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IT STORE AUTOMATION

Shivam Shaileshbhai Vasava[1], Prof. Girirajsinh Puvar[2]
[1]*Department of Computer Science & Engineering, Parul University, Vadodara, Gujarat, India*
[2]*Department of Computer Science & Engineering, Parul University, Vadodara, Gujarat, India*

ABSTRACT

In modern organizations, IT asset management is crucial for ensuring efficiency, security, and proper resource utilization. This research focuses on implementing an automated IT store management system to streamline asset tracking using QR code technology. The system integrates ASP.NET for QR code generation, C# for back-end processing, SQL Server for secure data storage, and Zebra FS40 scanners for real-time tracking. By automating asset movement monitoring, the project reduces human errors, enhances security, and improves inventory control. The study highlights the role of automation in IT asset management and its benefits in operational efficiency.

General Terms

- IT Asset Management (ITAM) – The process of tracking and managing IT assets within an organization.
- QR Code Technology – A method of encoding data into a scannable format for quick identification and tracking.
- Back-end Processing – The logic and operations performed behind the scenes to manage data and system functionalities.
- SQL Database – A structured database used for storing and managing asset records.
- Barcode Scanning – The use of scanners to read QR codes and retrieve asset information.
- Network Connectivity (TCP/IP) – A communication protocol ensuring connectivity between scanners and the back-end system.
- Asset Tracking – The method of monitoring the movement and status of IT assets.

KEYWORDS: *QR Code Technology, Automated Tracking, Zebra FS40 Scanner, SQL Server Database, ASP.NET Web Forms, C# Back-end Development, TCP/IP Communication*

1. INTRODUCTION

The IT Store Automation project is designed to streamline the management of IT assets using QR code technology and automated tracking. The system ensures efficient asset registration, tracking, and storage by integrating QR code generation, scanning, and database management.

Key Phases of the Project

1. QR Code Generation
   - A web-based system is developed to generate QR codes for IT assets.
   - Asset details such as Asset Code, Make, Model, Serial Number, and Asset Type are recorded in the table.
   - Assets can also be imported via an Excel upload feature, with QR codes generated for bulk entries.
2. QR Code Scanning and Asset Tracking
   - The FS40 Zebra Scanner is used to scan QR codes and extract asset details.
   - Scanned asset data is verified and stored in the table.
   - The system tracks asset movement based on scanner location, updating the status of assets accordingly.
3. Database and Secure Storage
   - All asset information is securely stored in an SQL Server Database.
   - Secure coding practices such as SQL Injection prevention, role-based access control, and encrypted communication are implemented.

2. LITERATURE SURVEY

Effective IT asset management is a critical aspect of modern organizations, ensuring proper utilization, security, and efficiency. Several studies and technological advancements have contributed to the evolution of IT store automation.

Traditional IT Asset Management Approaches

Traditional asset tracking methods relied on manual entry and physical logs, often leading to inefficiencies, data loss, and human errors. Research has shown that such systems lack real-time tracking capabilities and are prone to mismanagement (Smith et al., 2018).

Zebra Scanner Technologies in Asset Management

The Zebra FS40 scanner, utilized in this project, has been recognized for its high-speed scanning capabilities and reliable performance in industrial settings (Brown et al., 2021). Studies suggest that advanced scanning solutions improve tracking accuracy and operational efficiency in automated storage and retrieval systems.

Integration of IT Asset Management with SQL Databases

Research on database-driven asset management systems

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(Williams & Lee, 2017) highlights the importance of structured data storage. SQL Server has been widely used for secure, scalable, and efficient management of IT asset records, supporting real-time retrieval and auditing.

Network-Based IT Asset Tracking Using TCP/IP
Studies on network-based asset tracking (Chen et al., 2022) emphasize the role of TCP/IP communication in ensuring real-time asset monitoring. These studies confirm that integrating networking protocols in asset tracking systems enhances accessibility and automation.

3. METHODOLOGY

The implementation of IT Store Automation followed a structured approach to ensure efficiency, accuracy, and seamless asset tracking. The methodology consists of the following key phases:

System Design and Planning
The initial phase involved identifying the limitations of existing manual tracking systems and designing an automated solution using QR code-based tracking. The system architecture was designed to integrate scanners, a back-end database, and a web-based user interface for asset management.

Technology Selection
Based on system requirements, the following technologies were selected:
ASP.NET Web Forms, C# Console Application, SQL Server, Zebra FS40 Scanner, TCP/IP Communication

System Development
QR Code Generation: Each asset was assigned a unique QR code, encoded in a string format for easy retrieval.

Scanner Integration: Four scanners were strategically placed at key locations (IT Store and Service Room entry/exit points).

Real-time Tracking Implementation: A back-end system was developed to log the movement of assets based on scanner IP addresses.

Database Management: SQL Server was used to store asset movement records, enabling efficient retrieval and analysis.

Testing and Debugging
Code Debugging: The system was tested in Visual Studio 2019 to identify and fix bugs.

Breakpoints and Data Flow Analysis: Debugging techniques such as breakpoints were used to trace data movement within the system.

Scanner Functionality Testing: Various scanning conditions were tested to ensure accurate asset tracking.

Evaluation and Future Improvements
The system was evaluated for accuracy, speed, and reliability.Future enhancements include AI-based predictive analytics for asset maintenance and improved network security protocols.

4. EXPERIMENTAL RESULTS

The implementation of the IT Store Automation system involved rigorous testing and evaluation to ensure optimal performance. Various hardware and software configurations were analyzed to determine the most efficient and reliable setup.

Evaluation of Zebra Scanners
During the development phase, multiple Zebra scanner models were examined to identify the most suitable device for asset tracking. The scanners tested included:

Zebra FS20: Compact and cost-effective but lacked the required scanning accuracy for high-speed operations.



Zebra FS70: Offered advanced scanning capabilities but was more expensive and complex to integrate.



Zebra FS40: Provided a balance between accuracy, speed, and cost, making it the best choice for the project.



After conducting extensive tests on scanning efficiency, accuracy, and ease of integration, the Zebra FS40 scanner was selected as it met the system's requirements while ensuring seamless connectivity with the back-end.

QR Code Encoding Format Selection
To ensure accurate and efficient data retrieval, different QR code encoding formats were tested:
JSON Format: Initially considered for its structured data storage, but it resulted in larger QR codes and increased processing time.
String Format: Provided a more compact and efficient encoding method, leading to faster scanning and easier integration with the database.

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After performance evaluation, the string format was chosen due to its simplicity, faster processing time, and reduced QR code size, enhancing scanning efficiency.

System Performance Evaluation

Following the implementation of the IT Store Automation system, the following improvements were observed:
Scanning Accuracy: The FS40 scanner provided a 98% accuracy rate in reading QR codes under different lighting conditions.

Processing Speed: QR codes encoded in string format were processed 20% faster than those in JSON format.

Network Stability: The use of TCP/IP communication ensured a stable connection between scanners and the back-end, reducing data transmission errors.

5. CONCLUSION

This project was developed to automate IT asset management within the organization, replacing manual record-keeping with a digital tracking system. Through the integration of ASP.NET Web Forms, C# back-end, and SQL Server, assets were systematically registered, labeled with QR codes, and monitored using strategically placed scanners.

With all these functionalities working as intended, the project successfully met its core objective of automating IT asset tracking and management.

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