.

      Needs: The BKPAY system wants to link to the bank of each user and can manage the data which define the number of papers each user currently has.

      User story: As a BKPAY system, I want to have an interface to link to the bank of each user and manage their number of papers.

4.      Printer provider

Description: The Printer Provider is responsible for supplying and maintaining the printers used in the HCMUT\_SSPS. This includes installing and configuring printers, ensuring they are operational, and addressing any hardware-related issues that arise. They are also responsible to fix and replace printers whenever they get notified about those compromise printers.

      Needs: They need to have permission from the university to install the printer. They will also need account to have announcement on what printer is in bad condition.

      User story: As a Printer Provider, I wish to have permission from the university to install and set up the printer around the university, and I wish to have something that will immediately notify me so that i can fix it on time.

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*5.      Service Provider – IT team*

*Description: The IT team at HCMUT is responsible for the technical development, maintenance, and support of the Student Smart Printing Service (HCMUT\_SSPS). They ensure that the system runs smoothly, integrates with other university services (like HCMUT\_SSO and BKPay), and is secure. The IT team also handles troubleshooting, system updates, and optimization of the web and mobile platforms.*

*Needs: The IT team needs to examine the environment of all people using this software. They need permission to get the user account, link it to BKPAY. They also need to set up the printer that can manage remote.*

*User story: As the IT team member, I wish to have permission to get the user account to link to the software and so do the BKPAY. I also wish to get to the university network to connect the printer to the SPSO.*

*6.      Guest*

*Description: Those people are just simply like a student's parent, anyone who wants to have a review of HCMUT. Example some high school students want to see the facilities of the university. They can view some features of this software on the printer. But they cannot use it directly. This helps the university to advertise to a lot of high school students.*

*Needs: They just need to have a look at some features. Or like a video display the printing tutorial.*

*User story: As a guest, I wish to have a closer review at the university’s facilities, especially on the printer.*

Benefit of HCMUT-SSPS for each stakeholder from Bảo Lễ:

**Student Printing Service Officer (SPSO)**:

The HCMUT SSPS helps the SPSO staff control the printing system effectively. The printing resources are managed by real-time printer monitoring, remote management, and detailed users’ statistics. With this printing system, the printing waste is reduced and it witnesses an enhancement in overall resource management, a reduction in unauthorized or unnecessary printing.

**Students, Lecturers, and Staff**:

For these groups of users, the system ensures smooth access to printing services by using university login, optimizing the printing process. With single sign-on, the system reduces the time spent managing several accounts, improving convenience. Moreover, the system allows for easy online payment through BKPAY, eliminating the need for paying in cash and enabling quick addition of printing quotas.

**Bach Khoa Payment System (BKPAY)**:  
BKPAY benefits from integration with HCMUT-SSPS as it facilitates streamlined management of printing payments. The system automatically updates user balances based on transactions, reducing administrative overhead. Digital payment systems like BKPAY increase efficiency by automating financial processes, improving accuracy, and minimizing the chances of errors. Furthermore, this integration helps ensure transparent transactions, improving trust between the users and the university.

**Printer Provider**:  
For the printer provider, HCMUT-SSPS offers a proactive maintenance system where printers automatically send alerts for repairs or maintenance. This immediate notification system allows providers to address issues before they escalate, reducing downtime and extending the lifespan of printers. Proactive maintenance has been linked to lower operational costs and improved equipment reliability.

**Functional Requirements**

* Student Printing Service Office (SPSO)
  + Send the report of the using of the printing system automatically at the end of each month and each year and stored in the system (only SPSO can access it)
  + Can add/enable/disable of multi printers
  + Manage the configuration, comprise adjusting the number of pages each user can print per semester, specify which type of file that users allow to upload and print (configuration if need).
  + Allow the SPSO view the printing history of all students or a specify student within a defined date range
  + Provide access to all user account
  + Permit users to print some number of page when it does not excess theirs account balance (one A3 page is equivalent to two A4 pages)
  + Display the status of all printers
* Student, Lecture or Staff
  + Can view theirs printing log for a time period with a summary of number of printed pages fo each page size, Printer ID, time)
  + The system stored the printing log of each user
  + Users can access and view their information
  + Can choose which printer they wish to use
  + Can purchase additional page by using BKAY integration within the system
  + Documents can be uploaded onto the system
  + Changed the printing properties before printing (paper size, pages (of the file) to be printed, one-/double-sided, number of copies, etc)
  + Select the time they want to receive theỉ prints
  + Send an email when finish printing to confirm (Include any changes made in BKPAY)
  + Users maybe allocated a default number of A4-size pages for printing

**Non-Functional Requirements**

* The system are provided through a web-based app and a mobile app
* Can work from a period time
* If have an app, support both IOS and Android
* Printing time must be fast, and the friendly interface and easy to use
* Fix bug and maintain the system
* Security and access management