


Chapter 12

Inventory Classification and Management System Using Machine Learning and Analytical Dashboard: A Case Study of a Manufacturing Industry

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ABSTRACT

This chapter explores the integration of inventory management and machine learning, offering a comprehensive guide to harnessing analytical dashboards for improved decision-making. At the core of modern inventory management lies the challenge of balancing stock levels to meet demand without incurring excess or shortfall. Using classification algorithms, this chapter explores how machine learning techniques can revolutionize inventory control, making predictions more accurate and operations more efficient. It provides a detailed walkthrough of implementing these machine learning models, emphasizing their practical benefits in forecasting and classification tasks within inventory management. Furthermore, it demonstrates how Power BI can be leveraged to visualize inventory data, enabling stakeholders to gain insights into stock trends, performance metrics, and the overall health of the supply chain. By integrating machine learning outputs into Power BI dashboards, businesses can achieve a holistic view of their inventory dynamics, facilitating informed decision-making processes.

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INTRODUCTION

An improvised business processes are anticipated to yield greater returns and good competitive benefits (Heck, Berg, Davarynejad, Duin, & Roskott, 2010). In this view, business processes are seldom termed as 'intangible' (Heck, Berg, Davarynejad, Duin, & Roskott, 2010). There are five crucial steps that need to be considered as key processes in Inventory Management (IM) as follows: forecasting, purchase, goods receipt, storage, and goods issue.

Analysis is executed to determine activities that comprise chances to improvise performance (Heck, Berg, Davarynejad, Duin, & Roskott, 2010). Such activities are improvise material requirements planning, good registration of supplier-contracts, restrict approved suppliers by automatic means, up-to-date budget control, improvise '3-way-match' between packing note, purchase note as well as invoice, good supplier reliability observation, improvise visibility of inventory turnover, enhance visibility of dead stock, decrease waste via good expiration dates information, good rush orders handling and fewer faults via single master data registration (Heck, Berg, Davarynejad, Duin, & Roskott, 2010). To measure reliability and sufficient performance is significant to accomplish the goals set by the top management (Heck, Berg, Davarynejad, Duin, & Roskott, 2010). When organizations experience stock-out on critical inventory items, production halts would happen (Sheakh, 2018). The highly developed inventory management is meant to meet all rising challenges of most corporate entities and this in response to the fact that inventory becomes an asset of distinct feature (Sheakh, 2018). The ROI of inventory management can be seen in aspect of revenue and profits increase, positive atmosphere among employee and increase of overall customer satisfaction (Sheakh, 2018).

The selected manufacturing industry conducts an annual review meeting of all projects, machines, and systems. Therefore, every team leader and system admin present their reports on their projects, systems, or machines to the management team. Throughout the review meeting, management will discuss solutions and improvements for existing projects, systems, or machines with the respective team leads. As a result, all team leaders need to be well-prepared, as they aim to develop a roadmap for the upcoming year after these discussions. However, the system department's admin faces difficulties presenting the performance of the internal system. This internal system comprises of eight subsystems: IMS (Inventory Management), HR (Human Resources Management), CRS (Change Request System), PM (Preventive Maintenance), TNM (Task Notification Management), SF (Service Form), Procurement Management, and SE (Sample Evaluation). Among these subsystems, the admin faces significant challenges with the Inventory Management System (IMS). Therefore, this study focuses on the IMS to address the admin's two main challenges.

The first challenge in the selected manufacturing industry is the *Lack of Visibility in performance*. The IMS lacks visibility regarding its performance when management intends to review annual reporting. The IMS is a system that records all stock-ins and stock-outs. During the stock-out period, specific items are assigned to specific projects; therefore, the details of the projects, along with the date and quantities of items, are recorded to facilitate traceability. However, there is no visibility showing IMS performance beyond mere recording purposes. There is no crucial information on whether the stock meets the project's demand or whether the company is spending hundreds to thousands on purchasing values that are unnecessary for the project or overstocking beyond the actual demand. So far, the IMS admin needs to manually track the records and manage the updates on the IMS weekly. Moreover, the admin has no summarized information about on-loan items that have been returned on time and their

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