1 Introduction

1.1 Scope

The Smart Wheat Processing System (SWPS) is a web-based supply chain management platform designed to streamline the flow of wheat from farmers to retail stores, ensuring efficient coordination among stakeholders, including farmers, factories, wholesalers, retailers, and consumers. Built using the Laravel framework for the user interface, MySQL for data storage, and a Java server for vendor validation, the SWPS integrates machine learning to optimize production and enhance customer satisfaction. The system supports key functionalities: real-time chat for stakeholder communication, inventory and order management, workforce distribution, scheduled reporting tailored to stakeholder needs, and automated vendor validation via PDF application processing.

The primary goal of the SWPS is to enhance the efficiency and transparency of the wheat supply chain. Specific objectives include:

- Predicting future demand using machine learning (ARIMA model) based on historical sales data to optimize production planning.
- Segmenting customers using K-means clustering to provide personalized recommendations, improving customer satisfaction.
- Facilitating seamless communication between stakeholders through a real-time chat system.
- Automating inventory tracking, order processing, and workforce allocation to reduce manual errors and delays.
- Generating stakeholder-specific reports to support data-driven decision-making.
- Validating vendors by assessing financial stability, reputation, and regulatory compliance, ensuring reliable partnerships.

The benefits of the SWPS include improved supply chain visibility, reduced operational costs through predictive analytics, enhanced customer engagement via personalization, and a scalable architecture that supports future expansion. By integrating modern technologies and data-driven insights, the SWPS aims to transform wheat supply chain management, delivering value to all stakeholders while meeting regulatory and operational standards.