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UNIVERSITY OF TECHNOLOGY
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SOFTWARE ENGINEERING (CO3001)

Assignment

A smart printing service for students at HCMUT

Task 1: Requirement Elicitation

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1 Requirement Elicitation

1.1 Domain Context

The Student Smart Printing Service (HCMUT_SSPS) project operates within the context of a university campus environment, influenced by various stakeholders and elements. This domain context comprises the following components:

1. **University Environment**
   - **Academic Departments:** The university includes multiple academic departments, each with unique printing requirements related to coursework, research, and administrative tasks.
   - **Students:** Students from diverse academic backgrounds have varying printing needs, such as assignments, research papers, and administrative documents.
   - **Student Printing Service Officer (SPSO):** The SPSO is responsible for managing and configuring the printing system. They set policies, manage printers, and resolve service-related issues.
   - **University Administration:** The university administration provides oversight and resources for the project to enhance campus services and ensure efficient operations.
   - **Facilities Management:** Personnel responsible for the physical installation and maintenance of printers in various campus locations to ensure hardware functionality.
   - **Finance Department:** The finance department plays a role in budgeting for the project, particularly regarding the online payment system and financial transactions.
2. **Technological Environment**
   - **Information Technology (IT) Department:** The university's IT department oversees the technical implementation and maintenance of the printing system, ensuring security, reliability, and availability.
   - **Online Payment System Provider:** Integration with an online payment system (e.g., BKPay) is a critical aspect of the project, enabling students to purchase additional printing pages seamlessly.
   - **HCMUT_SSO Authentication Service:** User authentication is managed by the HCMUT_SSO authentication service, ensuring secure access to the printing system.
   - **Web and Mobile App Development:** Developers are responsible for creating user-friendly web and mobile interfaces to facilitate access to the printing service.
3. **Legal and Compliance**
   - **Legal Department:** The university's legal department reviews contracts, agreements, and terms of service related to the printing system, online payment integration, and compliance with data protection and privacy regulations.
   - **Compliance and Data Privacy Authorities:** Depending on the university's location and applicable regulations, compliance and data privacy authorities may need to be consulted to ensure that the system complies with legal requirements regarding student data and privacy.
4. **External Services and Standards**
   - **Printer Manufacturers or Suppliers:** If the university contracts with specific printer manufacturers or suppliers, they are stakeholders with an interest in the project's success.

This domain context provides a comprehensive overview of the factors and stakeholders influencing the Student Smart Printing Service (HCMUT_SSPS) project. Understanding this context is essential for effectively designing, developing, and deploying the system to meet the diverse needs of the university community while ensuring compliance and security.

1.2 Stakeholders

1. **Students:**
   - **Needs:**
     - Convenient and efficient printing services for coursework, assignments, and research.
     - Clear information on available printing credits and costs.
     - Easy access to printing history for tracking usage.
   - **Benefits from HCMUT_SSPS:**
     - Convenient access to on-campus student budget-friendly printing services.
     - Transparency in printing credit usage and costs, allowing better budget management.
     - Easy access to printing history for tracking usage, aiding in academic planning.
     - Reduced waiting times and improved efficiency in the printing process.
2. **Student Printing Service Officer (SPSO)**
   - **Needs:**
     - Tools to configure and manage the printing system efficiently.
     - Access to usage data and reports for monitoring and policy adjustments.
   - **Benefits from HCMUT_SSPS:**
     - Streamlined management of printers and system configurations, reducing administrative workload.
     - Access to detailed usage logs and reports for informed decision-making and policy adjustments.
     - Improved user satisfaction with the printing service due to efficient management.
3. **University Administration**
   - **Needs:**
     - Improved campus services for students.
     - Efficient resource allocation and cost control.
   - **Benefits from HCMUT_SSPS:**
     - Enhanced campus services contribute to a positive student experience and improved university reputation.
     - Data-driven insights from reports support optimized resource allocation and cost control.
     - Efficient management of the printing system aligns with the university's commitment to excellence.
4. **Facilities Management:**
   - **Needs:**
     - Well-maintained printing hardware for reliable service.
   - **Benefits from HCMUT_SSPS:**
     - Efficient maintenance and monitoring of printing hardware, reducing downtime and maintenance costs.
     - Reliable printing service contributes to a smoother campus operation and student satisfaction.

5. **Finance Department:**
   - **Needs:**
     - Budget oversight and financial control for the printing service.
   - **Benefits from HCMUT_SSPS:**
     - Accurate tracking of printing-related finances ensures transparent financial management.
     - Integration with an online payment system streamlines financial transactions and minimizes errors.
     - Better control over printing-related expenses and revenue.
6. **IT Department:**
   - **Needs:**
     - Secure and reliable technical implementation of the printing system.
     - Scalability to accommodate growing user and resource demands.
   - **Benefits from HCMUT_SSPS:**
     - Secure and reliable technical implementation of the printing system enhances the university's IT infrastructure.
     - Scalability accommodates growing user and resource demands without major disruptions.
     - Reduced technical issues and increased system reliability.
7. **Online Payment System Provider:**
   - **Needs:**
     - Integration with the university's printing system for financial transactions.
   - **Benefits from HCMUT_SSPS:**
     - Integration with the printing system expands the payment system's user base, increasing revenue.
     - Contribution to seamless financial transactions for printing services enhances user experience.
8. **HCMUT_SSO Authentication Service:**
   - **Needs:**
     - Secure and seamless integration with the printing system.
   - **Benefits from HCMUT_SSPS:**
     - Enhanced security and authentication for system access, reducing the risk of unauthorized access.
     - Seamless user experience with single sign-on simplifies access for all users.
9. **Web and Mobile App Developers:**
   - **Needs:**
     - Clear requirements and guidelines for system interfaces.
   - **Benefits from HCMUT_SSPS:**
     - Well-defined requirements and design ensure the development of user-friendly interfaces.

  - Contribution to a positive user experience, increasing user satisfaction and usability.

10. **Legal Department and Compliance Authorities:**
    - **Needs:**
      - Compliance with legal and data privacy regulations.
    - **Benefits from HCMUT_SSPS:**
      - Ensuring that the system complies with relevant laws and regulations protects the university from legal risks.
      - Protecting student data and privacy strengthens the university's ethical standing and reputation.
11. **Printer Manufacturers or Suppliers:**
    - **Needs:**
      - Successful implementation and utilization of their printing hardware.
    - **Benefits from HCMUT_SSPS:**
      - Increased utilization of their printing hardware on campus leads to higher sales and potential long-term partnerships with the university.
      - Expansion of their presence in the university's printing ecosystem.

By addressing the needs of these stakeholders, the Student Smart Printing Service (HCMUT_SSPS) can provide a range of benefits, including improved user experience, efficient management, financial control, and compliance with legal. These benefits contribute to a more effective and user-friendly printing service within the university environment.

1.3 Functional Requirements

1. **User Authentication:**
   - Users must be authenticated through the HCMUT_SSO authentication service before accessing the system.
2. **Print Job Submission:**
   - Students should be able to upload documents for printing.
   - Students can select a printer from the available options.
   - Students can specify printing properties such as paper size, single/double-sided, number of copies, and page range.
   - Supported file types for printing must be limited and configurable by the SPSO.
3. **Printing Credits and Payments:**
   - The system should maintain a record of students' available printing credits.
   - Students can purchase additional printing pages through the online payment system (e.g., BKPay).
   - The system should deduct the appropriate amount from a student's account when they print.
4. **Logging and Reporting:**
   - The system must log printing actions, including student ID, printer ID, file name, start and end times, and the number of pages for each page size.
   - Generate automatic monthly and yearly usage reports for the SPSO.
   - Provide a summary of the number of printed pages for each page size.
5. **Printer Management:**
   - The SPSO should be able to add, enable, and disable printers in the system.
   - Ensure that printers' details (ID, brand, model, description, location) are configurable.
6. **System Configuration Management:**
   - The SPSO can configure system parameters such as the default number of pages allocated to students, allocation dates, and permitted file types.
   - These configurations should be easily adjustable.
7. **Viewing and Managing Printing History:**
   - The SPSO can view the printing history (logs) of all students or a specific student for a specified time period.
   - The SPSO can view the printing history (logs) of all printers or a some printers.
   - Students can view their own printing history.
8. **Reports Generation:**
   - Automatic generation of end-of-month and end-of-year reports for usage statistics.
   - Reports should be stored within the system and accessible to the SPSO.

9. **Support for A3 Printing:**
    - Ensure that one A3 page is equivalent to two A4 pages when deducting from students' account balances.
10. **User Support:**
    - Provide user support and a helpdesk for addressing user inquiries and issues related to the system.

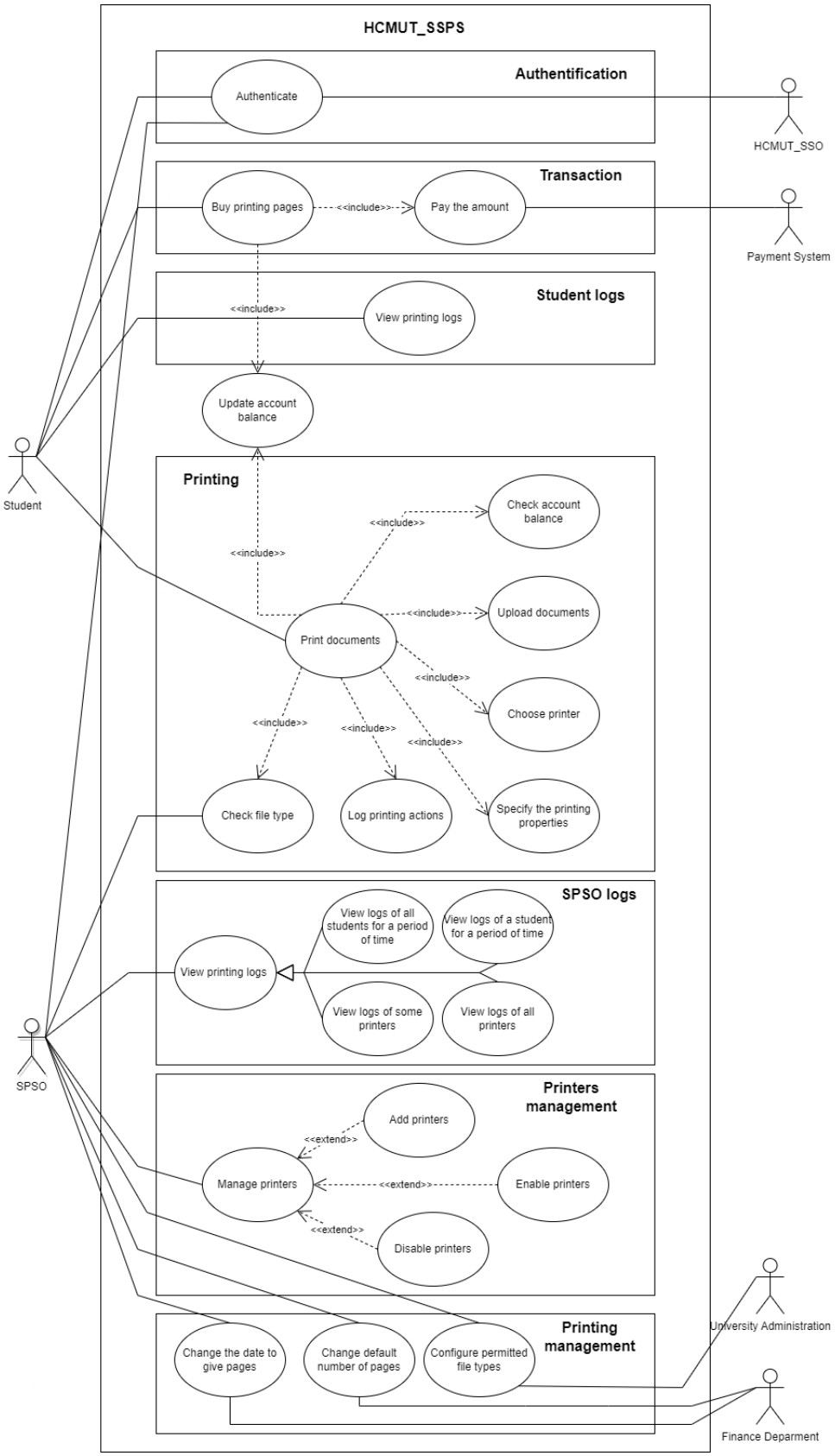
1.4 Non-Functional Requirements

1. **Performance:**
    - The system should provide efficient and responsive performance even during peak usage times.
2. **Security:**
    - Ensure robust data security to protect sensitive student information and printing logs.
    - Implement secure authentication and authorization mechanisms.
    - Regularly conduct security audits and updates.
3. **Reliability and Availability:**
    - Maintain high system availability to ensure students can print when needed.
    - Implement backup and disaster recovery mechanisms to prevent data loss.
4. **Scalability:**
    - The system should be designed to accommodate a growing number of users, printers, and printing requests.
5. **Usability and Accessibility:**
    - The user interface (both web-based and mobile) should be intuitive and accessible to users with disabilities.
    - Ensure compatibility with common web browsers and mobile devices.
6. **Compliance and Data Privacy:**
    - Comply with relevant data privacy regulations (e.g., GDPR, HIPAA) and university policies regarding student data.
    - Maintain data retention and deletion policies.
7. **Integration:**
    - Seamlessly integrate with the HCMUT_SSO authentication service and the online payment system (e.g., BKPay).
    - Support future integration with other university systems if necessary.
8. **Error Handling and Logging:**
    - Implement robust error handling mechanisms and log errors for troubleshooting.
    - Log system events for monitoring and auditing purposes.

9. **Compliance with Standards:**
    - Follow industry best practices and coding standards for software development.
    - Ensure compliance with web and mobile app development standards.

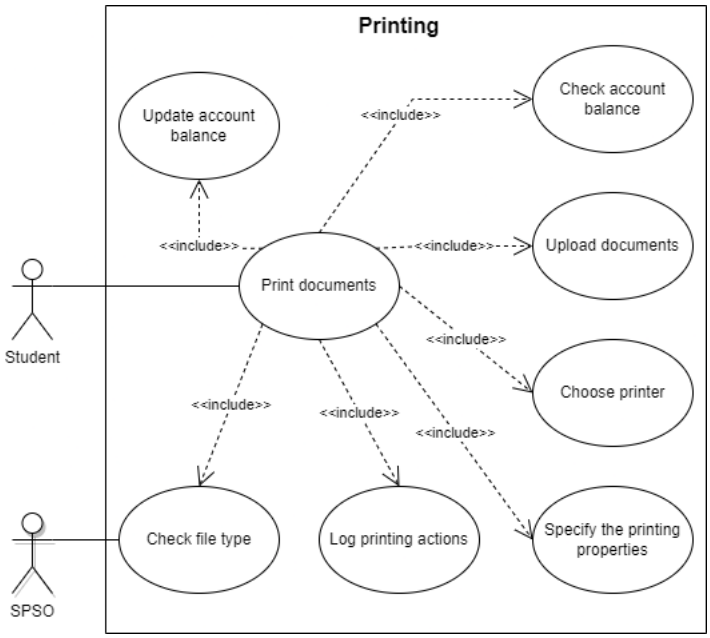
1.5 Use-case Diagram

1.5.1 System Use-case Diagram



1.5.2 Printing Module

1.5.2.a Use-case Diagram

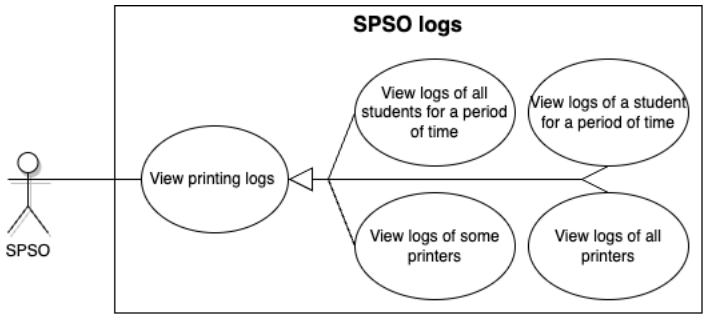


1.5.2.b Use-case Diagram Description

Use-case Name	Print documents
Actor(s)	Students, SPSO
Description	Students can print documents.
Pre-condition(s)	Students have authenticated successfully.
Post-condition(s)	1. Students can print documents successfully. 2. Printing actions are logged.
Trigger	Students click the "Printing" option button.
Normal flow	1. Students navigate to the functional menu. 2. Students choose the printing option. 3. Students upload the documents. 4. Based on the information from SPSO, verify that the document formats are compatible. 5. Students choose the printer to print. 6. Students specify the printing properties. 7. Students click the confirmation "Print" button. 8. The system checks the account balance is sufficient. 9. The system deducts a needed amount of balance from the account. 10. The system adds the printing actions to log activity. 11. Documents are printed.
Alternative flow	No alternative flow.
Exception flow	4a. The system verifies the document formats are not compatible and shows notice. 4a1. Students choose the cancel printing option (Use-case stops). 4a2. Students choose the retry printing option (Use-case continues at step 3). 4b. The system verifies the account balance is not sufficient and shows notice. 4b1. Students choose the cancel printing option (Use-case stops).

1.5.3 SPSO logs Module

1.5.3.a Use-case Diagram



1.5.3.b Use-case Diagram Description

Use-case Name	View printing logs
Actor(s)	SPSO
Description	SPSO can view the action printing logs.
Pre-condition(s)	SPSO have authenticated successfully.
Post-condition(s)	The corresponding logs are shown.
Trigger	SPSO click the "View logs" option button.
Normal flow	1. SPSO navigates to the functional menu. 2. SPSO chooses the view logs option. 3. SPSO chooses which printing history to show. 4. SPSO chooses the time period. 5. Printing history is shown.
Alternative flow	3a. SPSO chooses to view from all students (Use-case continues at step 4). 3b. SPSO chooses to view from a student. 3b1. SPSO enters the student ID (Use-case continues at step 4). 3c. SPSO chooses to view from all printers (Use-case continues at step 4). 3d. SPSO chooses to view from some printers. 3d1. SPSO chooses some printers (Use-case continues at step 4).
Exception flow	No exception flow.