INVENTORY MANAGEMENT

A PROJECT REPORT

Submitted by

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DECLARATION

I undersigned hereby declare that the project report on **INVENTORY MANAGEMENT**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Application of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of Dr.Prof.Nadera Beevi S. This submission represents my ideas in my own words and where ideas or words of others have been included,I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not previously served as the basis for the award of any degree, diploma, or similar title by any other University.

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This is to certify that the report entitled **INVENTORY MANAGEMENT** submitted by **DON G MADAMANNIL** (TKM21MCA-2016) to the APJ Abdul Kalam Technological University in partial fulfillment of the Masters degree in Computer Application is a bonafide record of the project work carried out by him under our guidance and supervision. This report, in any form, has not been submitted to any other University or Institute for any reason.

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Dear Sir / Madam,

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Thank you,
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ABSTRACT

In **INVENTORY MANAGEMENT** the inventory held by the client holds significant value as it represents a valuable economic resource for the organization in the future. There exist certain instances wherein inventory may become obsolete, spoiled, damaged, lost, or pilfered. In these circumstances, clients employ the practice of inventory write-off as a means of eliminating items from the general ledger, recognizing their null value.

In the event that the worth of inventory diminishes, it is recorded as a loss in value, commonly referred to as inventory impairment, as opposed to being entirely eliminated. The aforementioned processes bear financial ramifications for our clients.

At present, the inventory write-off/write-down procedure implemented at the client exhibits a hybrid approach, comprising electronic mail-based communication together with the utilization of the Oracle/SAP platform.

On the client's side, the inventory write-off and impairment process is guided by a delegation of authority (DoA) framework that applies to all relevant business units.

It also includes a **Ticketing System** for notifying issues, concerned persons.Also, include a **Staff Management System** The company have a different set of staff for warehouse management This system manages those staff. Also, have an **Intelligent Task Management System-ITM** for managing all tasks

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Chapter 1

Introduction

INVENTORY MANAGEMENT is a platform designed for monitoring and managing the whole inventory and warehouse-related processes. The inventory retained by the patron comprises a considerable worth since it embodies a valuable economic asset for the entity in the forthcoming period. There are specific occurrences where the inventory may become out of date, spoiled, damaged, lost, or stolen. In the present circumstances, clients engage in the practice of inventory write-off as a mechanism to expunge items from the general ledger by acknowledging their zero worth.

If the value of the inventory decreases, it is recognized as a loss in value, which is conventionally known as inventory impairment, rather than being completely written off. The aforementioned processes have financial implications for the client.

Currently, the client's practice for inventory write-off/write-down is characterized by a hybrid approach, which involves a combination of electronic mail-based communication and the use of the Oracle/SAP platform.

The process of inventory write-off and impairment on the side of the client is guided by a framework of delegation of authority (DoA) that is applicable to all pertinent business units.

The recognition of inventory write-off or write-down as necessitated through financial accounting entries is a requisite for our client. The purpose of this is to ascertain that a certain segment of the corporate inventory has depreciated in value or that its current fair market value is less than its recorded book value.

The procedure of inventory write-off and impairment passes through a delegation of authority (DoA), which stipulates a predetermined limit for the amount threshold deemed appropriate. The team dedicated to risk management and regulatory compliance at the organization in question is responsible for the maintenance of the Delegation of Authority. The stipulated prerequisite entails the implementation of an automated workflow for the inventory write-off/write-down procedures, which must be in conformity with the Delegation of Authority (DoA) regulations. The administration of personnel in distribution centers. Once the tasks

of approval for users have been established according to the designated threshold levels and designated authorities, the inventory write-offs and write-downs are executed in accordance with the prescribed business rules. The user tasks are retrieved by the CW-ITM application to facilitate the execution of user actions. The synchronization process for the task status of a user is accomplished by utilizing a transaction code (T code) within the SAP system, specifically the S4 module.

The actual working of the **INVENTORY MANAGEMENT** is the inventory write off/write down process level field requirements are created in a form in SAP BTP which will entail details such as items, description, quantity, value and write off/write down justifications. The submission of this form on SAP BTP will trigger a workflow and create user tasks in SAP BTP inbox for actioning. These tasks from SAP BTP inbox are further pulled into CW-ITM(Intelligent Task Management) application where the Client's users(delegation of authority people) will accept, reject, forward or substitute the tasks. Once this is completed, the users' tasks actions and statuses are further synced to SAP S4 application through a transaction code (T) code in Materials management module in SAP S4. Cycle count is the monthly count where adjustment of surplus (+) and deficit (-) is done where there is no material loss in the overall quantity for the company. The control point is that there has to be surplus (+) & deficit (-) with respect to item quantity count and the net effect at the quantity level has to be zero. At the cycle count, user can propose surplus (+) or deficit (-) but the sum total at the quantity level should be 0 because that would trigger two actions in SAP once its approved. **Cycle count** is done for Raw Materials (RM), Packing Material (PM) & Finished Goods (FG) inventory categories every month.

Write off will always have the negative connotation as a value and the volume (quantity) as write offs are completely disposed and thrown off from the company.

The whole system also includes a **Ticketing System** that is used for notifying and assigning issues or system-related concerns to concerned persons and includes a module for managing staff at warehouses the module is called **warehouse staff management System** it includes shift assignment and duty management and other staff related services like leave and transferring duty because of any situations etc.

1.1 Existing System

The inventory write-off/write-down processes happen through an approval process which is manual in nature (email approval etc.) and carried out further in Oracle.Inventory write-off refers to the process of removing or reducing the value of inventory items that are no longer usable or saleable The preparation & posting of journal entries and other financial configurations are configured in Oracle for Client. The Oracle system has an approval matrix set up in place with constituents of SSC-specific team members. Business Unit (BU) level approver members are not present in Oracle and hence for inventory write-off/ write-down processes at CLient the 1st level of approval for each Business Unit (BU) is manually completed over by emails. Once the approvals are done the subsequent steps of write-offs/write down in journal entries are created and finally posted to the general ledger through the Oracle system. The SAP system also follows the same pattern for inventory write-off & impairment. Approvals are sought over emails manually and then write-off/impairment is done through material movement in SAP. There is no system for Ticketing and Inventory staff management.

1.2 Proposed System

In The proposed to be process will be automated with sequence of events in SAP Business Technology Platform (BTP). The inventory write off/write down processes with thresholds and Delegation of Authority (DoA) is defined as a business rule and created in SAP Business Technology Platform (BTP). For each workflow process line item across Inventory write-off & write down applicable thresholds & DoA will be defined. A form will be created in SAP BTP which will capture fields associated with Inventory write-off/write-down process such as BU name, write-off, cycle count, item description, total write off value etc. The submission of the form on SAP BTP will trigger a workflow and create user tasks for actioning. The tasks will be pulled and actioned in CW-ITM (Cherrywork Intelligent Task Management) application and further synced to the SAP S4 application through a transaction code. and create a Staff management and ticketing system

1.3 Objectives

Project deliverable includes:

- Develop a User Interface for entering changes in the Inventory details.
- Custom workflow for Threshold checking and DoA.
- Integrate with CW-ITM for pulling tasks from SAP BTP inbox.
- Reduce and remove loss to the client and create an effective system for inventory management.
- Develop a ticketing system for raising issues with concerned persons.
- Develop an Employee Management System for managing warehouse staff.

1.4 Company Profile

Incture is one of the driving suppliers of advanced applications, and advanced arrangements. **Cherrywork®** could be a comprehensive suite of shrewdly computerized applications and items for **SAP** clients conveying bundled commerce esteem with deftness and at scale to address advancing trade necessities.

1.4.1 Products

- **Cherrywork Industry 4.0** Cherrywork Industry 4.0 digital applications create smarter, more efficient, and flexible production processes, with increased customization and personalization. They create smart factories, where machines and systems are interconnected and can communicate with each other, optimizing production and reducing downtime. With these digital applications we are enabling our manufacturing customers achieve greater efficiency, productivity, and customization, and improving quality and customer satisfaction.
- **Cherrywork Intelligent Procurement**
  Cherrywork Shrewdly Obtainment advanced applications offer assistance move forward the acquirement handle and make more educated and key acquiring choices.

- **Cherrywork Customer Experience**

  The digital applications of Cherrywork Customer Experience facilitate ongoing enhancement and fine-tuning through the utilization of customer feedback and data analysis. Through the utilization of data-driven insights, our applications possess the capability to discern pertinent areas necessitating enhancement and subsequently enact modifications in order to enhance the experience of our customers.

- **Cherrywork HXM**

  The HXM digital applications offered by Cherrywork are instrumental in elevating the quality of customer experience, augmenting employee engagement, and amplifying overall satisfaction levels.

- **Cherrywork Intelligent Work Management**

  The Cherrywork Intelligent Work Management system integrates numerous workflows, tasks, and associated systems into a cohesive, efficient workbench, thereby enabling users to access all the necessary data. The present tool is a comprehensive and collaborative solution for task and work management, designed to assist users in overcoming operational challenges and enhancing workflow efficiency.

1.4.2 Services

- **Intelligent Process Automation**

  The utilization of robotic process automation exhibits considerable promise in expediting digital transformation and enhancing operational efficacy. Nevertheless, enterprises are required to delve into assessing how it seamlessly integrates within their organizational framework. Robotic Process Automation (RPA) has been developed to streamline monotonous tasks, augment fundamental software functionalities, minimize human involvement, mitigate potential risks, and elevate productivity levels. Employing customized bots that are harnessed by Artificial Intelligence (AI) and Machine Learning (ML) technologies allows personnel to engage in optimum work practices.

- **Cloud Platform and Solutions**

  The cloud transformation services provided encompass a range of expert consultation, meticulous planning, and efficient implementation solutions designed to facilitate the seamless migration of the user's IT infrastructure and applications from conventional

on-premises data centers to advanced cloud-based environments. The scope of our services encompasses the evaluation of present-day infrastructure and applications, the discernment of potentialities for cloud-based migration or optimization, the formulation and conception of cloud-based migration strategies, and the successful deployment and execution of the cloud migration process.

- **Sustainability Management**

  The provision of specialized reporting frameworks tailored to the distinct requirements of the manufacturing, supply chain, maintenance and operations, as well as procurement and logistics domains. This paper presents guidance for the implementation of an open technology stack intended for use by a variety of non-profit organizations. Specifically, the guidance focuses on the development of portals and approval centric applications.

Chapter 2

Literature Survey

A literature survey, commonly referred to as a literature review, entails a comprehensive examination and evaluation of academic sources pertinent to a specific area of study. After conducting an in-depth analysis of the extant literature, a comprehensive review of the current state of the field is presented. This provides a valuable opportunity to identify pertinent theories, methodologies, and lacunae in the existing body of knowledge. When undertaking a literature review from an audit standpoint, the primary attention is centered on assessing the pertinent literature. The present process pertains to an assemblage of published information within a particular field of study, which on occasion may encompass the inclusion of publications confined to a specific temporal scope. The literature review is an essential aid for carrying out research and serves as a common starting point for exploring a particular area of study. The literature review is a valuable tool not only for identifying significant theories and concepts but also for recognizing voids in the existing knowledge and highlighting the domains that necessitate further exploration. Through the examination of numerous sources, conducting a literature review enables one to attain a more comprehensive comprehension of a particular subject or matter. A meticulously prepared literature review holds the potential to bolster the author's credibility and authority by attesting to their familiarity with contemporary research and ongoing debates within the respective domain. In specific contexts, a literature review has the capability to incorporate a meta-analysis, which entails a systematic evaluative approach to deconstructing the outcomes of numerous studies in order to unearth prevalent themes or recurring tendencies. It is crucial to recognize that a literature review differs from a research paper or an argumentative essay, as it entails a concentrated analysis of extant scholarship and literature related to a particular subject matter.

2.1 Purpose of the Literature Review

1. A literature review assists in identifying and defining the research problem by providing a comprehensive understanding of the existing knowledge and research in the field.

2. A literature review aids in identifying and accessing pertinent research studies, theories, and concepts related to the research problem.

3. A thorough examination of the existing literature has the potential to reveal lacunae in current understandings, thereby emphasizing the necessity for additional research in specific domains.

4. A literature review can offer a comprehensive understanding of a specific topic or issue by scrutinizing several sources.

5. A well-written writing survey can offer assistance to set up the validity and authority of the creator because it demonstrates their nature with the current investigation and talks about within the field.

6. A writing survey can be a standalone piece or portion of a bigger investigative venture such as a proposition, thesis, or term paper.

2.2 Related Works

2.2.1 Spring Boot

1. Spring Boot based REST API to Improve Data Quality Report Generation for Big Scientific Data: ARM Data Center Example:This paper explores the usage of Spring Boot, a popular Java-based framework, for developing web and enterprise applications, with a particular focus on its flexibility for service-oriented architecture (SOA). Spring-based applications often pose challenges due to their configuration complexity. However, Spring Boot simplifies the creation and deployment of stand-alone, production-grade Spring applications by minimizing the need for extensive Spring configuration. For instance, in the case of the Spring Model-View-Controller (MVC) framework, Spring Boot's auto-configuration feature eliminates the requirement for manual configuration

of components such as the dispatcher servlet, web jars, view resolver, and component scanning.[1]

Another challenge in web application development is managing framework dependencies and associated library versions. Spring Boot addresses this issue by providing simplified dependency management through a comprehensive yet flexible framework, encompassing all the necessary Spring-related technologies in a single dependency. This approach streamlines the development process, particularly for starter projects and CRUD web applications. Moreover, Spring Boot incorporates a range of additional features commonly required in many projects, including an embedded server, security mechanisms, metrics, health checks, and externalized configuration.[1]

While traditional web applications are typically packaged as WAR files and deployed on web servers, Spring Boot allows applications to be packaged as either WAR or JAR files. This flexibility enables running the application without the need for extensive installation or configuration on the application server.[1]

This paper discusses the implementation of a service-oriented REST API using Spring Boot at the Atmospheric Radiation Measurement (ARM) Data Center (ADC) located at Oak Ridge National Laboratory. The REST API acts as a bridge between frontend user interfaces and the backend database, facilitating the submission of reports by ARM scientists through a user form or a command-line interface. These reports capture crucial data quality and other pertinent information about ARM data.[1]

By leveraging the capabilities of Spring Boot, the ARM Data Center demonstrates the advantages of using this framework to develop robust and flexible web applications aligned with a service-oriented architecture. The paper highlights Spring Boot's simplified configuration, streamlined dependency management, and the ability to package applications as either WAR or JAR files, making it a valuable choice for web application development in various domains.[1]

2. Cloud Data Monitoring Management and Visual Application System Based on Spring Boot:This paper presents a cloud-based data monitoring management and visualization system developed using Spring Boot, a micro-service framework. The utilization of Spring Boot simplifies system configuration and monitoring, providing ease of use and efficiency. To accommodate various page layouts, the front-end of the system is

built using HTML5, CSS, JavaScript, bootstrap, and other technologies. The system offers multiple functionalities, including data management, data downloading, and visualization using Baidu maps. The integration of Baidu maps enables the intuitive and distinctive visualization of air quality data. Deployment of the system in Ali Cloud allows remote access to the web projects, enhancing accessibility for users. By combining the Spring Boot framework with AJAX, the system achieves a complete separation of the front and back ends, resulting in a stable, real-time, and highly efficient system.[2]

3. An Analysis of the Significance of Spring Boot in The Market:This paper aims to gather and review various research papers, chapters, and articles that focus on the Java Spring Boot Framework. Through a comprehensive analysis of these sources, the study provides insights into the framework's applications and possibilities across different domains. Recent articles are examined to demystify the workings of the Spring Boot framework and explore its potential in diverse areas. The framework is found to be well-suited for building enterprise Java applications and highly scalable RESTful web services with relative ease. The reviewed articles also delve into different architectural styles employed with Spring Boot to develop scalable and efficient applications. Examples include systems such as the Hourman information management system and backends for public complaint systems. The survey highlights the significance of Spring Boot as the preferred choice for building backends that require scalability and multithreading. Notably, Spring Boot demonstrates superior capabilities when processing large volumes of data compared to single-threaded frameworks like Node.js. Overall, this research emphasizes the importance of the Spring Boot framework and its advantages in enabling the development of robust, scalable, and efficient backend solutions for various applications.[3]

4. Research of Microservices Features in Information Systems Using Spring Boot:This article focuses on the growing need for learning samples and data support in the era of artificial intelligence. It highlights the significance of having access to a substantial amount of data material to facilitate advancements in visual cognition, behavioral cognition, and core algorithms. To address this need, the authors have developed a data collection system based on the Spring Boot framework, which enables broad participation from internet users in contributing to the growth of the artificial intelligence industry.[4]

The article emphasizes the importance of high-quality raw materials for machine learning and acknowledges that the availability of such materials is crucial for the progress of artificial intelligence. The authors present their design and implementation of the Spring Boot-based data collection system, which serves as a platform for individuals to contribute their data and actively participate in the development of artificial intelligence.[4]

By leveraging the features and capabilities of the Spring Boot framework, the system offers a user-friendly and efficient interface for users to submit and share their data. The system is designed to accommodate a diverse range of data types, ensuring its applicability to various areas of artificial intelligence research. This inclusivity encourages users from different backgrounds and expertise to contribute their data, fostering a collaborative and diverse ecosystem.[4]

The article highlights the benefits of the Spring Boot framework in the development of the data collection system. It emphasizes how Spring Boot simplifies the development process, allowing for the rapid creation and deployment of the system. The framework's versatility and robustness enable the system to handle large volumes of data and ensure its efficient processing.[4]

Furthermore, the authors emphasize the importance of community participation in the growth of the artificial intelligence industry. The data collection system serves as a platform to bridge the gap between researchers, developers, and individuals interested in artificial intelligence. By providing an accessible and user-friendly interface, the system encourages a broader range of contributors and facilitates the collection of diverse and valuable data.[4]

In conclusion, this article presents a Spring Boot-based data collection system for artificial intelligence, designed to meet the increasing demand for learning samples and data support in the field. It emphasizes the significance of high-quality data for machine learning advancements and highlights the benefits of utilizing the Spring Boot framework in developing the system. The authors stress the importance of community participation and inclusivity in the growth of the artificial intelligence industry, and the data collection system serves as a platform to enable broader involvement and contribution from internet users.[4]

5. Design and Implementation of a Spring Boot-Based Data Collection System:This article presents a Spring Boot-based data collection system for artificial intelligence, emphasizing its role in facilitating the growth of the AI industry. With the rise of AI and the increasing need for learning samples and data support, the system offers a platform for individuals to actively participate in providing high-quality raw materials for machine learning.[5]

   The system leverages the power of the internet to enable users from all over the world to contribute data, supporting various AI applications such as visual and behavioral cognition research. Built on the Spring Boot framework, the system benefits from its robustness and scalability, allowing for the development of a reliable web application.[5]

   Users can easily upload and share relevant data samples through the system's user-friendly interface. To ensure data quality and integrity, the system incorporates validation mechanisms and anonymization techniques to protect user privacy. By utilizing a crowdsourcing approach, the system addresses the challenges of acquiring diverse and sufficient data for AI applications.[5]

   The article highlights the significance of community participation in AI research. By involving a global community, the system encourages collaboration, knowledge sharing, and the democratization of AI technology. This approach promotes transparency and openness in the AI industry, building trust and understanding among stakeholders.[5]

   In conclusion, the Spring Boot-based data collection system plays a vital role in meeting the increasing demand for learning samples and data support in the AI field. It provides a user-friendly platform for individuals worldwide to contribute their data, supporting advancements in AI research and fostering the growth of the industry. With its emphasis on transparency, inclusivity, and data quality, the system contributes to the development of robust and accurate AI models and algorithms.[5]

6. Design and Implementation of a Health Status Reporting System Based on Spring Boot:This article presents the "IamOK" online health status reporting system, which has been developed to cater to the specific requirements of colleges and universities in monitoring the health status of teachers and students during the Covid-19 epidemic prevention and control period. The system's development process and design framework are thoroughly explained, beginning with a comprehensive requirements analysis and

overall structure design. The article further delves into the implementation details, highlighting the utilization of key technologies such as JPA, Redis caching, Nginx, and others within the Spring Boot framework.[6]

The authors emphasize the significance of having a dedicated system to monitor the health status of individuals in educational institutions during the ongoing Covid-19 pandemic. They elucidate the specific requirements and challenges faced by colleges and universities in maintaining a comprehensive overview of the health conditions of their teachers and students. In response to these needs, the ”IamOK” online health status reporting system was developed, with the objective of providing an efficient and user-friendly solution.[6]

The article outlines the development process, starting with a thorough requirements analysis phase. By understanding the specific needs and objectives of the system, the authors were able to formulate a clear and effective overall structure design. This approach ensured that the system would encompass all necessary features and functionalities, addressing the unique demands of health status monitoring during the Covid-19 epidemic.[6]

The implementation of the ”IamOK” system is discussed in detail, with a focus on the integration of key technologies under the Spring Boot framework. The authors explain the utilization of JPA for efficient database management, Redis caching technology for improved performance and scalability, and Nginx for robust web server configuration. These technologies were carefully selected and integrated to enhance the system's functionality, security, and overall performance.[6]

The article highlights the benefits of the ”IamOK” system, including its user-friendly interface, real-time health status reporting, and comprehensive data management capabilities. The system enables educational institutions to gather and monitor health-related information of their teachers and students in a centralized and efficient manner. By employing the Spring Boot framework and incorporating key technologies, the system offers a stable and scalable solution for health status reporting during the Covid-19 epidemic.[6]

In conclusion, this article presents the ”IamOK” online health status reporting system, developed specifically for colleges and universities to monitor the health status of their

teachers and students during the Covid-19 pandemic. The authors provide an in-depth overview of the system's development process, emphasizing the importance of requirements analysis and overall structure design. The utilization of key technologies under the Spring Boot framework is thoroughly explained, showcasing the system's robustness and performance. The "IamOK" system offers a user-friendly interface and comprehensive data management capabilities, enabling educational institutions to effectively monitor the health conditions of their community members.[6]

7. Work-in-Progress: Enabling Secure Boot for Real-Time Restart-Based Cyber-Physical Systems:This research paper focuses on addressing the security vulnerabilities in real-time restart-based embedded systems with the Simplex architecture. While several approaches exist to safeguard these systems against faults, none have been able to prevent adversaries from modifying the operating system or application code to execute persistent attacks even after a reboot. In response, the authors propose a secure boot mechanism that restores these systems into a secure computing environment after each restart.[7]

   The article highlights the critical need for a secure computing environment in cyber-physical systems, emphasizing the potential consequences of security violations. The authors discuss existing approaches and their limitations in protecting these systems from persistent attacks. They emphasize the importance of a secure boot mechanism that ensures the integrity of the system's operating system and application code.[7]

   The proposed secure boot mechanism is thoroughly explained, outlining its functionality and its ability to restore the embedded system into a secure state after each restart. The authors provide an analysis of the delay introduced by the security feature, acknowledging the potential impact on real-time operations. To demonstrate the viability of their approach, they present preliminary results based on the implementation using an open-source bootloader and a real-time operating system.[7]

   The article emphasizes the significance of the proposed secure boot mechanism in ensuring the security of real-time restart-based embedded systems. By preventing persistent attacks and restoring the system to a secure state after every restart, the authors highlight the potential to mitigate security vulnerabilities and enhance system resilience.[7]

   In conclusion, this research paper presents a novel secure boot mechanism for real-time

restart-based embedded systems with the Simplex architecture. The authors address the limitations of existing approaches in preventing persistent attacks, highlighting the need for a secure computing environment. The proposed mechanism offers the ability to restore the system into a secure state after each restart, enhancing the security and resilience of cyber-physical systems. The preliminary results demonstrate the viability of the approach, providing a foundation for further research and development in this important area of cyber-physical system security.[7]

2.2.2 SAP S/4HANA

1. Efficient Memory Occupancy Models for In-memory Databases:This research paper addresses the challenge of predicting memory occupancy during the execution of large-scale analytical workloads in in-memory databases. The authors highlight the importance of accurate predictions in such systems and the difficulties associated with modeling the highly variable threading levels present in these workloads using analytical methods. They note that existing literature with a queueing theoretic background often overlooks the memory modeling aspect, creating a gap that needs to be filled.[8]

   To bridge this gap, the authors propose a new probabilistic model specifically designed to capture the distribution of memory occupancy in in-memory databases during the execution of large-scale analytical workloads. They explain the rationale behind this model and its relevance in accurately predicting memory occupancy, which is crucial for efficient resource management and performance optimization.[8]

   The authors integrate their proposed probabilistic model with an analytical formulation called TP-AMVA, which improves computational efficiency compared to simulation-based methods. They highlight the advantages of their approach in terms of accuracy, speed, and scalability, making it a valuable tool for predicting memory occupancy in real-world scenarios.[8]

   To validate the effectiveness of their model and formulation, the authors conduct experiments using SAP HANA, a widely used in-memory database platform. They compare the predictions generated by their model with the actual memory occupancy observed during the execution of large-scale analytical workloads. The results demonstrate the accuracy and reliability of their approach, further reinforcing the value of their probabilistic model

in practical settings.[8]

In conclusion, this research paper introduces a novel probabilistic model for capturing memory occupancy distribution in in-memory databases during the execution of large-scale analytical workloads. The authors address the limitations of existing analytical methods and propose an efficient and accurate approach to overcome these challenges. The integration of their model with the TP-AMVA formulation demonstrates superior computational efficiency compared to simulation-based methods. The experimental evaluation using SAP HANA confirms the effectiveness of their approach in predicting memory occupancy. This research contributes to the advancement of performance optimization and resource management in in-memory databases, with potential applications in various domains requiring large-scale analytical processing.[8]

2. Acceleration of Single Inserts for Columnar Databases – An Experiment on Data Import Performance Using SAP HANA: This research paper focuses on the critical procedure of data loading in modern relational database management systems (RDBMS) and specifically addresses the scenario where data arises frequently and real-time analysis is required. The paper evaluates the performance of data import for single-row inserts in SAP HANA's column store and compares it with the load performance of MySQL's row store. The experiments were conducted using the command line interface (CLI) provided by both databases.[9]

   The study begins by examining the results of sequential imports and then delves into the impact of concurrency on import speed. The research question of how multiple insert operations invoked simultaneously can enhance performance is explored. To illustrate these concepts, a practical example is presented using a dataset in comma-separated-values (CSV) format, consisting of monitoring information from active IT infrastructures. The dataset is transformed into 1.89 million independent insert statements, simulating a typical asynchronous sensor or monitoring workload.[9]

   The experimental findings indicate that the best import performance for SAP HANA's column store is achieved by invoking 200 CLIs simultaneously, with each CLI importing 5,000 rows. The researchers observe that the number of parallel CLIs significantly depends on the available CPU cores, and it can accelerate the overall import process by a factor of up to 12 compared to the default sequential import. While it is commonly

assumed that row stores are better suited for single inserts, MySQL outperformed SAP HANA in 25 out of 34 test cases. However, within a range of 60 to 150 simultaneously invoked CLIs, the load performance of SAP HANA's column store surpassed MySQL's row store for specific test cases.[9]

These results provide valuable insights for practitioners and contribute to the understanding of the suitability of column and row stores in Big Data scenarios involving frequently generated datasets. The findings highlight the importance of considering concurrency and CPU cores in optimizing data import performance, and they demonstrate that SAP HANA's column store can outperform MySQL's row store in certain scenarios when the appropriate level of parallelism is employed. This research encourages further exploration of column and row store capabilities in handling Big Data workloads.[9]

Chapter 3

Methodology

INVENTORY MANAGEMENT is a Framework made in such a way that prepare will be robotized with grouping of occasions in SAP Business Technology Platform (BTP) as shown in Figure 3.1. The stock type in off/write down forms with limits and Delegation of Authority (DoA) is characterized as a trade run the show and made in SAP Business Technology Platform (BTP).

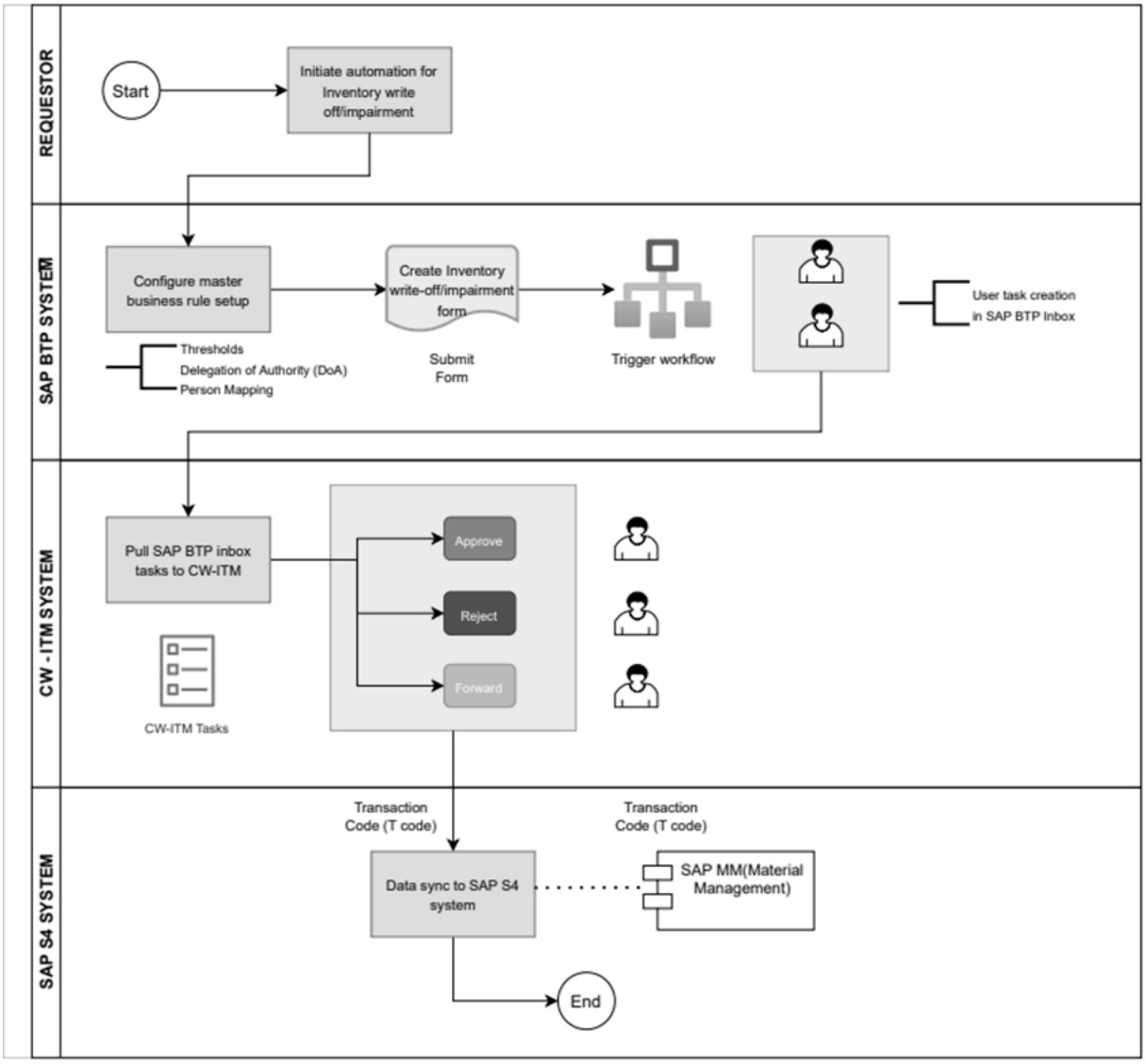

Figure 3.1: User level workflow -Inventory management

For each workflow prepare line thing over Stock write-off & compose down appropriate edges & DoA will be characterized. A shape will be made in SAP BTP which is able capture areas related with Stock compose off/write down prepare such as BU title, compose off, cycle number, thing portrayal, add up to type in off esteem etc. The accommodation of frame on SAP BTP will trigger a workflow and make client assignments for actioning. The assignments will be pulled and actioned in CW-ITM (Cherrywork Brilliantly Assignment administration) application and encourage synced to SAP S4 application through a exchange code

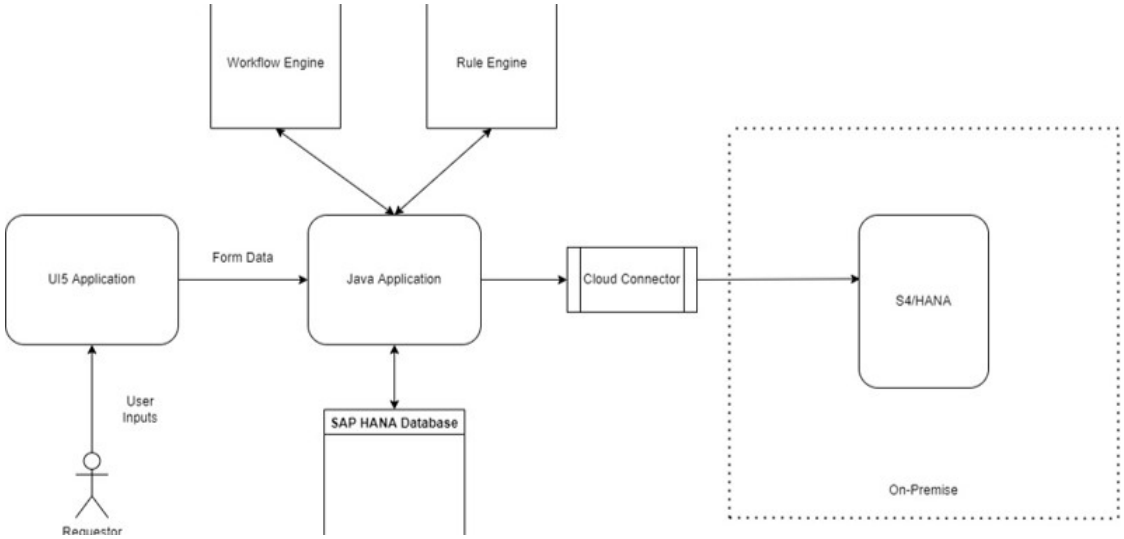

Figure 3.2: Architecture-Inventory Management

Stock write-off/write-down must be recognized at the client through monetary bookkeeping passages. The stock write-off and impedance handle go through delegation of authority (DoA) for suitable pre-defined sum edge restrain. The necessity is to have an automated workflow for the stock write-off/write down forms with DoA. Once the endorsement client errands are made based on the edge levels & DoA, the stock write-offs/write-down are executed as per commerce rules characterized. The system works depending on the architecture shown in figure 3.2

3.1 Key Features of System

- Inventory management:

    1. Triggering workflow.
    2. Threshold checking.
    3. Tasks transfer to CW-ITM for DoA .

4. Updation in all systems.

- staff management:

1. add Employee to the system.
2. Updation.
3. Deletion.
4. Assign work shift.
5. Change work shift.

- Ticketing System:

1. create Tickets.
2. Update Tickets.
3. Add comments.
4. Add Attachments.
5. Close Tickets.
6. Change Priority Tickets.

- CW-ITM:

1. Pull Tasks.
2. Approve.
3. Reject.
4. Forward.
5. Chat Boat.

3.2 Module Description

3.2.1 Inventory management

The inventory write off/write down process in INVENTORY MANAGEMENT-WORKBOX requires the creation of a form in SAP BTP. This form will include item details such as

description, quantity, value, and justifications for write off/write down. Upon submission of the form, a workflow is triggered and user tasks are created in the SAP BTP inbox for actioning. These tasks are then pulled into the CW-ITM (Intelligent Task Management) application where the client's authorized personnel can accept, reject, forward, or substitute the tasks. After the user tasks are completed, their actions and statuses are synced to the SAP S4 application through a transaction code in the Materials Management module.

Cycle count is a monthly inventory check where adjustments are made for surplus (+) and deficit (-) without any actual material loss for the company. The objective is to ensure that there is a balance between surplus and deficit with respect to item quantity count, resulting in a net effect of zero at the quantity level. During the cycle count, users can propose surplus (+) or deficit (-) adjustments, but the overall quantity must remain at zero. Once approved, this triggers two actions in SAP. Cycle count is performed every month for Raw Materials (RM), Packing Material (PM), and Finished Goods (FG) inventory categories. Write off refers to a negative value and volume (quantity) as it involves disposing of inventory completely from the company.

3.2.2 staff management

This system is designed to manage the staff responsible for warehouse management in the company. The management includes adding, updating and deleting staff into the system. and assigning and changing work shifts

3.2.3 Ticketing System

Ticketing System for notifying issues, concerned person. The ticketing system includes features like creating tickets, attending tickets, updating tickets and closing tickets. The creating ticket includes the creation of tickets it also provides features for adding priority. The deadlines and determined based on priority. The tickets can be assigned to a specific person for resolving the ticket creator can also upload attachments for more clarification about the ticket The attending ticket includes the person assigned to the ticket who can change the stats of the ticket according to resolving the issue. the status can include ACTIVE, HOLD, IN-PROGRESS, RESOLVED The process of updating tickets can include features for changing the priority and also a feature for adding comments there is one more feature for adding extra

attachments for more clarifications. The process of closing a ticket is after finishing the work the assigned person can close the ticket will move to resolved stage

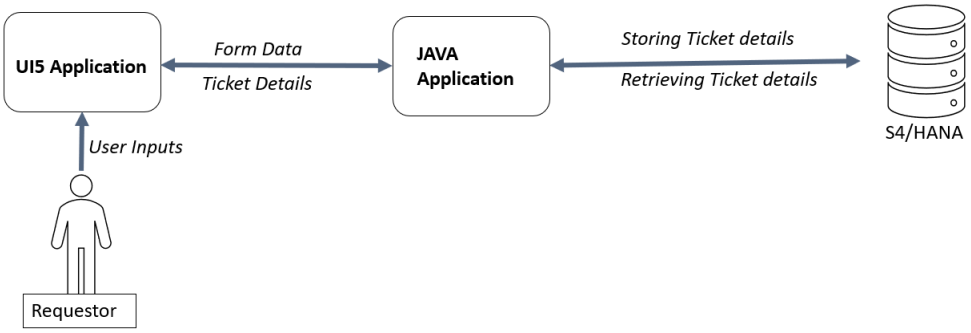

Figure 3.3: Architecture-Ticketing System

3.2.4 CW-ITM

ITM puts together prioritized and relevant information together with an easy-to-understand visualization. It's easy for us to now get an overall picture of what's happening with all the tasks that has and make decisions on them. The powerful analytics dashboard makes sure no insights are missed and all tasks can be tracked in real-time. We can easily generate reports for her superiors that helps them understand the status of projects based on KPIs and are able to chart out what course to take for the future based on the quick bites of information. In ITM we can pull tasks from SAP systems and make decisions on them like Approve, Reject Forward and it also has a chat boat for chatting regarding tasks

3.2.5 Hardware Requirements

- Processor: Minimum 1 GHz (Recommended 2GHz or more)
- Hard Drive: Minimum 4 MB (Recommended 6 GB or more)
- Memory (RAM): Minimum 1 GB (Recommended 4 GB or above)
- Internet connection

3.2.6 Software Requirements

- SAP UI5 - Front End

- JAVA Spring Boot - Back End
- SAP BTP - Cloud
- S4/HANA - Database
- Windows, Mac, Linux, Any - OS
- Mozilla Firefox, Microsoft Edge, Any - Browser

3.2.7 Software Description

- SAP UI5: SAPUI5 may be a improvement toolkit that empowers the creation of web applications for desktop and versatile gadgets. It is based on HTML5, CSS, and JavaScript and is utilized to build responsive and cross-platform web applications. SAPUI5 may be a center innovation for creating client interfacing for SAP applications.

  SAPUI5 gives a set of UI controls and libraries that permit designers to form a reliable client involvement over distinctive applications. It moreover underpins information official, which permits information to be consequently synchronized between the application and the server. SAPUI5 applications can be conveyed on SAP Cloud Stage or on-premise SAP frameworks.

  SAPUI5 is portion of the SAP Trade Innovation Stage (BTP) and is utilized to create applications for different SAP arrangements such as SAP S/4HANA, SAP SuccessFactors, and SAP Ariba. It underpins different advancement approaches, counting Show See Controller (MVC) design, explanatory programming, and responsive plan.

  SAPUI5 too gives an broad set of advancement devices and systems, counting SAP Web IDE, SAP Fiori devices, and the SAPUI5 runtime environment. These instruments disentangle the advancement prepare and empower designers to make applications speedier and with less exertion.

- JAVA: Java may be a general-purpose, object-oriented programming dialect that was to begin with discharged by Sun Microsystems in 1995. It was planned to be platform-independent and could run on any machine that includes a Java Virtual Machine (JVM) introduced. This include makes it exceptionally prevalent for creating web and versatile

applications that can run on diverse working frameworks and equipment designs. Java code is compiled into bytecode, which can run on any machine with a JVM, making it more versatile and secure.

Java contains a wide run of applications and is utilized for creating different sorts of computer program, counting web applications, portable apps, desktop applications, diversions, and enterprise applications. A few of the key highlights of Java incorporate its straightforwardness, object-oriented approach, programmed memory administration, and stage autonomy. Java moreover features a huge designer community, which has contributed to the creation of various libraries and systems that make it less demanding to create applications.

Java is additionally prevalent for creating server-side applications, such as web servers and application servers. Some popular web application systems in Java incorporate Spring, Struts, and JavaServer Faces (JSF). Java has too been utilized for creating Android portable apps utilizing the Android SDK and Android Studio.

In general, Java may be a widely-used programming dialect with a huge designer community and a wide run of applications.

- S4/HANA: SAP HANA may be a high-performance, in-memory database that's planned to handle expansive volumes of information in real-time. It is an progressed, columnar-based, social database management system (RDBMS) that can be conveyed either on-premise or within the cloud.

  HANA stands for High-Performance Expository Machine, and the database is optimized for handling and analyzing expansive volumes of information at tall speed. It employments in-memory innovation to store information in RAM, making it much speedier than conventional disk-based databases.

  The HANA database is additionally planned to back progressed analytics and information handling, such as real-time prescient analytics, machine learning, and spatial information preparing. It can handle both organized and unstructured information and can coordinated with a wide extend of information sources, counting SAP and non-SAP frameworks.

  By and large, the HANA database gives organizations with a effective stage for overseeing and analyzing their information in real-time, permitting them to pick up

important bits of knowledge and make more educated commerce choices.

- JAVA Spring Boot: Spring Boot may be a well known open-source Java-based system for building and sending microservices and web applications. It was made to disentangle the method of creating and conveying production-ready applications, with an accentuation on tradition over setup, making it simple to set up and get begun rapidly.

  Spring Boot gives a number of highlights that streamline the advancement prepare, such as implanted servers and auto-configuration, which consequently designs the application based on the conditions included to the extend. It too incorporates a number of starter conditions for prevalent advances, such as Spring Information, Spring Security, and Spring Web, which offer assistance to decrease the sum of boilerplate code required to construct an application.

  In expansion, Spring Boot is exceedingly customizable and can be amplified with a run of plugins, making it conceivable to tailor the framework to the particular needs of an application. It moreover features a huge and dynamic community, with numerous assets and examples available online to assist engineers get begun and troubleshoot any issues that emerge.

  In general, Spring Boot may be a capable and adaptable system that streamlines the improvement handle for Java-based applications, permitting designers to center on building high-quality, adaptable, and viable code.

- Rest API: A REST API (Representational State Exchange Application Programming Interface) is an interface for web administrations that takes after the standards of the REST engineering fashion. REST may be a set of imperatives utilized to plan web administrations that are adaptable, straightforward, and lightweight.

  In a RESTful API, each asset or protest within the framework is spoken to by a special URL. The HTTP verbs (GET, POST, PUT, Erase) are utilized to associate with these assets to perform different CRUD (Make, Examined, Upgrade, Erase) operations.

- SAP ABAP: SAP ABAP (Advanced Business Application Programming) may be a high-level programming dialect utilized to create applications for the SAP R/3 framework. ABAP is an object-oriented programming dialect and it is the essential programming language utilized for making custom applications within the SAP environment.

ABAP is utilized to create a assortment of programs, counting reports, exchange programs, clump input programs, and shapes. ABAP programs can associated with the fundamental database, get to information from diverse sources, and can be coordinates with other SAP modules.

3.3 System Design

The framework plan stage successfully bridges the hole between the issue region and the current framework, tending to the arrangement zone - particularly, ”how to execute?” Amid this arrange, the SRS documentation is changed over into an compelling usage arrange that too diagrams the system’s operation. The complex assignment of framework advancement is broken down into sensible sub-activities that work together to attain the extreme objective of framework improvement. A great plan empowers the generation of proficient code and minimizes usage measure based on the application and extend prerequisites.

Framework plan comprises two levels: consistent plan and physical plan. Coherent plan gives an unique outline of the system’s inputs, yields, and information stream, assembly client needs in portraying inputs (sources), yields (goals), databases (information capacity), and forms (information streams). Consistent plan is vital for the fruitful execution of a corporate database. An insufficient coherent plan may require exorbitant adjustments to information collection, capacity, and security afterward on. A sound preparatory plan rearranges database advancement and assessment, contributing to fruitful execution. The framework examiner indicates client prerequisites in detail, basically directing the data stream into and out of the framework and the vital information sources amid a coherent framework plan.

When creating a system’s coherent plan, the framework investigator indicates client needs with sufficient detail to decide how data enters and takes off the framework and the specified information sources. Charts of information stream and E-R chart modelling are utilized. Furthermore, the input/output media is indicated, the database is outlined, and reinforcement strategies are set up. At last, framework execution is arranged.

3.3.1 Complete System architecture

The complete system consists of 4 modules inventory management module, Ticketing system, Staff management module, And CW-ITM workBox inventory management is for managing the

inventories in the system. It works in such a way that a person concerned can enter the changes in the system the system will check for threshold values and it triggers a workflow for DoA. The tasks can be pulled to CW-ITM which is integrated into this system. In the ITM interface, the User can easily pull tasks into it. And make actions like Approve, Reject, and Forward. The Ticketing system consists of a system used for notifying issues to concerned persons. The ticket can be created and deadlines generated based on the priority of the task given and it gets directly assigned to the concerned person the ticket can include statuses like ACTIVE, HOLD, IN-PROGRESS, RESOLVED and the staff management system including the adding staff into the system managing staff details assigning shifts

Chapter 4

Result and Discussion

In Stock Administration the stock held by the client holds critical esteem as it speaks to a profitable financial asset for the organization within the future. There exist certain occasions wherein stock may gotten to be out of date, ruined, harmed, misplaced, or stolen. In these circumstances, clients utilize the hone of stock write-off as a implies of disposing of things from the common record, recognizing their null esteem. Within the occasion that the worth of stock reduces, it is recorded as a misfortune in esteem, commonly alluded to as stock disability, as restricted to being totally disposed of. The previously mentioned forms bear money related consequences for our clients. At show, the stock write-off/write-down strategy actualized at the client shows a cross breed approach, comprising electronic mail-based communication along side the utilization of the Oracle/SAP stage. On the client's side, the stock write-off and disability prepare is guided by a designation of specialist (DoA) system that applies to all important commerce units. It moreover incorporates a Ticketing Framework for informing issues, concerned persons.Also, incorporate a Staff Administration Framework The company have a diverse set of staff for stockroom administration This framework oversees those staff. Too, have an Brilliantly Errand Administration System-ITM for overseeing all assignments

4.1 Testing Methods

Testing ensures that the system is error-free based on criteria that are anticipated by the user or by the organization. A system may have high-end or low-end performance based on the environment in which it operates.

4.1.1 Validation Testing

The process of validating whether a system meets the requirements and expectations of its users or clients is called validation testing. In this project, unit testing is an important aspect of validation testing, aimed at identifying defects in individual sections of the project. Unit

testing is used to evaluate the functionality and performance of each system unit or component in isolation. This testing helps developers to identify and resolve issues early on, thereby minimizing the risk of encountering problems during deployment or integration. A successful validation test confirms that the system meets the requirements, while a failed test indicates that modifications are necessary. Unit testing is a critical step in the validation process, enabling developers to ensure that the system performs as expected and meets the needs of all stakeholders. Including a gigantic stack to the framework and guaranteeing the framework carries on because it would in a great scenario. Here ,we have included a part of the assignments are confirmed the assignment board loads without any issue in the ticketing system. Indeed for a single page there are a parcel of APIs called,so its vital to know the stacking time of the application .Including in a huge information and get to it all at one time guarantees the execution in high stack .Since there's API's that runs within the foundation it ought to moreover work without any issue .Gicing tall stack to the API's and confirming the API's and the application does not break was too portion of the testing . And Tested the UI by providing values

4.1.2 User Acceptance Testing

The User Acceptance Testing (UAT) phase holds considerable importance in the development of a Project Management System. The process entails subjecting the system's functionalities to empirical scrutiny by end-users with the aim of verifying conformance to their specifications, and determining its fitness for deployment. The conduction of User Acceptance Testing (UAT) holds a paramount significance in the identification of potential errors or faults and ensuring that the functionalities of the system comply with the users' anticipated outcomes. During the User Acceptance Testing (UAT) phase, end-users engage in the simulation of real-life scenarios aimed at assessing the functionalities of the system under consideration. Subsequently, the users provide constructive feedback to the development team to enable them to make improvements to the system. The aforementioned feedback is subsequently utilized to effectuate any essential enhancements to the system. The process of User Acceptance Testing (UAT) serves to mitigate the possibility of user discontentment and guarantees the system is sufficiently prepared for implementation. The efficacy of the Project Management System is contingent upon the adequacy of the User Acceptance Testing process. The aforementioned system is guaranteed to exhibit attributes of user-friendliness, efficiency, and alignment with

end-users' needs. The implementation of a proficient User Acceptance Testing (UAT) protocol ensures that the system is equipped with the necessary attributes to accommodate any future modifications and updates, while also being able to meet the evolving requirements of its users. This, in turn, enables increased scalability, thereby enhancing the overall effectiveness of the system.

In essence, User Acceptance Testing (UAT) is a crucial component of the developmental life cycle of Project Management Systems. The process assists in discerning possible concerns, harmonizing the traits of the system with the users' anticipations, and ascertaining the system's preparedness for implementation.

4.2 Test Cases

Table 4.1: Test Cases

Slno	**Condition to be Tested**	**Expected Result**	**Observed Outcome**	**Status**
1	Adjustment Authorisation form with correct details	details are in the valid form the form should be submitted.	Form submitted successfully.	PASS
2	Adjustment Authorisation form with correct details and selecting no plant name	Form will not get submitted.	The system shows error and form not get submitted.	PASS
3	Tring to log in with an Invalid customer ID and password on the login screen.	The user should not get logged in.	An error message stating "Invalid credentials" is displayed.	PASS

4	Entering valid user name and password.	The customer should get logged in.	user gets logged in and redirected to the home page.	PASS
5	Opening admin task window.	Expected to display only the tasks, when the login module is successful.	The window displays all the current tasks from various systems.	PASS
6	Trying to click the Approval button of a task	When clicking the approve button the request has get approved.	The task gets approved and forwarded for the next approval process.	PASS
7	Trying to change the language to Bahasa Indonesia	When the user tries to change language gets changed.	Language changed to Bahasa Indonesia.	PASS
8	Trying to create a ticket.	The ticket gets created and displayed on the dashboard.	The ticket gets created and displayed on the dashboard.	PASS

4.3 Output Screens and Results

1. Adjustment Authorisation Form

   User can enter Adjustment Authorisation Form for making an inventory Adjustments

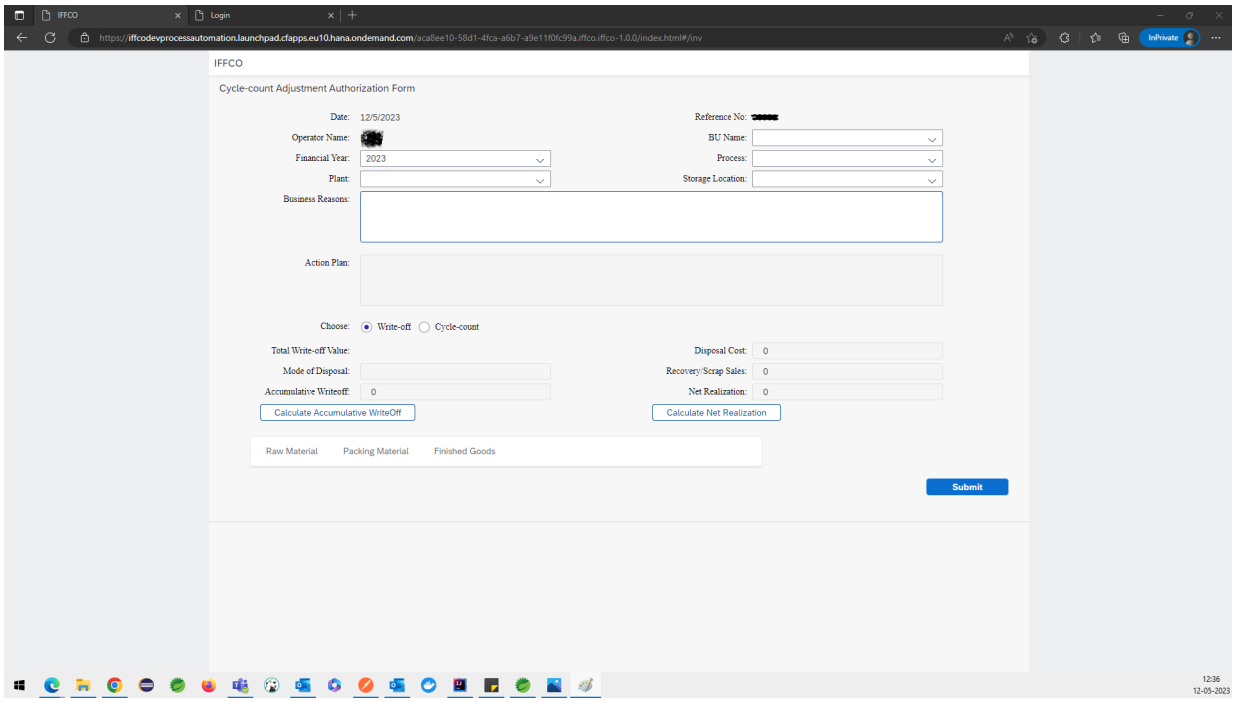

Figure 4.1: WorkBox Adjustment Authorisation Form

2. WorkBox Task Tab

   The page is for displaying tasks.

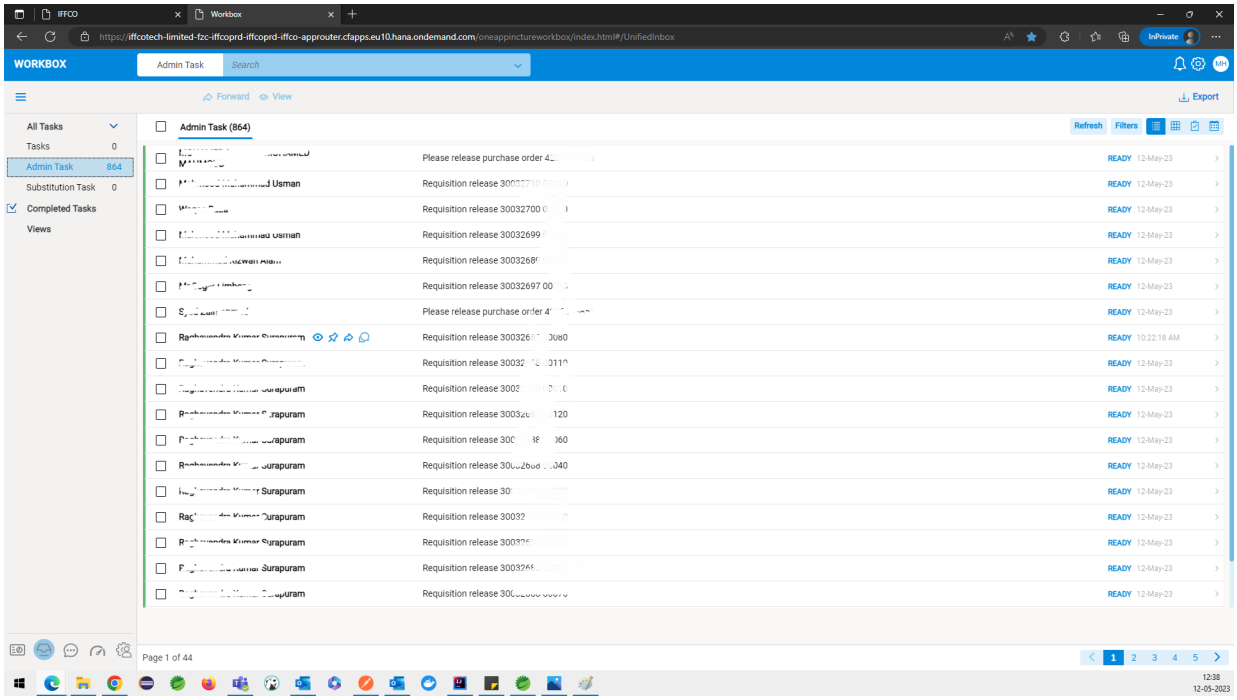

Figure 4.2: WorkBox Task Tab

3. View for each Task

   Viewing each tasks in system.

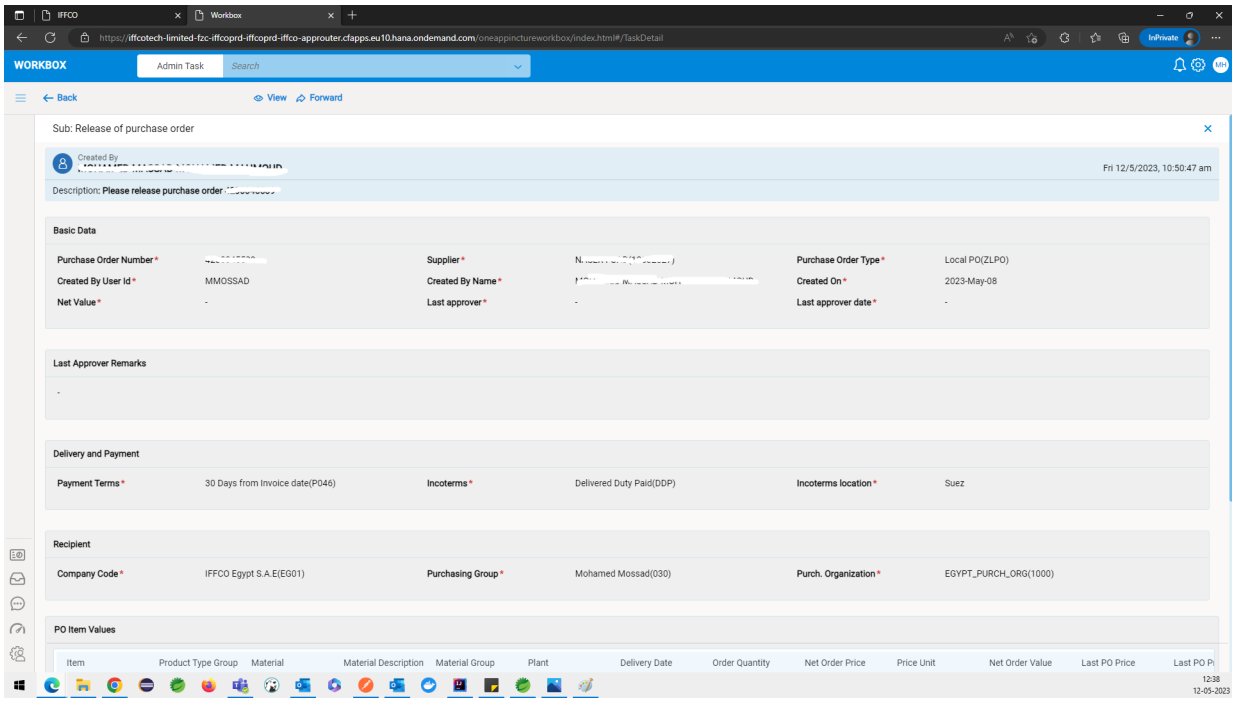

Figure 4.3: View for each Task

4. Graphical representation page

   Graphical representation page for all visualizations .

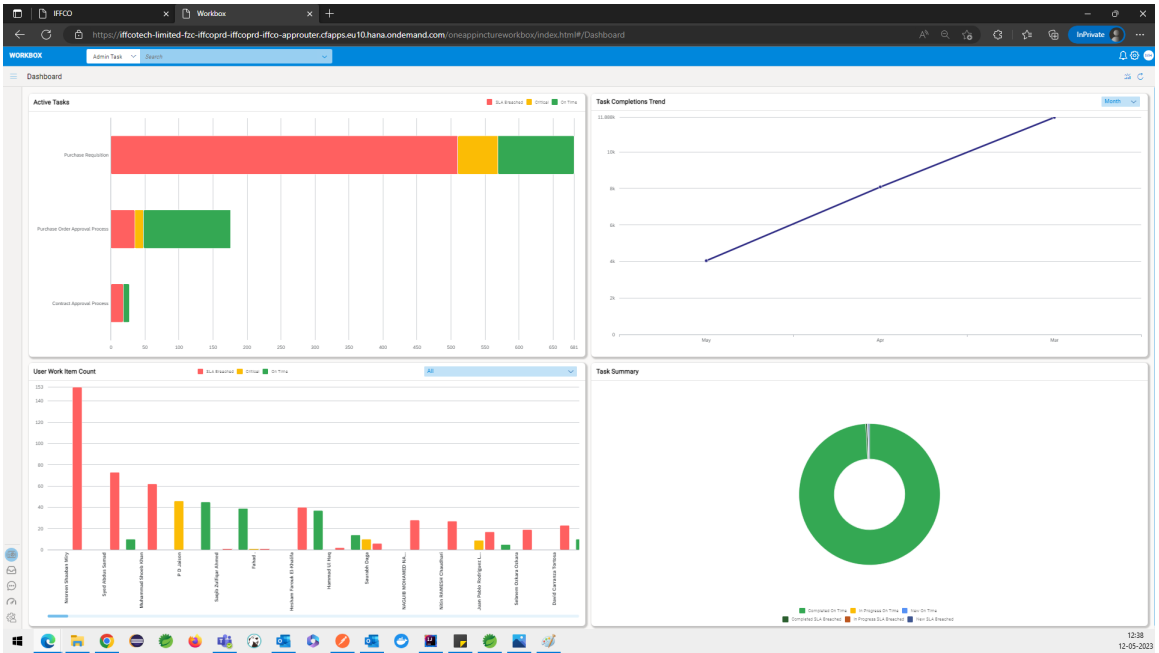

Figure 4.4: Graphical representation page

5. Version control page

Its an internal configuration page for updating the system and maintaining Version.

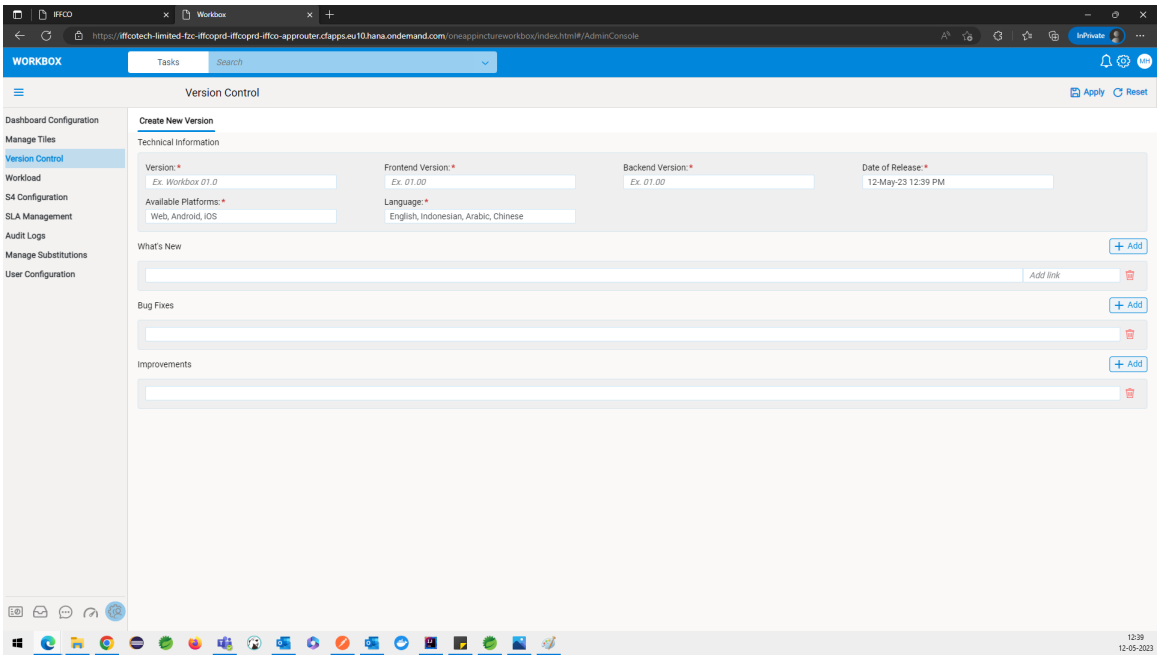

Figure 4.5: Version control page

6. Theme

Create new Themes and edit existing theme.

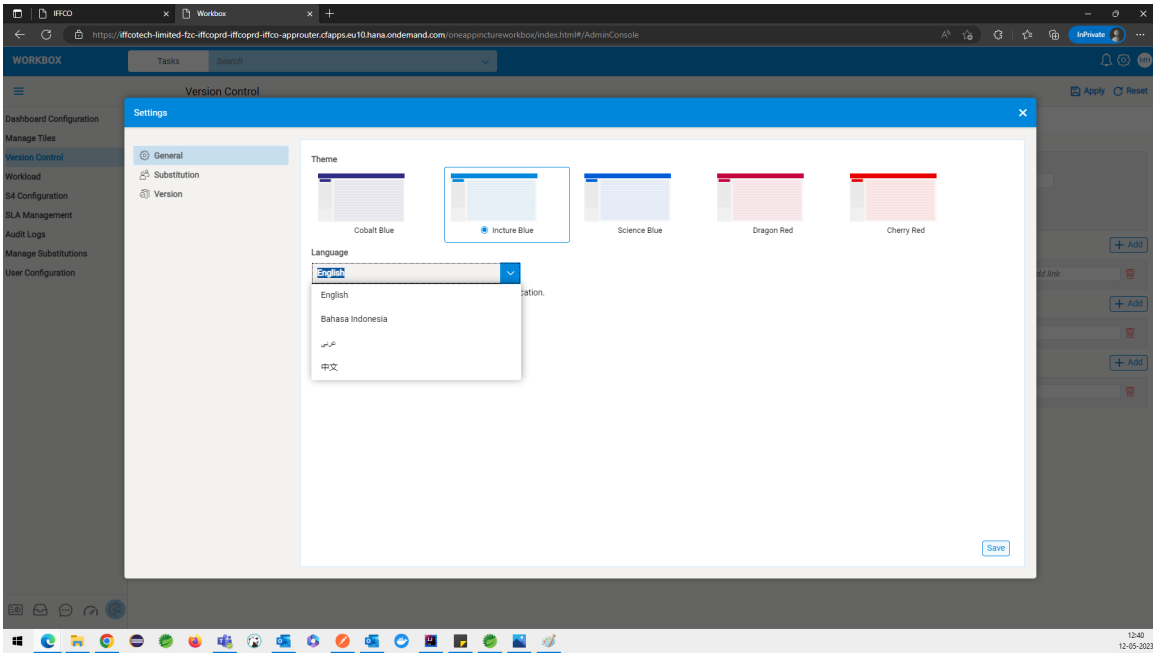

Figure 4.6: Theme

7. Ticketing System Home

   A page for viewing the tickets and doing operations

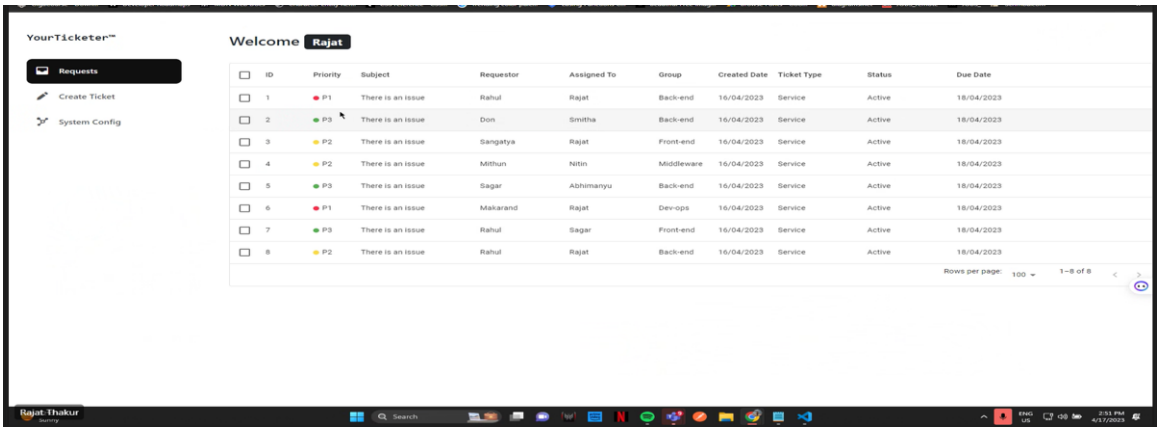

Figure 4.7: Ticketing System Home

Chapter 5

Conclusion

The study of inventory management in the given context highlights the significance of inventory as a valuable economic resource for organizations. However, various challenges such as obsolescence, spoilage, damage, loss, and pilferage can lead to the need for inventory write-off or write-down, impacting the organization's financials.

The current inventory write-off/write-down procedure at the client follows a hybrid approach, combining email-based communication with the use of the Oracle/SAP platform. This approach enables efficient communication and streamlines the process of eliminating or impairing inventory items.

The delegation of authority (DoA) framework applied across relevant business units ensures that the inventory write-off and impairment process is guided by appropriate authorization and accountability. This framework helps maintain transparency and control over inventory-related decisions.

Additionally, the incorporation of a Ticketing System proves beneficial in promptly notifying issues and involving relevant personnel for resolution. This system enables efficient communication and collaboration among stakeholders, ensuring timely actions to address inventory-related concerns.

The Staff Management System implemented by the company effectively handles the management of warehouse staff. This system helps streamline staff allocation, scheduling, and performance tracking, ensuring efficient utilization of resources and optimal warehouse management.

Moreover, the Intelligent Task Management System (ITM) plays a crucial role in managing all tasks related to inventory management. This system aids in task allocation, tracking, and monitoring, enhancing productivity and ensuring that inventory-related activities are well-coordinated and executed.

Overall, the combination of the hybrid approach for inventory write-off/write-down, the delegation of authority framework, the Ticketing System, Staff Management System, and

Intelligent Task Management System demonstrates a comprehensive and efficient approach to inventory management. These systems and processes contribute to minimizing losses, optimizing inventory utilization, and enhancing overall organizational efficiency.

5.1 Future Enhancement

While the current inventory management systems and processes provide a solid foundation, there are several areas where future enhancements can further improve efficiency and effectiveness. Here are some potential areas for improvement:

1. Implementation of an Automated Inventory Tracking System: Introducing an automated system using technologies such as RFID (Radio-Frequency Identification) or barcode scanning can greatly enhance inventory tracking and accuracy. This system can provide real-time updates on inventory levels, location, and movement, reducing the likelihood of errors, improving inventory visibility, and enabling faster decision-making.

2. Integration of Artificial Intelligence and Machine Learning: Leveraging AI and ML algorithms can help optimize inventory forecasting, demand planning, and replenishment strategies. These technologies can analyze historical data, market trends, and other relevant factors to provide accurate predictions and recommendations for inventory management, leading to reduced carrying costs and improved customer satisfaction.

3. Incorporation of IoT (Internet of Things) Devices: IoT devices can be utilized to monitor environmental conditions, such as temperature and humidity, to ensure proper storage and prevent spoilage or damage to inventory items. Real-time data from IoT devices can be integrated with inventory systems, triggering alerts or automated actions when predefined thresholds are breached.

4. Introduction of Mobile Applications: Developing mobile applications for inventory management can enhance accessibility and facilitate on-the-go inventory monitoring and control. Warehouse staff and managers can use mobile devices to perform tasks such as scanning barcodes, updating inventory records, and accessing real-time information, improving efficiency and responsiveness.

5. Implementation of Advanced Analytics and Reporting: Advanced analytics capabilities can enable in-depth analysis of inventory data, helping identify trends, patterns, and

opportunities for improvement. Interactive dashboards and comprehensive reports can provide key insights into inventory performance, stock turnover rates, and potential areas of risk or inefficiency, supporting informed decision-making at all levels of the organization.

6. Integration with Supplier and Customer Systems: Integrating inventory management systems with suppliers' systems can facilitate seamless communication, enabling real-time updates on order status, delivery schedules, and stock availability. Similarly, integrating with customer systems can enhance visibility into demand patterns, enabling better inventory planning and fulfillment.

7. Implementation of Robotics and Automation: In highly repetitive tasks such as picking and packing, the introduction of robotics and automation can significantly increase efficiency and accuracy while reducing labor costs. Robotic systems can work alongside human operators or autonomously to handle routine inventory tasks, freeing up human resources for more value-added activities.

8. Enhanced Security Measures: Strengthening security measures, such as access controls, surveillance systems, and inventory tagging technologies, can minimize the risk of inventory loss or theft. Implementing stringent protocols and conducting regular audits can help maintain inventory integrity and safeguard valuable assets.

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Appendix

Screenshots

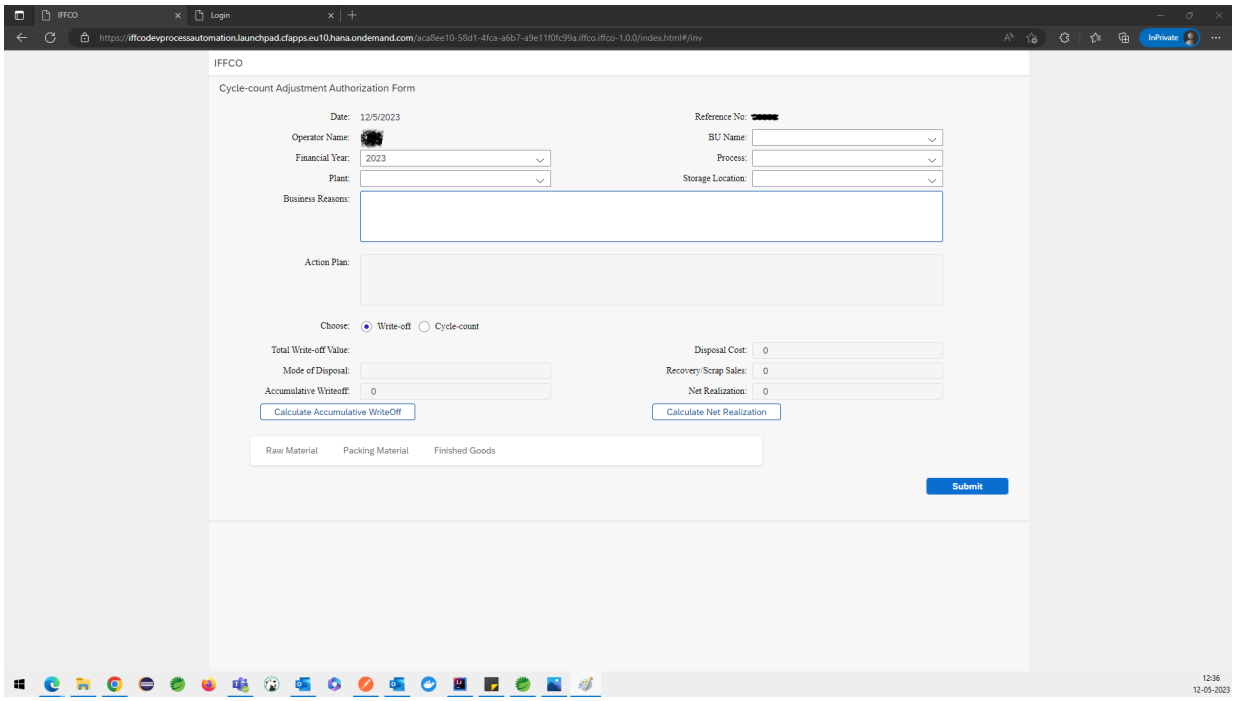

Figure A.1: WorkBox Adjustment Authorisation Form

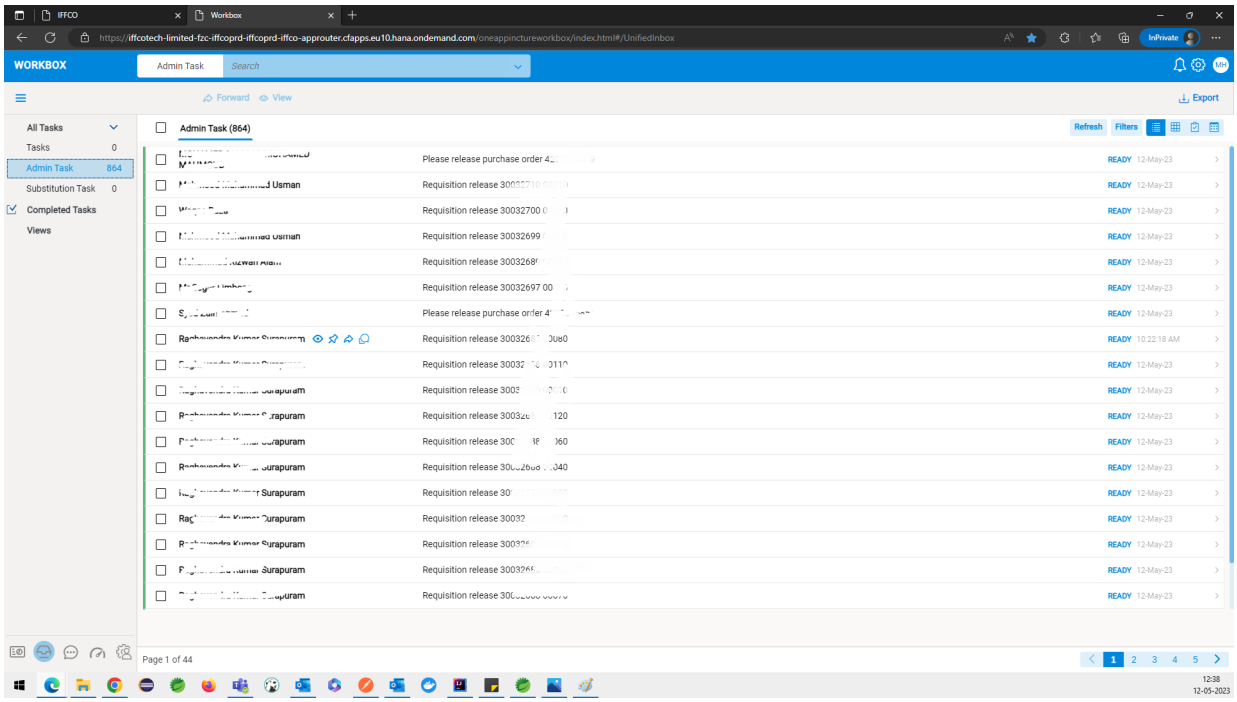

Figure A.2: WorkBox Task Tab

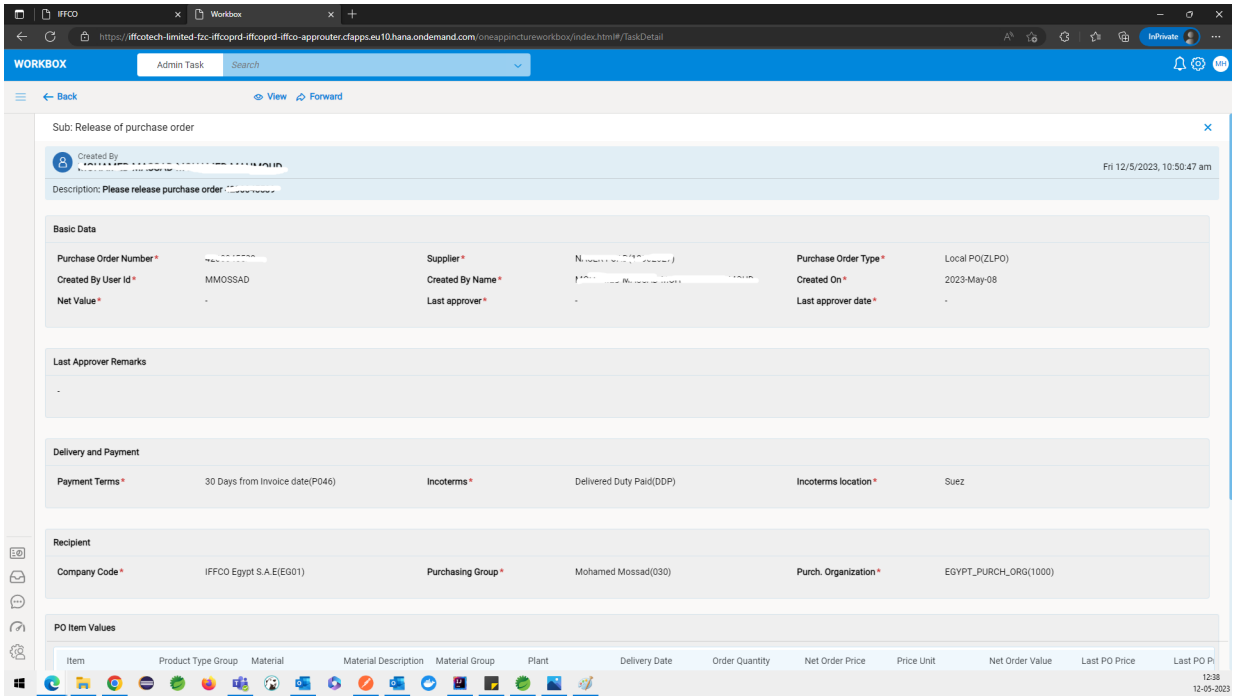

Figure A.3: View for each Task

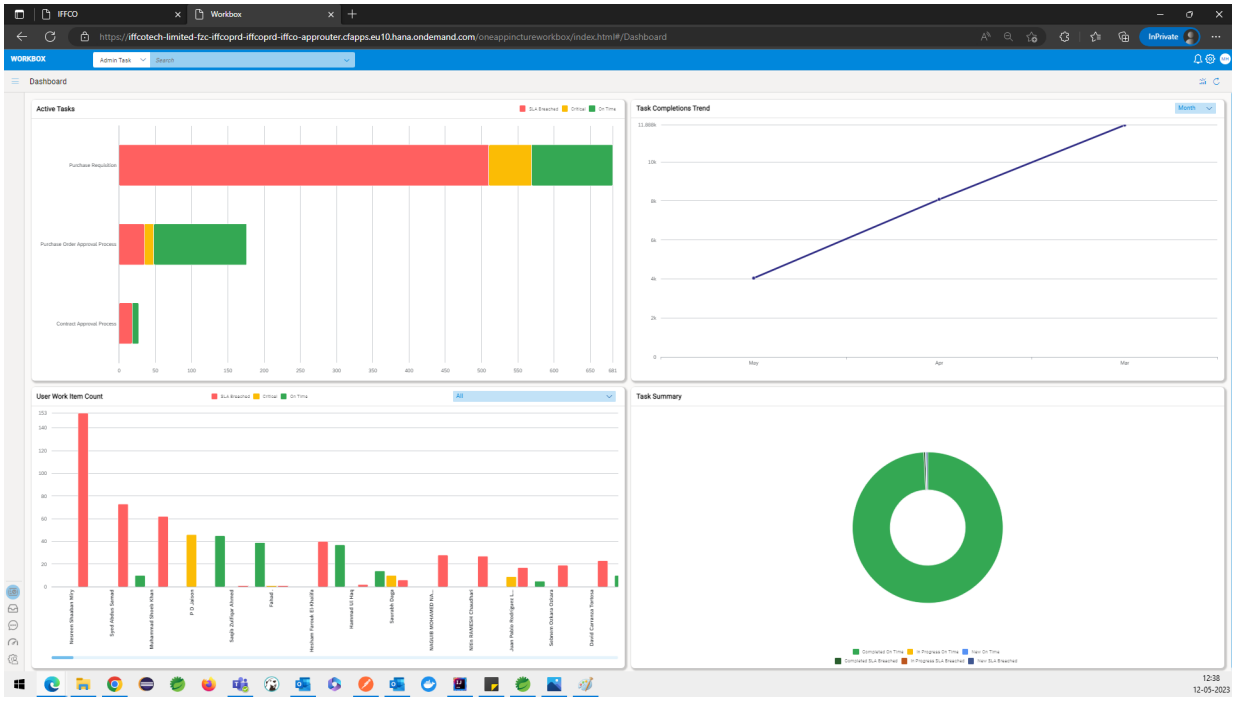

Figure A.4: Graphical representation page

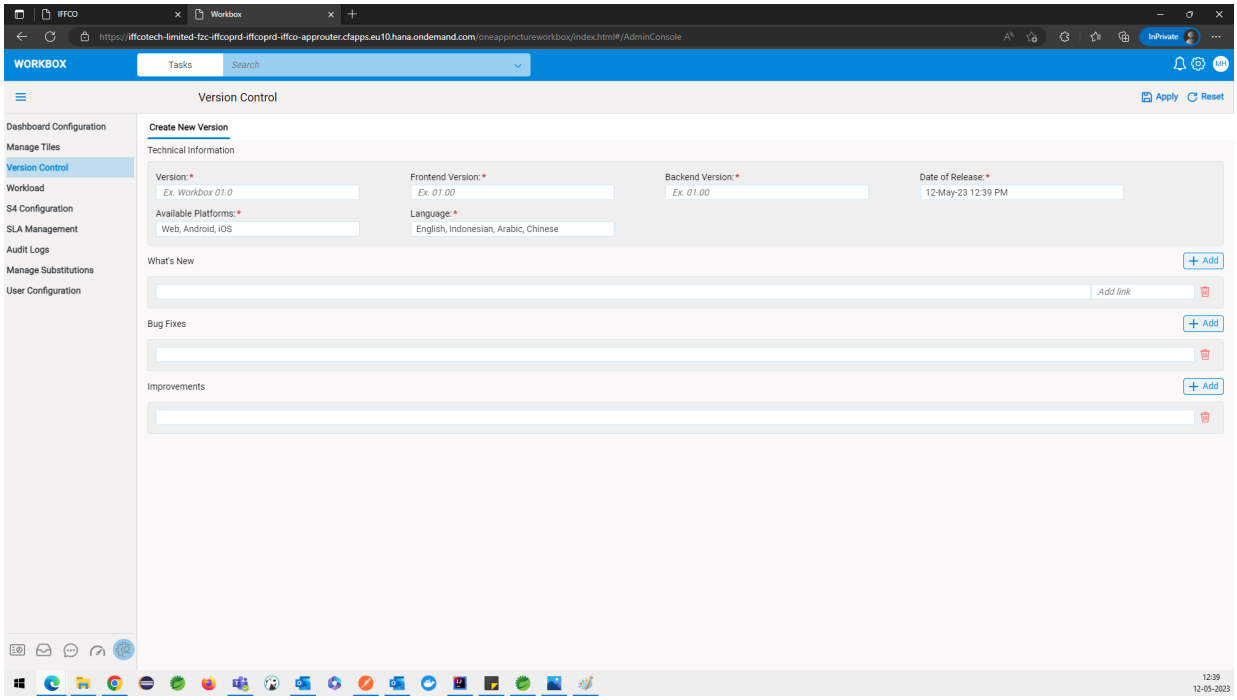

Figure A.5: Version control page

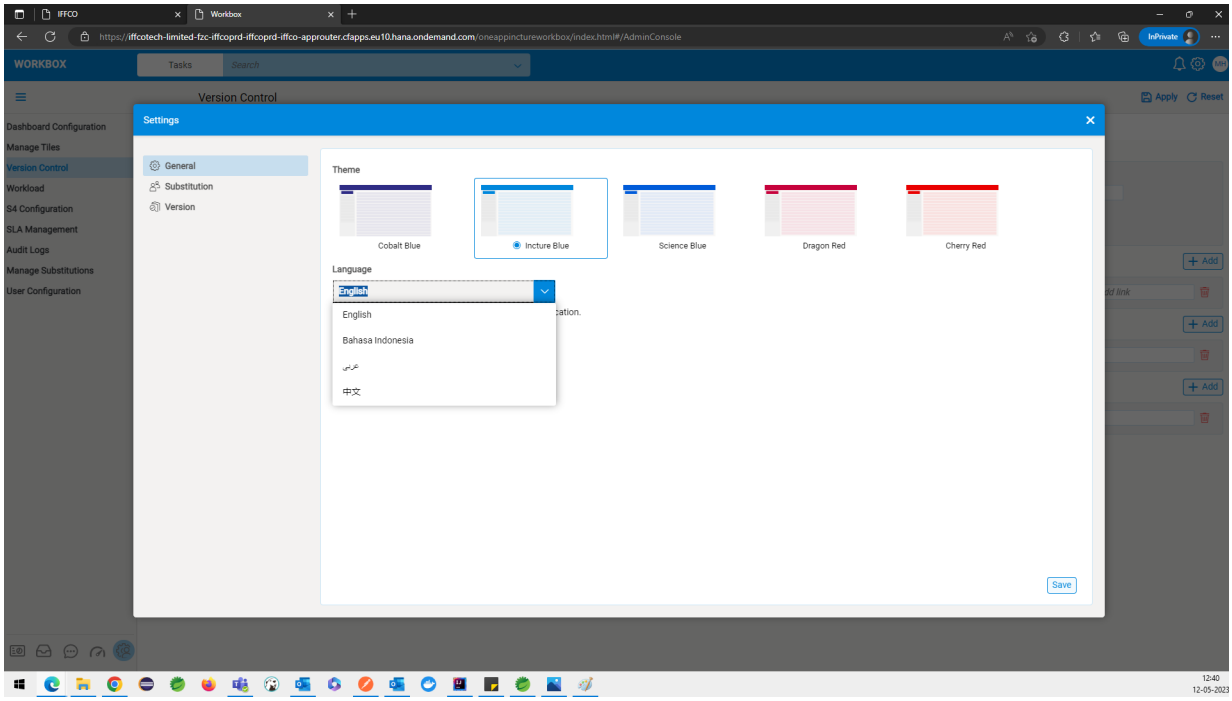

Figure A.6: Theme

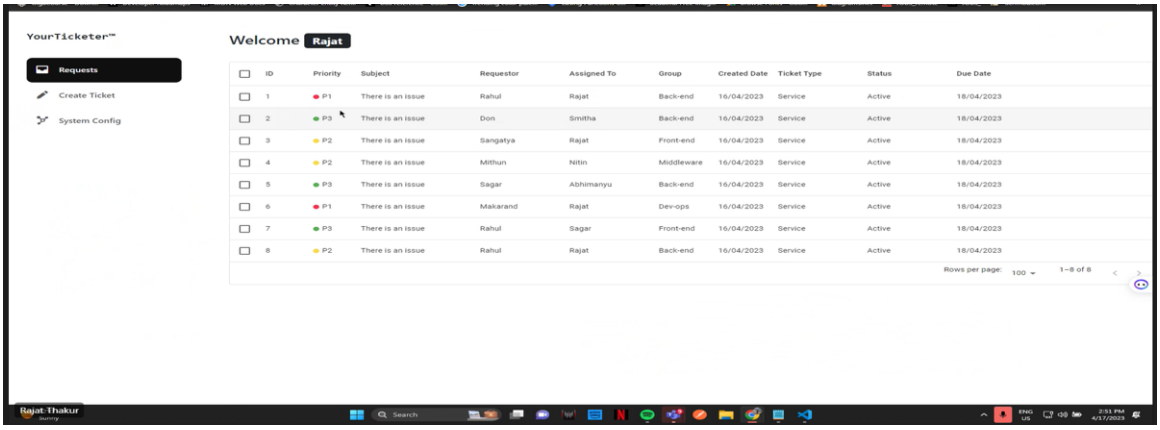

Figure A.7: Ticketing System Home