

Development of a Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals at Systems Plus College Foundation

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ABSTRACT

The management of PCs and computer peripherals in educational institutions requires accurate equipment records, updated availability information, and proper tracking of borrowing and returns. However, manual or separate records can make it difficult to maintain accurate equipment information, monitor availability, and track equipment borrowing and accountability across institutional facilities. This study proposes the development of a Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals at Systems Plus College Foundation (SPCF). The proposed system will integrate equipment inventory, availability, borrowing requests, custodian approval, returns, loan duration, and overdue monitoring into one centralized platform. It will use a hybrid cloud-local framework, where the cloud-based web system will manage centralized inventory and borrowing information, while a local network monitoring program will use ICMP (ping) and SNMP to monitor the connectivity status and network information of authorized PCs and computer peripherals across campus subnets. The study will employ a descriptive-developmental research design with a quantitative approach and will use Agile-Scrum for system development. The system will be developed and tested using authorized or sample equipment information and a controlled network environment, while actual monitoring of SPCF devices will depend on institutional authorization. The proposed system is expected to provide a more organized approach to equipment inventory, borrowing management, accountability, and network status monitoring across SPCF facilities.

Keywords: Equipment Inventory Management, Equipment Borrowing Management, Network Monitoring, ICMP, SNMP, Hybrid Cloud-Local System, Systems Plus College Foundation

SECTION I — INTRODUCTION (THE PROBLEM AND ITS SETTING)

1.1 Introduction

The management of computers, peripherals, and other institutional equipment is an important part of educational institutions because these resources support academic, laboratory, and administrative activities. As the number of equipment and users increases, institutions need organized ways to record equipment information, check availability, and monitor the use of shared resources. Digital asset management systems have been developed to help institutions organize asset records and make equipment information easier to access. Ahmad (2023) presented an electronic asset inventory and management system for recording, tracking, and monitoring school resources, while Purnawan and Aldy (2025) discussed the use of digital technologies in managing assets in educational institutions. Kusumojati and Mediawati (2024) also showed how web-based asset management can help higher education institutions organize asset information, equipment classification, and condition records.

Equipment borrowing is also an important part of institutional asset management because equipment may be shared among students, employees, laboratories, and departments. When records are maintained manually or separately, it can become difficult to determine the current availability of equipment, identify who borrowed an item, and track when it should be returned. Pamungkas et al. (2024) identified problems related to inaccurate inventory information, untracked loans, and equipment accountability in a university laboratory. Similarly, Austero (2026) developed a web-based equipment borrowing and computer inventory management system to address problems involving inaccurate records, fragmented logbooks, delays, and limited visibility of equipment availability. Sitompul et al. (2025) also developed a web-based system for laboratory equipment borrowing, returning, and inventory management, showing the use of a centralized system to organize these related activities.

Other studies have explored the use of technology to make equipment management more organized and easier to monitor. Paredes-Rivera and Tite-Haro (2025) developed a web-based inventory and loan management system for higher education that focused on improving accuracy, traceability, and the organization of loan processes. Network monitoring has also been applied in educational environments. Hasanudin et al. (2026) developed a centralized SNMP-based monitoring system for network devices in a school environment, while Juliansyah et al. (2026) developed a web-based network monitoring system in a university environment using ICMP, SNMP, and other network protocols. These studies provide a basis for using digital inventory, borrowing management, and network monitoring as related components of an equipment management system.

However, the reviewed studies generally focus on specific equipment management functions, such as inventory, borrowing, asset tracking, or network monitoring. They do not specifically focus on managing SPCF's PCs and computer peripherals through one centralized system that combines equipment inventory and borrowing management with network-based monitoring of authorized devices across different campus facilities. This gap provides the basis for the proposed study.

Therefore, this study proposes the Development of a Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals at Systems Plus College Foundation. The proposed system will combine equipment inventory, availability information, borrowing requests, custodian approval, return records, loan duration, and overdue monitoring in one centralized platform. It will also include a local network monitoring component that will use ICMP (ping) and SNMP to monitor the connectivity status and network information of authorized PCs and computer peripherals across campus subnets. The cloud-based system will manage the centralized inventory and borrowing information, while the local component will collect network monitoring information within the campus environment. Actual monitoring of SPCF devices will remain subject to institutional authorization.

1.2 Background of the Study

Educational institutions rely on computers, peripherals, laboratory equipment, and other information technology resources to support their daily academic and administrative activities. Proper equipment management requires updated information about the available assets, their assigned locations, their status, and their use. Digital asset management provides a way to organize this information and make records easier to access and maintain.

ISO/IEC 19770-1:2017 provides requirements for IT asset management systems, while studies such as those of Kusumo Jati and Mediawati (2024) and Purnawan and Aldy (2025) demonstrate how digital systems can be applied to organize institutional assets.

The need for organized asset management becomes more important when equipment is shared by different users and departments. Manual inventory procedures may require separate records for equipment information, borrowing transactions, and returns, which can make it more difficult to maintain consistent and updated records. Pamungkas et al. (2024) reported issues involving inaccurate inventory data, untracked loans, and accountability in a university laboratory setting. Faizal and Irfan (2025) also developed a web-based campus asset management system to address problems related to manual recording, duplicated information, and delays in inventory reporting. These studies show the value of using digital systems to organize asset information and reduce the dependence on separate manual records.

Borrowing management is closely connected to equipment inventory because the availability of an item changes when it is requested, borrowed, or returned. Austero (2026) developed an equipment borrowing and computer inventory management system that included functions for managing equipment and borrowing activities. Cepeda and Saludes (2025) also developed an online ICT equipment inventory and borrowing system with digital borrowing processes and inventory information. Sitompul et al. (2025) further demonstrated the use of a web-based system for equipment inventory, borrowing, and returning. These studies support the integration of inventory and borrowing functions so that equipment records and transactions can be managed within the same system.

Technology can also be used to provide information about network-connected devices. Network monitoring systems commonly use protocols such as ICMP and SNMP to check device connectivity and obtain available network information. Hasanudin et al. (2026) implemented centralized SNMP monitoring in a school environment, allowing network devices to be monitored through a centralized platform. Juliansyah et al. (2026) likewise developed a web-based network monitoring system for a university environment using ICMP, SNMP, SSH, and API-based monitoring. These studies show that network monitoring can support the observation of network-connected equipment in educational environments.

For Systems Plus College Foundation, these related studies provide a basis for developing a centralized system specifically focused on PCs and computer peripherals. The proposed system will organize equipment information, availability, borrowing requests, custodian approvals, returns, loan duration, and overdue records. It will also include a local monitoring program that will use ICMP (ping) and SNMP to monitor authorized devices across campus subnets. The cloud-based system will serve as the main platform for centralized inventory and borrowing management, while the local component will perform network monitoring within the campus network.

The study will be developed and tested using authorized or sample equipment information and a controlled network environment. Actual monitoring of SPCF devices will depend on institutional authorization and network accessibility. Through this approach, the proposed system aims to provide SPCF with an organized way to manage equipment inventory and borrowing activities while supporting the monitoring of authorized network-connected PCs and computer peripherals.

1.3 Objectives of the Study

The general objective of this study is to develop a centralized equipment inventory and borrowing management system for monitoring PCs and computer peripherals at Systems Plus College Foundation. The system aims to organize equipment records, availability, borrowing activities, and network monitoring information through one centralized platform. The specific objectives of the study are: 1. System Development: To design and develop a cloud-based web system that allows departments to submit equipment requests, enables authorized custodians to approve requests, and manages equipment lending through a centralized platform. 2. Network Integration: To implement a local network monitoring program that uses ICMP (ping) and SNMP to monitor the connectivity status and network information of authorized PCs and computer peripherals across campus subnets. 3. Borrowing and Tracking: To develop a centralized process for managing equipment requests, approvals, borrowing, loan duration, returns, and overdue records. 4. System Evaluation: To evaluate the proposed system in terms of functional suitability, usability, performance efficiency, and reliability based on the ISO/IEC 25010 software quality model.

1.4 Scope and Limitation of the Study

This study focuses on the development of a Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals at Systems Plus College Foundation. The proposed system will provide a centralized platform for managing equipment information across different departments and facilities of SPCF. It will cover equipment inventory, availability, equipment location or network information, borrowing and returning transactions, custodian approval, loan duration, and overdue tracking.

The system will use a hybrid cloud-local framework. The cloud-based web system will provide the main platform for equipment inventory, equipment requests, custodian approvals, borrowing records, return records, and overdue monitoring. A centralized database will store the equipment and borrowing information. The local network monitoring component will operate within the campus network and use ICMP (ping) and SNMP to check the connectivity status and gather available network information from authorized PCs and computer peripherals across campus subnets.

The study will involve the identified users and personnel who are related to equipment management, borrowing, and system evaluation. Equipment custodians will be responsible for managing equipment records, reviewing requests, approving borrowing transactions, and recording returns. Authorized users or departments will be able to view equipment availability and submit borrowing requests through the system.

The study will be limited to PCs and computer peripherals within Systems Plus College Foundation and will focus on inventory, availability, borrowing, returning, and related network monitoring functions. It is not intended to replace all existing institutional asset-management processes or systems outside the identified equipment and borrowing activities. The study will also not automatically determine the physical condition of equipment or its exact physical location through network monitoring.

The network monitoring component will depend on the availability and accessibility of the campus network, as well as the proper configuration and support of the monitored devices. Devices that are disconnected, inaccessible, improperly configured, or do not support the required monitoring functions may not be detected or monitored accurately. Actual monitoring of SPCF devices will also depend on authorization from the appropriate institutional personnel, particularly the Information Technology Services (ITS) or other authorized personnel.

If access to actual SPCF devices or the campus network is not granted, the researchers will use authorized or sample equipment information and a controlled network environment for development and testing. In such a case, the inventory and borrowing functions can still be developed and evaluated, while actual campus network monitoring will remain subject to institutional authorization.

1.5 Significance of the Study

This study aims to develop a centralized equipment inventory and borrowing management system for monitoring PCs and computer peripherals at Systems Plus College Foundation. The proposed system focuses on organizing equipment records, monitoring availability, managing borrowing transactions, and providing network status information for authorized devices. The study may provide useful support to the following: Systems Plus College Foundation

The proposed system can help Systems Plus College Foundation organize information about its PCs and computer peripherals through one centralized platform. It can provide information about equipment availability, borrowing records, loan duration, overdue transactions, and network status of authorized devices. These functions may support the institution in maintaining more organized equipment records and improving equipment accountability across departments and facilities.

Equipment Custodians

The system can help equipment custodians manage equipment records and borrowing activities more efficiently. It can provide a centralized view of equipment availability and borrowing requests, while allowing custodians to approve requests, record borrowing and returns, monitor loan duration, and identify overdue equipment. The network monitoring information can also provide additional information about the connectivity status of authorized

devices. Departments and Authorized Users

The proposed system can provide departments and authorized users with easier access to equipment availability information before submitting a request. Users can submit equipment borrowing requests through the system and receive a more organized process for requesting and returning equipment. This can help reduce confusion regarding equipment availability and borrowing records. IT Personnel or Authorized Network Administrators

The network monitoring component can provide authorized IT personnel with information about the connectivity status and available network information of supported devices. This can serve as an additional source of equipment and network status information while remaining within the access and authorization provided by the institution. Future Researchers

The study can serve as a reference for future researchers who plan to develop systems related to equipment inventory, borrowing management, asset tracking, or network monitoring in educational institutions. Future studies may also build upon the proposed hybrid cloud-local approach or explore additional monitoring and asset-management functions.

1.6 Definition of Terms

Centralized Platform – A single, unified system where related data, documents, and processes are stored and managed in one location instead of being scattered across multiple systems. In this study, it refers to the proposed platform where equipment inventory, borrowing, return, and related records are managed in one system.

Cloud-Based System – A system that provides hosted services and resources through the Internet. In this study, the cloud-based system serves as the main platform for managing centralized equipment inventory and borrowing information.

Hybrid Cloud-Local Framework – An integrated computing environment that combines cloud-based services with local infrastructure or a local network. In this study, the framework uses a cloud-based system for centralized equipment and borrowing management and a local component for network monitoring within the campus network.

ICMP (Internet Control Message Protocol) – A network protocol used to transmit control and diagnostic messages between network devices. In this study, ICMP is used through the ping function to check the connectivity status of authorized PCs and computer peripherals.

SNMP (Simple Network Management Protocol) – A network management protocol used to collect and manage available information from supported devices connected to an IP network. In this study, SNMP is used by the local monitoring program to collect available network information from authorized devices.

Borrowing Management System – A system used to record and manage the borrowing and returning of physical equipment. In this study, it refers to the system used to manage equipment requests, custodian approval, borrowing transactions, return records, loan duration, and overdue records. **Subnet** – A smaller logical network created by dividing a larger IP network into smaller network segments. In this study, subnet information is used to identify the network segment where authorized PCs and computer peripherals are connected and to support network monitoring across campus facilities.

Equipment Inventory – A complete record of physical equipment owned or managed by an organization, including information such as equipment type, status, location, and availability. In this study, the equipment inventory contains records of PCs and computer peripherals that can be monitored, borrowed, and returned.

PC (Personal Computer) – A general-purpose computing device designed for individual use and capable of performing tasks such as data processing, communication, document creation, and information management. In this study, PCs are among the equipment included in the inventory and network-monitoring components of the proposed system.

Computer Peripherals – External hardware devices connected to a computer through wired or wireless connections to provide input, output, storage, or additional computing functions. Examples include keyboards, mice, webcams, monitors, and external drives. In this study, computer peripherals are included as equipment that can be recorded, monitored when applicable, borrowed, and returned.

SECTION II — LITERATURE REVIEW

2.1 Introduction to the Review

This chapter presents the related literature and studies on digital equipment inventory, asset management, borrowing, tracking, and monitoring in educational institutions. The reviewed literature is organized into themes covering digital asset and inventory management, equipment borrowing and accountability, and the use of technology for centralized equipment management. These studies provide a basis for understanding existing approaches and identifying the gap addressed by the proposed system for Systems Plus College Foundation.

2.2 Review of Related Literature and Studies

2.2.1. Digital Asset and Equipment Inventory Management

Digital asset and equipment inventory management has become an important part of managing institutional resources because schools and universities may have large numbers of computers, peripherals, laboratory equipment, and other technological resources distributed across different departments. Maintaining accurate information about these resources allows institutions to identify available equipment, monitor their status, and maintain organized records. Ahmad (2023) developed an electronic asset inventory and management system that supports the recording, tracking, and monitoring of school resources. Similarly, Purnawan and Aldy (2025) reviewed asset management systems for educational institutions and emphasized the use of digital technologies to improve the organization and management of institutional assets. These studies show that digital inventory systems can provide institutions with a more organized way to manage equipment information compared with separated or manual records. Kusumojati and Mediawati (2024) examined web-based asset management information systems in higher education. Their study focused on organizing asset information, including equipment classification and condition records, and improving access to asset data. Faizal and Irfan (2025) also developed a web-based campus asset management system that addressed problems associated with manual recording, duplicated information, and delays in inventory reporting. These studies demonstrate the value of web-based systems for maintaining centralized and accessible asset information. In the Philippine setting, digital inventory management has also been applied in higher education. A study from Central Philippine University developed an automated laboratory inventory and borrowing system for its Electronics Engineering laboratories. The researchers identified traditional inventory and borrowing procedures as a source of possible human errors and ineffective time management. The proposed system included inventory and borrowing subsystems and used RFID to identify assets and borrowers. The reviewed literature shows that digital inventory systems can help institutions organize equipment records, identify available resources, and improve access to asset information. However, most of the studies focus mainly on inventory management or specific laboratory settings. This supports the need for the proposed SPCF system to focus specifically on PCs and computer peripherals distributed across different institutional facilities and to connect inventory information with other equipment-management functions.

2.2.2. Equipment Borrowing, Returning, and Accountability

Equipment borrowing is closely connected to inventory management because institutional equipment is often shared among students, employees, laboratories, and departments. When equipment is borrowed, the inventory status changes and information about the borrower, borrowing date, expected return date, and actual return must be recorded. Proper borrowing management can therefore help institutions maintain accountability for shared resources. Austero (2026) developed an equipment borrowing and computer inventory management system that addressed problems involving inaccurate records, fragmented logbooks, delays, and limited visibility of equipment availability. Cepeda and Saludes (2025) also developed an online ICT equipment inventory and borrowing system with decision-support functions. Their work demonstrates how inventory information and borrowing activities can be connected within an online system. Sitompul et al. (2025) developed a web-based system for laboratory equipment borrowing, returning, and inventory management. The study focused on organizing equipment information and borrowing transactions through a digital platform. Similarly, Wicaksono et al. (2021) developed a laboratory equipment inventory system using RFID and IoT that included borrower information, borrowing and returning times, and equipment availability. In the Philippines, Biso et al. (2025) developed the Automated

Laboratory Inventory and Borrowing System for the Central Philippine University Electronics Engineering laboratories. The system consisted of inventory and borrowing subsystems, with RFID tags used to identify laboratory assets and students. The system was tested through functionality, RFID validation, integration, and user perception testing. The researchers reported that the system was functional and supported inventory, borrowing, and returning activities. An earlier Philippine study by Lim et al. (2010) also developed an automated laboratory equipment borrowing system using RFID technology. The system allowed users to view available equipment through a web-based database and provided information about their borrowed equipment. These studies demonstrate that digital borrowing systems can help record equipment transactions and improve accountability. However, the proposed SPCF system will focus on PCs and computer peripherals, while also incorporating custodian approval, loan duration, return recording, and overdue monitoring within a centralized platform.

2.2.3. Centralized and Web-Based Equipment Management

Centralized systems allow equipment information and related transactions to be managed through one platform. This approach is useful when resources are distributed across different departments or facilities because users and authorized personnel can access information from a common system rather than relying on separate records. Paredes-Rivera and Tite-Haro (2025) developed an inventory and loan management system for higher education institutions using a web-based approach. Their study focused on improving the organization, accuracy, and traceability of inventory and loan activities. This demonstrates how inventory and borrowing functions can be combined within a single platform. Fauzi, Ar Rosyid, and Herwanto (2024) developed a digital laboratory management system that converted manual procedures, forms, and workflows into digital processes. The system included equipment inventory management and role-based access, showing how different users can be given appropriate access to institutional equipment information. Pamungkas et al. (2024) developed a web-based inventory information system for a university robotics laboratory. Their study identified concerns involving inaccurate inventory information, untracked loans, and equipment accountability. The system provided a digital approach for organizing equipment information and related transactions. A Philippine study by Belvis et al. examined a centralized ICT network resource management system at the Lyceum of the Philippines University–Cavite. The system was designed to streamline the management and documentation of network equipment and IP addresses under one centralized platform. It included inventory and monitoring functions and was evaluated using ISO/IEC 25010 characteristics. The literature demonstrates that centralized web-based platforms can connect different equipment-management activities and provide a common source of information. This is directly related to the proposed SPCF system because the study will use a centralized cloud-based platform for inventory, availability, borrowing, approval, return, and overdue information.

2.2.4. PC and Computer Equipment Management

PCs and computer peripherals are important institutional resources because they are commonly used for academic activities, laboratory operations, administrative work, and other school functions. Unlike general inventory items, computer equipment may also require information related to network connectivity, IP address, network segment, and device status. Pamungkas et al. (2024) developed an inventory information system for a university robotics laboratory and identified the need to organize equipment information and borrowing activities. Austero (2026) also specifically addressed computer inventory together with equipment borrowing, demonstrating the relevance of computer equipment as a distinct category within institutional inventory systems. Belvis et al. focused specifically on ICT network resources and developed a centralized system for managing network equipment and IP addresses at the Lyceum of the Philippines University–Cavite. Their study demonstrates that ICT equipment management may include both inventory information and technical network information. The management of computer equipment is therefore not limited to recording an item as available or borrowed. Additional information, such as network-related information, may provide authorized personnel with a better understanding of the status of connected equipment. For the proposed study, this is particularly relevant because SPCF's equipment scope includes PCs and computer peripherals. The proposed system will therefore combine equipment records and borrowing information with network monitoring information for authorized devices.

2.2.5. Network Monitoring of Computer Devices

Network monitoring allows administrators to observe the connectivity and available network information of connected devices. In educational institutions, network monitoring can support the management of infrastructure used by laboratories, classrooms, offices, and other campus facilities. Hasanudin, Hanifatunnisa, and Hanafi (2026) implemented a Simple Network Management Protocol (SNMP) monitoring system for network devices in a vocational school environment. Their study demonstrates the use of centralized monitoring for observing network-connected equipment within an educational institution. Juliansyah, Geges, and Kristianti (2026) developed a web-based network monitoring system at Universitas Palangka Raya. The system used several protocols, including

ICMP and SNMP, for monitoring network devices. The study shows how network-monitoring information can be collected and presented through a centralized web-based system. Rizqi, Saedudin, and Hedyanto (2026) examined an SNMP-based network monitoring system at Telkom University. The monitored environment included laboratory computers and laptops, with monitoring parameters including interface status, memory usage, and ping response.

Zapata (2025) developed an SNMP-based dashboard for monitoring network infrastructure at FaCENA-UNNE. The system collected network performance and device-status information and presented the information through a centralized dashboard. These studies provide support for the proposed network-monitoring component. In the proposed SPCF system, ICMP/ping will be used to check device reachability, while SNMP will be used to obtain available information from supported and authorized devices. The resulting information can then be associated with the corresponding equipment record in the centralized system.

2.2.6. Integration of Inventory, Borrowing, and Network Monitoring

The reviewed literature shows that equipment inventory, borrowing management, and network monitoring have been widely studied as individual functions. Inventory studies generally focus on recording and organizing assets, borrowing studies focus on requests and transactions, while network-monitoring studies focus on device connectivity and network information. Studies by Ahmad (2023), Purnawan and Aldy (2025), and Kusumojati and Mediawati (2024) demonstrate the importance of digital asset and inventory management. Austero (2026), Cepeda and Saludes (2025), Sitompul et al. (2025), and Biso et al. (2025) demonstrate how digital systems can support equipment borrowing, returning, and accountability. Meanwhile, Hasanudin et al. (2026), Juliansyah et al. (2026), and Rizqi et al. (2026) demonstrate how network monitoring can provide information about connected devices. The literature therefore provides support for each major component of the proposed system. However, the reviewed studies generally focus on one or two of these functions rather than specifically combining equipment inventory, borrowing management, and network-based monitoring of PCs and computer peripherals across different facilities within one centralized platform. This provides the research gap addressed by the proposed study. The proposed SPCF system will combine centralized equipment inventory, equipment availability, borrowing requests, custodian approval, loan duration, return and overdue records with a local monitoring component using ICMP/ping and SNMP. The cloud-based platform will serve as the centralized management system, while the local component will collect network information from authorized devices within the campus network. The integration of these functions is intended to provide one organized source of equipment and borrowing information while also providing network-related status information for authorized PCs and peripherals.

2.3 Conceptual Framework

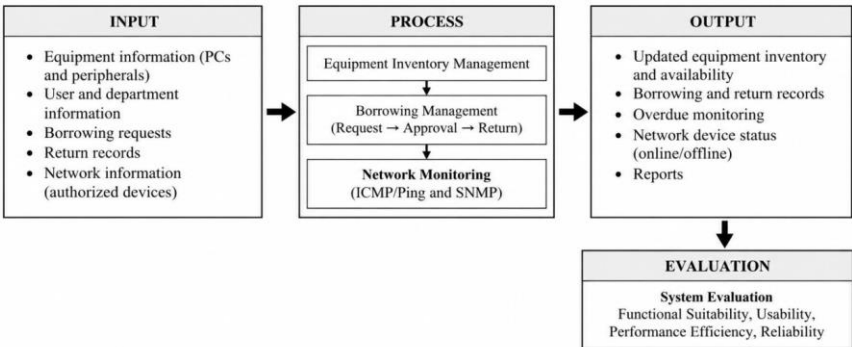


Figure 1. Input-Process-Output Conceptual Framework of the Proposed System

2.4 Synthesis

The reviewed literature and studies show that digital systems are increasingly being used to improve equipment inventory, asset management, borrowing, tracking, and accountability in educational institutions. Ahmad (2023) and Purnawan and Aldy (2025) emphasized digital asset management, while Austero (2026), Cepeda and Saludes (2025), and Zambas et al. (2025) demonstrated different approaches to equipment borrowing and resource tracking. Other studies, such as those by Kusumojati and Mediawati (2024), Fauzi et al. (2024), and Pamungkas et al. (2024), further support the use of web-based and digital systems for organizing equipment information and managing institutional resources. Although these studies address different aspects of equipment management, the reviewed literature does not specifically focus on SPCF's PCs and computer peripherals through one centralized system that combines inventory and borrowing management with network-based monitoring of authorized devices across campus facilities. Therefore, the proposed study addresses this specific setting by developing a centralized equipment inventory and borrowing management system for SPCF. The system will combine equipment records, availability, borrowing requests, custodian approval, returns, loan duration, and overdue monitoring with network-based monitoring using ICMP (ping) and SNMP. This provides the basis for the proposed system and its focus on organized equipment management and monitoring within SPCF.

SECTION III — METHODOLOGY

3.1 Research Design

The research employs a descriptive-developmental research design based on a quantitative methodology. During the descriptive phase, the researchers will document the existing equipment inventory and borrowing procedures within Systems Plus College Foundation. This will provide information about the current process and the requirements needed for the proposed system.

During the developmental phase, the researchers will design, develop, and evaluate the Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals. The proposed system will provide functions for equipment inventory management, equipment availability, borrowing requests, custodian approval, borrowing and return records, loan duration, and overdue monitoring. It will also include a local network monitoring component that will use ICMP (ping) and SNMP to monitor the connectivity status and available network information of authorized devices.

The quantitative aspect of the study will be used to evaluate the developed system based on selected software quality characteristics: functional suitability, usability, performance efficiency, and reliability. These characteristics are part of the software quality evaluation approach identified in ISO/IEC 25010.

3.2 System Development Methodology

The Agile-Scrum methodology will be used to guide the iterative development of the proposed system. The researchers will divide the development into manageable iterations or sprints, allowing the system functions to be developed, tested, and improved throughout the development process.

The development team will gather system requirements from the identified stakeholders, including equipment custodians, IT personnel, and authorized equipment borrowers. Information about the existing equipment management and borrowing procedures will be used as a basis for identifying the required system functions.

During each sprint, the researchers will develop selected system functions, test their operation, and review the results. Feedback from the identified stakeholders will be used to improve the system in the succeeding development iterations. The major functions to be developed include equipment inventory management, equipment availability, borrowing requests, custodian approval, borrowing and return records, loan duration,

overdue monitoring, and network monitoring.

The network-monitoring component will be developed separately as a local component that will use ICMP (ping) and SNMP to check authorized devices. The collected monitoring information will then be connected to the centralized system according to the final system design and available network access.

After the development process, the completed system will be evaluated using a structured questionnaire based on the selected ISO/IEC 25010 characteristics. The collected evaluation data will be analyzed using descriptive statistical methods.

3.3 Requirement Specification and Analysis

This section presents the functional requirements and system processes of the proposed Centralized Equipment Inventory and Borrowing Management System for Monitoring PCs and Computer Peripherals.

The requirement analysis focuses on the functions needed to manage equipment records, equipment availability, borrowing requests, custodian approvals, borrowing and return transactions, loan duration, overdue records, and network monitoring information.

The system processes and data relationships are represented through the Data Flow Diagram (DFD) and Entity-Relationship Diagram (ERD). The DFD illustrates how information moves between users, custodians, the system, and authorized network devices. The ERD presents the main entities and their relationships within the centralized database. A flowchart is also used to illustrate the process of submitting a borrowing request, checking equipment availability, obtaining custodian approval, recording the borrowing transaction, monitoring the loan period, and recording the return.

3.3.1 Functional Requirements

This section outlines the functional requirements for the proposed Centralized Equipment Inventory and Borrowing Management System and describes the system's processes and data structures through a Data Flow Diagram (DFD). The Entity-Relationship Diagram (ERD) presents the main entities and their relationships within the centralized database. Lastly, the flowchart illustrates the processes involved in equipment borrowing, approval, tracking, and return. The system's functionalities include maintaining an equipment inventory, allowing authorized users to submit borrowing requests, obtaining approval from assigned custodians, recording borrowing and return transactions, monitoring loan duration and overdue records, and monitoring the network status of authorized devices.

3.3.2 Data Flow Diagram

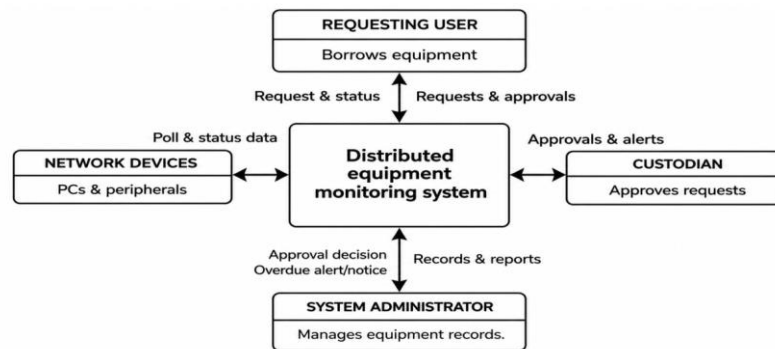


Figure 2. Data Flow Diagram Level 0 of the Proposed System

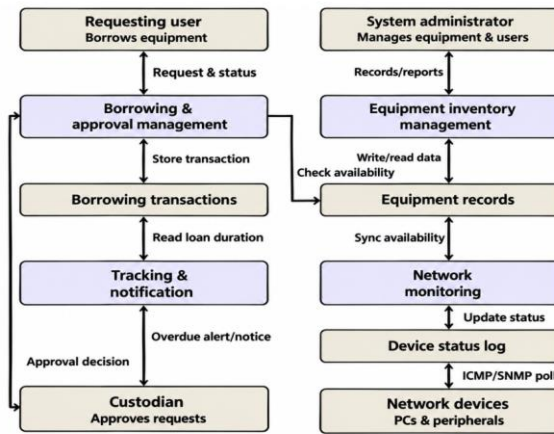


Figure 3. Data Flow Diagram Level 1 of the Proposed System

3.3.3 Entity-Relationship Diagram

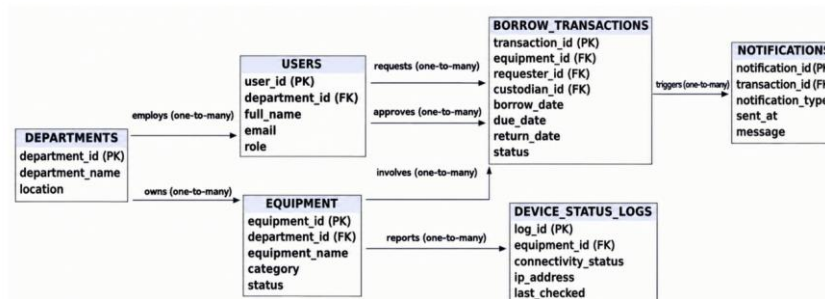


Figure 4. Entity-Relationship Diagram of the Proposed System

3.3.4 Flowchart

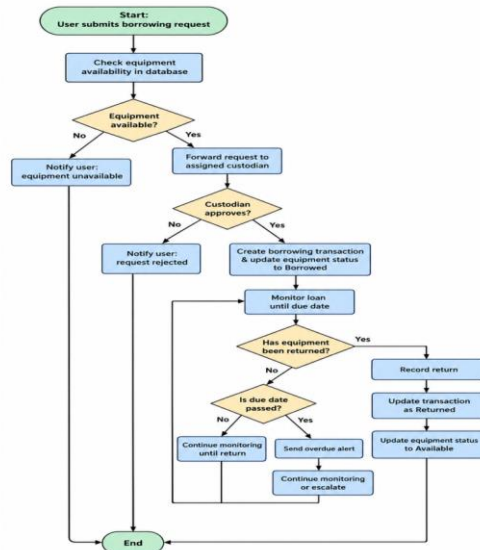


Figure 5. System Flowchart of the Proposed Equipment Borrowing Process

3.4 System Design Specification

The system follows a hybrid cloud-local architecture. The cloud-based web application manages centralized inventory records, borrowing requests, approvals, loan duration, returns, and overdue monitoring. A local network monitoring program, running within the campus network, uses ICMP (ping) and SNMP to collect connectivity status and basic network information of authorized PCs across campus subnets. Collected monitoring data is synchronized with the centralized platform according to institutional authorization and network accessibility. Major Components 1. Web Application (Cloud) – Handles user authentication, equipment inventory CRUD operations, request submission, custodian approval workflow, borrowing/return records, and overdue tracking. 2. Local Network Monitoring Program – Periodically polls authorized devices using ICMP and SNMP; reports online/offline status and selected network information. 3. Centralized Database – Stores equipment data, location, availability, reservation/borrowing records, user roles, and monitoring status. 4. Role-Based Access Control – Differentiates privileges for equipment borrowers, custodians, and IT/administrative users. System Flow – User submits borrowing request → Custodian reviews and approves/rejects → System records loan start date and expected return → Local monitoring can reflect device status while equipment is in use or returned → Return is recorded and overdue status is updated if applicable.

3.5 Implementation

The cloud-based web system will be developed to provide the interface for equipment inventory management, request submission, custodian approval, borrowing records, loan duration tracking, return recording, and overdue monitoring, with role-based access implemented for the identified stakeholder groups. A local network monitoring program will be implemented to use ICMP (ping) and SNMP for checking the connectivity status and gathering basic network information of authorized devices across campus subnets. A centralized database will be established for inventory, reservations, borrowing transactions, and monitoring status. Data exchange between the local monitoring component and the cloud platform will be implemented within the limits of institutional authorization and network accessibility. The system will be developed and tested using authorized or sample equipment information and a controlled network environment. Actual monitoring of SPCF devices will remain subject to institutional authorization, consistent with the statement in the abstract and Section 1.4.

3.5.1 System Deployment

The completed system will be deployed using a hybrid cloud-local setup. The web application will be hosted on a cloud server accessible to authorized departments, equipment custodians, and IT staff through standard web browsers. The local network monitoring program will run within the campus network environment to poll authorized devices using ICMP and SNMP. The centralized database will be hosted securely to ensure availability and integrity of inventory and borrowing records.

3.5.2 Data Migration and Initial Setup

Prior to full rollout, existing equipment records (if available in paper or spreadsheet form) will be encoded into the system to populate the initial inventory database. User accounts will be created with appropriate access levels (e.g., equipment borrower, custodian, IT/administrator). Authorized devices will be registered in the system for monitoring, and initial configuration of the local network monitoring program will be performed within the controlled campus network environment.

3.5.3 User Training and Orientation

Equipment custodians, IT staff, and authorized department users will undergo hands-on orientation covering system navigation, equipment request submission, approval processes, borrowing and return recording, loan duration and overdue tracking, and basic interpretation of network monitoring status.

3.5.4 Full-Scale Rollout and Monitoring

Once users are trained and the initial data is loaded, the system may be deployed for equipment inventory and borrowing operations at Systems Plus College Foundation, subject to institutional approval. Initial monitoring will be conducted to observe system performance, the accuracy of inventory and borrowing records, and the reliability of the local network monitoring component. If access to actual SPCF devices or the campus network is not

granted, monitoring will be limited to the authorized or controlled testing environment.

3.6 Testing and Evaluation

Testing and evaluation will assess the system based on the four ISO/IEC 25010 quality characteristics specified in the objectives: functional suitability, usability, performance efficiency, and reliability (International Organization for Standardization & International Electrotechnical Commission, 2023). Testing Approach

Functional Testing – Will verify that inventory recording, availability display, request submission, custodian approval, borrowing recording, return processing, loan duration calculation, and overdue detection operate correctly.

Network Monitoring Testing – Will be conducted in a controlled network environment to confirm that the local program can detect the connectivity status of authorized sample devices using ICMP and SNMP.

Usability Evaluation – Will use structured surveys administered to representative users, such as custodians, IT staff, and authorized borrowers.

Performance and Reliability Checks – Will measure the response behavior of core web operations under normal conditions and check whether inventory and borrowing records remain consistent after common interruptions.

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