**2.1 Related Foreign Study**

**2.1.1 Benefit of Equipment Inventory Management System**

In Manish Mohan's 2022 article, the indispensable role of equipment inventory management systems in contemporary organizations is underscored. These systems simplify equipment management by providing a comprehensive view of assets throughout their lifecycle, aiding in stock level management and risk mitigation. They excel in inventory forecasting, aligning stock levels with precise demand data to optimize order volumes. Real-time data and traceability capabilities enable informed decisions, while automation eliminates human error, saving time and ensuring accuracy. Additionally, equipment inventory management systems enhance supply chain operations by diversifying sources and maintaining optimal inventory levels. Ultimately, these systems contribute to organizational growth and success by avoiding inventory-related issues and facilitating well-informed decision-making.

<https://infraon.io/blog/benefits-of-equipment-inventory-management-system/#:~:text=Equipment%20inventory%20management%20is%20the,a%20simple%20supply%20chain%20component>.

**2.1.2 Tools and Equipment Monitoring System**

Kimmy Matillano's Tools and Equipment Monitoring System, developed in March 2021, exemplifies the integration of technology in addressing asset management challenges within the construction industry. This system's focus on preventing tool and equipment loss, transitioning from manual to computerized tracking, and its expected impact on management underscores broader trends in digitalization and efficiency enhancement. While the study's details are limited, Matillano's work serves as a testament to the evolving landscape of asset tracking systems, leaving room for future researchers to expand upon these advancements and contribute to the field's growth.

<https://itsourcecode.com/fyp/tools-and-equipment-monitoring-system-chapter-1/>

**2.1.3 Importance of QR Code Asset Management in Business**

In Carlos Virreira's blog post published on July 20, 2023, the importance of QR code asset management in today's fast-paced digital business landscape is emphasized. QR codes, as two-dimensional barcodes, offer an efficient solution for tracking and managing physical assets, such as equipment and machinery. By affixing unique QR codes to assets, businesses can streamline the identification and monitoring process. QR code asset management facilitates efficient tracking, enhances security by restricting access to authorized personnel, and results in cost savings by eliminating the need for expensive software or hardware. The process involves creating distinct QR codes for each asset, attaching them securely, scanning with mobile devices for access to asset details, and regularly auditing and maintaining data for accuracy and completeness. This approach enhances overall asset management efficiency and can greatly benefit organizations in various industries.

<https://www.shelf.nu/blog/the-importance-of-qr-code-asset-management-in-business>

**2.1.4 Asset Management Information and Tracking System with QR Code Based on the Human Centered Design Method**

In today's business landscape, particularly in establishments with inventory systems, accessing asset information can often be a time-consuming process, leading to delayed data retrieval. Addressing this issue, the research conducted by Benrahman in 2021, as cited in J. Phys.: Conf. Ser. 1830 012006, aims to streamline the acquisition of asset information for improved efficiency. The proposed method involves affixing QR Codes to asset labels, allowing data retrieval through the scanning of these QR Codes using Android smartphones. The research seeks to enhance the existing inventory system by incorporating web addresses into the QR Code labels, leveraging the widespread use of QR scanning capabilities on Android smartphones. This approach holds promise for optimizing inventory management processes. The application's testing and implementation have yielded a remarkable 99.9% validity rate, making it a valuable asset for organizations seeking to enhance their inventory operations.

<https://iopscience.iop.org/article/10.1088/1742-6596/1830/1/012006>

**2.1.5 The Benefit of Equipment Management for schools and universities**

In a publication by Hana Belbecir dated October 14, 2021, the significance of efficient equipment management, particularly in educational institutions like schools and universities, is highlighted. The article emphasizes the need for proper equipment tracking and maintenance to reduce costs, enhance accountability, and ensure students' access to essential equipment. It underscores the benefits of implementing equipment management software, such as barcode tracking systems, to minimize human errors, centralize data accessibility, simplify annual inventory audits, and streamline the equipment checkout process. This comprehensive approach to equipment management not only saves time and resources but also contributes to a more efficient and reliable educational environment.

<https://www.cheqroom.com/blog/equipment-management-for-schools-and-universities-the-top-5-benefits/>

**2.1.6 Inventory Management for Sports Equipment: Agile Project Management**

In this Agile software development project, led by author Nicholas Barnard (2019), the goal was to create a web-based application for managing inventory and rentals within an on-campus organization, specifically focusing on the Kinesiology, Sport Studies, and Physical Education department at The College at Brockport. The project followed an Agile methodology, emphasizing client collaboration and adaptability throughout the development process. Initial requirement capture involved understanding the existing paper-based processes and creating detailed use cases, sequence diagrams, GUI mockups, and state diagrams. The team successfully implemented the Agile approach, ensuring consistent client communication and accommodating evolving requirements. The project aims to streamline equipment management processes, reduce paper usage, and enhance tracking efficiency, with the ultimate success measured by the adoption of the software in the coming year.

<https://soar.suny.edu/bitstream/handle/20.500.12648/6737/honors/245/fulltext%20%281%29.pdf?sequence=1&isAllowed=y>

**2.1.7 The benefits of using web-based applications.**

In the article authored by Phymon Khamooshi and published in December 2019, the advantages of web-based applications over desktop applications are highlighted. These web-based applications, often referred to as Software as a Service (SaaS), offer accessibility across various devices and operating systems, promoting flexible working and enhancing employee productivity. They can be easily customized for different devices and integrated with other systems, providing greater interoperability. Maintenance is simplified, with updates and upgrades managed centrally, reducing downtime and ensuring consistency. Additionally, web-based applications offer scalability, data security, and centralized data access, making them a valuable choice for businesses seeking efficiency and flexibility in their software solutions.

<https://www.geeks.ltd.uk/insights/blog/the-benefits-of-using-web-based-applications>

**2.1.8. Design Method and Application of Intelligent Sports Equipment Based on Stochastic Differential Equation**

In the article authored by Xianrong Liang and Jiangxi Yu, published in June 2023, the architecture for IoT (Internet of Things) applications in sports is discussed. The architecture comprises multiple layers, with the perceptual layer being the foundation, encompassing various sensors like EMG, ECG, EEG, and more, used to monitor a user's physical condition in sports. These sensors are connected to devices such as belts, armbands, or cuffs. The network layer handles data transmission and processing, employing communication protocols like Z-Wave, NFC, IrDA, ZigBee, and more. The sports management layer focuses on IoT applications in sports, including data analysis, statistics, 3D visualization, and cloud computing. Finally, the sports application layer involves communication protocols like MQTT, COAP, XMPP, and AMQP for seamless connectivity and messaging in IoT-based sports applications. This architecture provides a comprehensive framework for incorporating IoT technology into the sports industry. <https://www.researchgate.net/publication/372937508_Design_Method_and_Application_of_Intelligent_Sports_Equipment_Based_on_Stochastic_Differential_Equation>

**2.1.9. Tracking Systems as Thinging Machine: A Case Study of a Service Company**

In his 2018 paper, Sabah S. Al-Fedaghi underscores the significance of object tracking systems in addressing various challenges related to safety, security, and location-based applications. These systems, particularly crucial in transportation, often suffer from the lack of well-defined and comprehensible descriptions, leading to fragmented representations that hinder effective documentation. Al-Fedaghi introduces a novel diagrammatic methodology for modeling tracking systems, aiming to produce engineering-like schematics that can be utilized for documentation, explanation, communication, education, and control purposes. The paper focuses on the role of the Global Positioning System (GPS) in tracking objects and its growing importance, especially in applications such as mobility pattern recognition, vehicle navigation, fleet management, and route tracking. It highlights the need for structured modeling in vehicle-tracking systems, which involve GPS and Global System for Mobile Communications (GSM) technology to monitor vehicle status, position, and timing, ultimately contributing to the advancement of tracking system understanding and utilization. <https://www.researchgate.net/publication/329305439_Tracking_Systems_as_Thinging_Machine_A_Case_Study_of_a_Service_Company>

**2.1.10 Inventory Management System Thesis**

The study conducted by Samaro et al. underscores the significance of implementing a systemized data manipulation process for managing inventory efficiently, particularly in the context of ordering products. The authors emphasize the relevance of integrating evolving technology and technological knowledge into inventory management to enhance its effectiveness. The proposed inventory management system is designed to offer various features, including product search and data item addition or deletion, benefiting both employees and retail administration. The study's primary objective is to optimize inventory oversight and management by providing real-time inventory status data, ultimately enabling companies to realize inventory management benefits. The choice of this study is deemed reasonable due to its practical implications and potential to improve daily operations within corporations, particularly benefiting Prifood Corporation and serving as a valuable reference for future researchers.

<https://www.studocu.com/ph/document/ama-computer-learning-center/bsit/inventory-management-system-thesis/28856629>

**2.2 Related Local Study**

**2.2.1 Maximizing Equipment Monitoring through Online Management Systems**

Mark Anthony M. Tamayo's 2008 study, the importance of efficient equipment monitoring and management within organizations was highlighted. Tamayo developed an online equipment management system utilizing prescriptive analytics, with a focus on optimizing monitoring and evaluation of property equipment while minimizing technology upgrade costs. This innovative system leveraged open-source programming languages like PHP and utilized standard Android mobile phones as QR code scanners for equipment evaluation, enhancing tracking and analysis capabilities. The study achieved three specific objectives: implementing the system in the pilot area, improving data collection accuracy and timeliness, categorizing equipment conditions, and providing versatile reporting formats. Tamayo's research exemplifies practical and cost-effective approaches for organizations seeking to enhance their equipment management processes through modern technology.

<https://ijssst.info/Vol-20/No-S2/paper10.pdf>

**2.2.2 AN AUTOMATED INVENTORY SYSTEM USING QUICK RESPONSE (QR) CODE AND BARCODE FOR PROPERTY MANAGEMENT OF THE BOY SCOUTS OF THE PHILIPPINES**

In De Chavez's 2015 design paper, an automated inventory system using QR code and barcode technologies is proposed for the Boy Scouts of the Philippines (BSP) National Office –NCR. This GUI-based system, driven by C# programming, aims to modernize property management processes and meet annual inventory reporting requirements mandated by the Commission on Audit (COA). By assigning QR codes to new and expensive items and barcodes to less costly ones, the system streamlines property tracking and establishes a comprehensive database for accurate inventory reporting. It also facilitates borrower monitoring and accountability in cases of property damage or loss. To further enhance its functionality, the recommendation includes adding a printing function for automatic receipt and report generation, integrating barcode and QR code generators, and establishing department-specific databases, ultimately promising increased efficiency and accuracy in property management and reporting.

<https://docplayer.net/41495807-An-automated-inventory-system-using-quick-response-qr-code-and-barcode-for-property-management-of-the-boy-scouts-of-the-philippines.html>

**2.2.3 Development of an Attendance Checker System Using QR Code for Technological Institute of the Philippines.**

In the research conducted in 2016 by Barlin, Raphael Jericho Cagas, Divine Mary Grace Collado, Darelle Andrei Pereyra, Keilyn Rodriguez, and Joshua Rod, the primary objective was to develop an attendance checker system using QR Codes for the Technological Institute of the Philippines. The study aimed to create an efficient and accurate attendance monitoring system that would offer an alternative to the traditional manual process. By utilizing QR Codes, students could conveniently log their time in and out, reducing the time and effort required for attendance management. The researchers employed a descriptive method and conducted surveys among thirty-nine students to gather information and assess the system's usability. The results indicated that the proposed system was well-received by the students and helped the school improve attendance monitoring. This innovative approach not only minimized paperwork for teachers but also provided a reliable database for attendance records. QR Codes emerged as a versatile and practical tool for attendance management in educational institutions.

<https://www.coursehero.com/file/44887141/RESEARCH-THESIS-Copy-2docx/>