

# Imbentaryo App: An Intelligent Inventory and Decision Support System

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**Abstract**—*Imbentaryo App* an intelligent inventory system and decision support system (DSS) equipped with forecasting algorithm and Short Messaging Service (SMS) technology. The system performs business intelligent solutions through predictive data analysis from the inventory historical data needed for decision making on planning, monitoring, and management of supplies and equipment in the Supply Management Office (SMO) of Tanauan, Leyte, Philippines. The study is designed to advance the current inventory system by integrating innovative technologies and intelligent algorithms comparable to artificial intelligence. The system development utilized an agile model in building software prototypes to meet user and business requirements. The application is equipped with a secured database server and accessible on secured network architecture through web and mobile technology. The application was confirmed by SMO personnel to be an effective and efficient inventory system using ISO 25010 with a significant rating of 4.32 interpreted as Extremely Efficient.

**Keywords**—Decision Support System, Forecasting Algorithm, Intelligent Inventory System, ISO 25010

## I. INTRODUCTION

Technological presence nowadays is getting more rampant than ever. This technological shift in various organizations leads to growing concerns for a decision support system that will feature business intelligent solutions to problems and complexities in the organization[1][2]. Information system becomes an important asset of the organization that contributes to job productivity, real-time and proven effective and efficient in every transaction which will enrich the institution reputation [3].

The local Government Unit of Tanauan is one of the pioneers in the government agencies in the Philippines in the

Province of Leyte. The Supply Management Office is mandated to provide a quality inventory of supplies and equipment to the different service offices among employees and administrative personnel. The tiresome process encountered by supply office personnel in tracking and updating inventory records demands a call for system automation that will aid decision making for the supply office[4][5].

One of the leading system automation in the organization today is the inventory system. This system automation provides ease and comfort in monitoring and managing inventory records but a deficiency to real-time re-order point decision status on the on-demand items from the supply office.

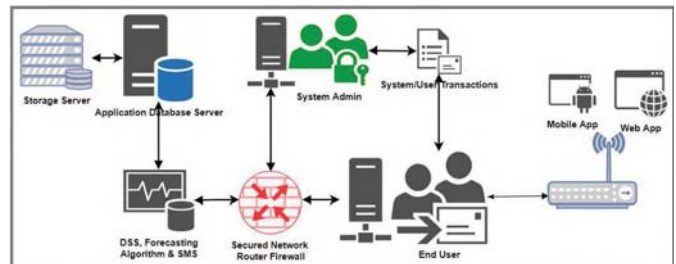


Figure 1. Imbentaryo App System Architecture

The progress of web and mobile applications, short messaging service (SMS), and machine learning algorithms allow system integration with a decision support system [4][6][7]. These integrations of technologies advance the inventory system to an intelligent business solution application capable of forecasting algorithm on the on-demand items and provide monitoring and managing of inventory comparable to artificial intelligence [8][9].

The problems encountered due to data inconsistencies, unsecured processing transactions, understocking of items and failure to meet the target reports, and poor delivery of services to different offices serve as the business requirements in the development of an integrated Imbentaryo App equipped with a decision support system, forecasting algorithm, and SMS technologies. The system is designed to a web and mobile application framework that runs on secured network architecture, presented in Figure 1.

The study is anchored to the Technology Acceptance Model (TAM) on the use of information systems in the intelligent inventory system of supplies and equipment in the Supply Office [10][11]. The application features a forecasting

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algorithm based on the on-demand items requested and purchased by different service offices. The model aims to examine how users will accept, use, and adapt to system innovation that will enhance employees' job performance and productivity [12][13].

The unique features of the Imbentaryo App in the inventory procedures of the office fortified with a forecasting algorithm on a Decision Support System provides accurate and real-time information for decision making in the procurement management plan of the different service offices. Further, the system is a web and mobile application that provides an intelligent management dashboard that acts as a business solution. The application features reports generation based on the forecasting algorithm such as a priority list of items that need to be purchased on their current stock requirements in the inventory.

Finally, the application is equipped with SMS technology that sends notifications to both the personnel and the end-user on the items requested in the supply office. The application is developed on a cross-platform computing framework where devices can access the system in a secured network-based architecture [14].

Thus, the proposed system contributed to job productivity, effectiveness, and efficiency in the inventory transactions of the supply office to different service offices in the LGU of Tanauan, Leyte. Building the morale and confidence of the Supply Office personnel [15].

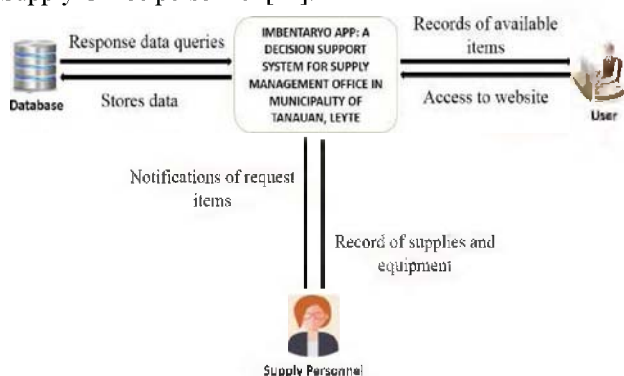


Figure 2. Imbentaryo App Context Diagram

Numerous inventory system automation has already been developed and studied in various organizations to provide efficiency in the service delivery in the inventory transactions. However, a limited study on an intelligent inventory system equipped with machine learning algorithms and various technologies on the web, mobile, and SMS technology that allows real-time and dependable inventory transactions. Therefore, this study is designed to advance the current inventory system through a forecasting algorithm utilizing a decision support system framework.

## II. GOALS

This study aimed to design and develop an Imbentaryo App: a Decision Support System with a forecasting algorithm for the Supply Management Office in Tanauan, Leyte. The

proposed system is an integrated application system that provides an effective, efficient, and intelligent inventory system to the different service offices. An inventory system that seeks to provide efficient decision making on the processing of transactions and real-time generation of reports of priority items for purchase.

Specifically, the study designed and develop an application system that is accessible to mobile and web application technology equipped with a system portal. The system features a forecasting algorithm utilizing SMS technology in sending notifications both to supply office personnel and the end-user. Finally, develop an intelligent inventory system with secured access to the database on secured network architecture.

## III. METHODS

The researchers utilize a qualitative and developmental research design to achieve the objectives of the study. The agile software model was employed in the development of the proposed system [16]. The process starts with a software prototype integrating decision support and forecasting algorithms based on the system requirements and iteratively improves until the whole system is completed and ready for deployment [17].

A specialized application such as Laravel, React Native, JavaScript, Visual Studio, Android Studio, and MySQL database were utilized on the robust system development and secured application database server. Further, user and system testing were comprehensively performed to ensure the application's robust development on web, mobile application framework, and short messaging service technology.

Standardized survey questionnaires on software quality standards ISO/IEC 25010 using a 5-point Likert scale were utilized to capture the respondents' views and opinions on the system's capability as an intelligent inventory system [18].

The 24 supply office personnel were purposively selected as the respondents of the study. These are personnel who collaboratively discussed the problems encountered and how they can be addressed by the proposed system in the Supply Management Office of Tanauan, Leyte.

Research ethics were strictly observed ensuring high confidentiality in the data collected. Quantitative analyses were performed using MS Excel and IBM SPSS 22 to perform data analysis [19].

## IV. RESULTS

The unique system features of the proposed system equipped with a decision support system, forecasting algorithm, and SMS technology confirms the result of the study objectives.

Table 1 presents the respondents' issues and concerns on their current inventory system. These were collaboratively discussed by the researchers and respondents on the development of the proposed system.

The results revealed that supply office personnel are determined on the system automation in their current



inventory system that will improve the service delivery, monitoring, and management of supplies and equipment.

TABLE I  
RESPONDENTS VIEWS ON THE CURRENT SYSTEM

Issues and Concerns	Mean
1. Problem encountered using the current system in processing inventory reports of supplies and equipment.	3.7
2. Manual process of the current system is time-consuming.	3.7
3. All data of inventory is secured.	3.1
4. The distribution of supplies and equipment to every office is sufficient.	3.4
5. The monitoring of all the supplies and equipment is easy using the manual process.	2.8
6. The record-keeping of inventory is 100% accurate using the manual process.	3.1
7. Computerized system for inventory will help improve the transaction of the supply office.	4.0

TABLE II  
IMBENTARYO APP SOFTWARE QUALITY STANDARDS

ISO 25010 Standards	Mean	Interpretation
Functional Suitability	4.37	Extremely Efficient
Performance Efficiency	4.40	Extremely Efficient
Compatibility	4.28	Extremely Efficient
Usability	4.31	Extremely Efficient
Reliability	4.29	Extremely Efficient
Security	4.40	Extremely Efficient
Maintainability	4.23	Extremely Efficient
Portability	4.30	Extremely Efficient
<b>Grand Mean</b>	<b>4.32</b>	<b>Extremely Efficient</b>
* 1.0-1.80 Not Efficient, 1.81-2.60 Fairly Efficient, 2.61-3.40 Efficient, 3.41-4.20 Very Efficient, 4.21 – 5.0 Extremely Efficient		

The intelligent inventory system was evaluated using ISO 25010, a software quality standards evaluation instrument to determine the software characteristics on its distinct functions. Table 2 presents the system evaluation of 4.32 interpreted as Extremely Efficient. The results reveal how the application exceeded the user and business expectations on its decision support system, forecasting algorithm, and SMS notifications features which provide real-time generation of reports and provide reliable re-order point and priority list suggestions on the frequently requested items and supplies in the supply office. Thus contributing to a reliable decision-making report and boost the morale of the supply office personnel [5].

The system provides secured access to different service offices on their Purchase Request, Purchase Order, Inspection Report, Memorandum Receipt, and Procurement Management Plan status. SMS notification is sent to both supply office personnel and end-user on its creation and update which makes monitoring and management reliable [5].

## V. DISCUSSIONS

The system integration of different information and communication technologies utilizing decision support systems, forecasting algorithms, and SMS technology in the development of the Imbentaryo App contributed to the new body of knowledge on an intelligent inventory system [1], [8], [12], [20], [21]. The developed application has been designed specifically to the needs of the Supply Office in the Municipality of Tanauan, Leyte but can be replicated to different municipalities having the same inventory operations.

The results further confirm the technology acceptance model in this study that user's level of acceptance and utilization of system automation will augment the current operations in the supply office using an intelligent inventory system that contributes to job productivity and organizational performance in the field of information and communication technology [11], [22].

Recent studies confirm automation in the inventory procedures indeed prevents human errors and contributed to effective and efficient monitoring in the inventory of supplies and equipment. The proposed system allows service personnel to monitor the stock inventory in a secured, real-time and reliable monitoring of inventory supplies and equipment through the application dashboard [1]. Inventory tracking and monitoring can easily be performed on the system tagging feature.

Researchers and experts present the use of information systems in inventory management and control [21]. Inventory control is supported by an enterprise information system that deals with transactional operations. Inventory management helps inventory managers define the technical way of parameters of inventory control policies which has a framework for a decision support system [23][1]. Experts mentioned decision support system [2] is suitable for decision-makers in selecting and acquisition of desired products and services for organizational needs. The proposed system provides a priority list and reduces time and cost in the decision-making process through DSS and forecasting algorithm [9].

Figure 3 presents the application implemented network diagram that runs on secured network architecture. The proposed system forecasting algorithm allows service office personnel to be directly involved in future planning in the procurement management plan of the office and view real-time stock levels through web and mobile applications in the inventory of data. Through quantitative forecasting, the historical data in all service office transactions were analyzed by the Imbentaryo app. Finally, the SMS capability of the application provides real-time notifications, reports for management, re-order point items, and priority lists to make a well - informed decisions through the reports generated on forecasting algorithm and decision support system [22][25].

The intelligent inventory system provides comprehensive tools for monitoring and managing the performance of the inventory procedures using a forecasting algorithm and



decision support system framework. The proposed application helps the supply management office make a strategic decision and provides a competitive advantage for an accurate decision regarding stocks, equipment, and supplies. Thus, the application contributed greatly to the SMO personnel effort spent on managing the inventory of supplies and equipment [10].

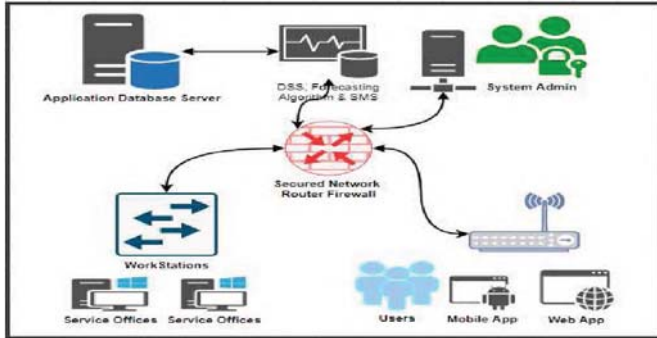


Figure 3. Imbentaryo App Network Diagram

The system's unique web and mobile application features allow secured access to an intelligent inventory system offers technological support and comfort to supply office personnel to easily manage, handle and generate all information required for informed decisions [20]. The application can be accessed in a secured network architecture utilizing cross-platform service via web browser applications thus allowing seamless mobility of the application [20][24], in Figure 4.

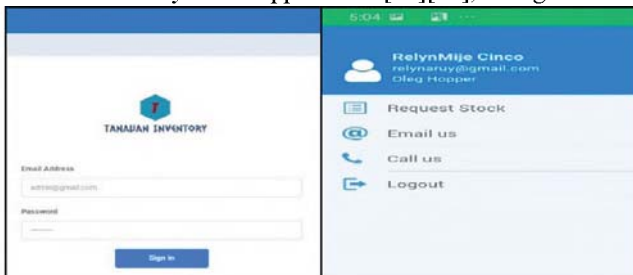


Figure 4. Imbentaryo Mobile and Web App

The forecasting algorithm analyzes the activities (trends) of different service offices on a given forecast period by the system. These allow the supply office personnel to provide accurate data analysis on the stock level and reorder point status of supplies and equipment needed for well-informed decision-making activities, presented in Figure 5.

The proposed system forecasting algorithm perform descriptive analysis on the different inventory transactions coming from different service offices. The system monitors all activities from different service offices in the application data server and performs a predictive modeling approach in coming up with a system-generated inventory list for well-informed decisions integrated into a unique application.

#### The Proposed System Forecasting Algorithm Process

1. *Input:* On system initialization, the application collects data from the database server using the specified parameters such

as `date_inventory`, `dept_name`, `item_name`, `qty_request`, `qty_stock`, `date_purchased`, and `priority_status`.

2. *Data Processing:* The application performs descriptive analysis based on the historical data of inventory transactions per service office. The frequency of `item_name` and `dept_name` are categorized to their `on_demand_status` checking to `item_reorder_point` and `current_stock`. These data are analyzed by the application algorithm to reveal the patterns on the various inventory transactions.
3. *Forecast Output:* The application generates a priority list on suggested inventory supplies and equipment consistent with the office PPMP. These reports include `dept_name`, `item_name`, `qty_reorder`, `priority_status` and `date_generated`.
4. *Quality Control:* The system admin can either confirm the forecasted priority list generated from forecasting analysis or modify `item_name` and `qty_reorder` per `dept_name`. The same reports are submitted to the service office personnel to confirm this system generated purchase request based on their inventory historical transactions.
5. *Distribution:* The system admin and concerned service office personnel are notified on the forecasted inventory list through system SMS mobile application features.

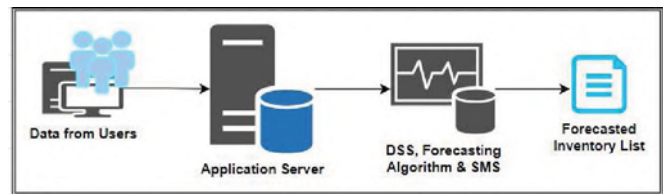


Figure 5. Imbentaryo App Inventory Forecasting Framework

## VI. CONCLUSIONS

The issues and problems encountered by the supply office personnel determined the development of the Imbentaryo App as an intelligent inventory and decision support system equipped with forecasting algorithms and SMS technology.

The unique contributions of the decision support and forecasting algorithm of the Imbentaryo App increase job performance and productivity of supply office personnel.

The application reduces the cost of time resources by providing reliable reports, effective and efficient priority list of frequently requested items and supplies in the office. The system allows historical data to improve decision making and inventory management approach. This eliminates the problem encountered on stock-outs and wastage of supplies and equipment in the supply office.

The application forecasting algorithm was confirmed to be reliable, effective, and efficient to the inventory needs of the different service offices catered by the supply office.

The Imbentaryo App contributed significant benefits to the supply office personnel on their workload requirements for a fast, effective, efficient, reliable, and real-time processing of inventory transactions. The intelligent inventory system contributed greatly to a well-informed decision by providing an effective and efficient inventory list based on the demand forecasting algorithm of the application.



## VII. RECOMMENDATIONS

The unique system features and significant benefits of the proposed system move the following recommendations to the Supply Management Office of Tanauan, Leyte.

The system demand forecasting algorithm needs to be enhanced to provide reliable predicting data analysis on stock inventory and to include other factors such as item price, supplier, and depreciation value, and item usability status.

The forecasting period of the application must be flexible enough to suit the needs of the supply office personnel to adopt need to know basis policy of the organization. The system deployment must be implemented on a secured network infrastructure to ensure application data integrity in the inventory procedures.

Finally, the hardware requirements of the proposed system for its sustainability on processing speed, data storage, and memory allocation on the concurrent access of the application. Using demand forecasting algorithm in system automation presents computational thinking capabilities of the proposed application.

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