Software Requirements Specification for

Student Smart Printing Service

**Version 1.0 approved**

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**Revision History**

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| Update domain context | 20/9/2024 | Update domain context | 1.1 |
| Update 1.2, 1.3 | 21/9/2024 | Improve 1.2, 1.3 by reconsidering stakeholders | 1.2 |
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# Task 1: Requirement elicitation (1.1, 1.2)

## 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.

## Stakeholders and Needs

* + 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. **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. **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. **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. **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. **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.

## Benefits of the System

* + 1. **Students:**
* Convenient document printing with flexible options.
* Easy management of printing page balance and history.
* Secure access through HCMUT\_SSO.
  + 1. **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. **University Administration:**
* Ensures compliance with printing policies and privacy regulations.
* Improves cost management and operational efficiency.
* Data-driven insights from automated reports.
  + 1. **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. **Printer Manufacturers:**
* Promotes their printers as reliable and compatible with the university's system.
  + 1. **HCMUT\_SSO Authentication Service:**
* Provides secure and seamless login for all users.
* Simplified integration with the printing system.

## 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.
* The system must allow students to choose which printer they want to use around the campus for convenience, ensuring they can select the nearest or most suitable printer based on location, availability, or specific printing needs.

**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.

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### *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.
  + Recommendation for redistributing resources / 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.

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### *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.

## 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.