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# TANAW: A Web-Based AI Analytics Platform for Accessible Decision Support in Small and Medium Enterprises

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# TABLE OF CONTENTS

# LIST OF FIGURES

**FIGURE** **PAGE**

# LIST OF TABLES

**TABLE** **PAGE**

# CHAPTER 1

# INTRODUCTION

This chapter presents an overview of the project, its purpose and description, the objective of the study, its scope and limitations, and the definition of unfamiliar terminologies that are being used in this study. It serves as an introduction to the project, providing readers with a clear understanding of what the study aims to achieve and what to expect in the subsequent chapters.

## Project Context

In today's modern world, data is used everywhere. Now practically every enterprise is creating loads of data each day whether they are small or big. For industries like retail and e–commerce, this data can be about sales, inventory or customer preferences and behavior. Big companies leverage this information in their favor by evaluating it and utilizing insights to enhance business processes, services, strategize, and remain competitive within the marketplace. Advanced tools and technologies were employed by big companies to enable them to make more intelligent decisions. But for SMEs, using data in the same manner is not always true, usually because of limited budgets, inability to access advanced analytics tools, and lack of full-time person with the required expertise to get the useful insights from their data.

Many SMEs struggle to use data analytics because the tools available in the

market is usually too complicated or expensive. Most platforms require users have a background in the data science or technical experience, which most SME owners don't have. They therefore depend on manual handling. This tends to result in slow decision-making, lost opportunities, and inefficiencies in the management of their operations [1].

One of the biggest reasons why SMEs do not adopt analytics is due to lack of resources, both in terms of manpower and money. They don't have the budget to hire a data analyst or subscribe to high-end analytical tools. In addition, even if they have access to data, they don't always know what to do with it or how to turn it into useful information that can help their business grow [2]. There is also a concern that existing platforms are not really built with SMEs in mind, they are often too technical or designed for large corporations [3].

That is why this research aims to develop TANAW, a web-based analytics platform specifically made for SMEs in retail and e-commerce. TANAW is a no code-system, which means users don't need to have programming skills to use it. They can simply upload their datasets in formats like Excel or CSV, and the system will automatically generate insights, forecasts, and recommendations to help them make decisions.

This analytical platform TANAW will employ machine learning algorithms to process data and forecast trends like top-selling products, restocking timelines,

and sales projections. It will have an interactive data visualizations, downloadable reports, and feedback loop so the AI can learn from how users react to its recommendations. We will develop it with an easy-to-use interface using ReactJS and TailwindCSS for the frontend, and Node.js and Express for the backend. The AI model is driven by Python with Scikit-learn libraries. Data uploads are handled using Pandas, and the output is shown in a chart using Recharts. Data will be stored using MongoDB, and files are processed securely with Multer and JWT Authentication.

This project aims to close the digital divide in business intelligence by providing a no-code, low-cost, and scalable solution to SMEs. Through TANAW, small enterprises will be able to access tools that were otherwise inaccessible, enabling them to grow and evolve more competitively in today's marketplace.

**Purpose and Description**

TANAW is a web- based analytics platform specifically made to help small and medium enterprises improve their business decision making by providing a simple, no code system for analyzing their datasets especially their sales, inventory, and customer data. The main purpose of TANAW is to make analytics and data-driven insights accessible to non-technical users in retail and e-ecommerce business.

TANAW aims to help SMEs by generating automated insights and

predictive recommendations through artificial intelligence, without requiring programming or data science skills. The system gives easy-to-understand visualizations, forecast, and strategic recommendations based on the uploaded data, helping SMEs in making better and faster decisions.

The system will be designed to address common challenges such as inventory mismanagement, falling sales, or pricing inefficiencies by using machine learning models to identify patterns and offer solutions. Users can upload their data files in Excel or CSV formats, and the system will analyze the data and provide insights like top-selling products, restocking schedules, or anticipated sales trends.

TANAW is a virtual business assistant that empowers SMEs to take full advantage of their data with minimal effort and cost. It is built to support day-to-day operations, improve efficiency, and enhance competitiveness by turning raw business data into practical, real-time intelligence.

**Objectives of the Study**

The objectives of this capstone project is to develop TANAW a web-based platform that enables businesses particularly in SMEs under retail, e-commerce, to analyze their sales, inventory, and customer transaction data. The platform will provide AI-powered descriptive and predictive analytics, interactive data visualizations, and automated business recommendations to support data-driven

decision-making.

1. To develop a system that will allow administrators to:
    1.1 Manage users and oversee platform access controls and permissions.
    1.2 Monitor and evaluate the performance of the AI model based on the user feedback and trends.
    1.3 Provide platform usage reports.
2. To develop a system that will allow users (SMEs) to:
    2.1 Register and login.
    2.2 Upload, manage, and preprocess industry-specific datasets.
    2.3 Perform descriptive analytics to summarize historical data trends.
    2.4 Perform predictive analytics to forecast future sales performance and inventory demand.
    2.5 Generate data visualizations for better data interpretation.
    2.6 Receive AI-generated business recommendations, such as restocking suggestions, pricing adjustments, and sales optimizations strategies.
    2.7 Download custom reports that summarize insights, predictions, and AI-generated suggestions.
    2.8 Provide feedback on AI-generated insights to improve model accuracy overtime.
3. To develop a system that will enable AI-driven analytics:

3.1 Clean, preprocess, and validate uploaded datasets to ensure accuracy in analytics.

3.2 Apply machine learning algorithms to detect patterns and predict future trends.

3.3 Continuously refine AI predictions and recommendations through adaptive learning and user feedback.

3.4 Generate automated recommendations based on sales trends, customer behavior, and inventory needs.

4. To test and evaluate the proposed system in terms of:

4.1 Test Cases

4.2 ISO/IEC 25010:2011

4.2.1 Functional Suitability

4.2.2 Performance Efficiency

4.2.3 Reliability

4.2.4 Security

4.2.5 Usability

**Scope and Limitations of the Study**

TANAW is a web-based artificial intelligence analytics platform developed to assist small and medium enterprises (SMEs) in the retail and e-commerce

industries with generating automated business insights. The system allows users to upload structured data in Excel or CSV format containing sales, inventory, or customer transaction information. By applying Artificial Intelligence and machine learning algorithms, the platform creates visualizations, sales predictions, and business recommendations such as restocking suggestions or pricing strategies. The system can be accessed through a web browser and has a user-friendly, no-code interface to support non-technical users.

The main scope of TANAW is focused on descriptive and predictive analytics for SMEs. Platform features include dataset upload, preprocessing, automated column detection and mapping, visual analytics using charts, downloadable reports, and intelligent recommendations. To support non-technical users, the system uses fuzzy matching and pattern recognition to detect and rename incorrectly labeled or ambiguous column headers (e.g., mapping “item_name” to “product_name”). If automatic mapping is uncertain, users are gently prompted with plain-language dropdown options for column clarification. The platform also includes a basic feedback mechanism where users can rate the usefulness of insights, helping improve future model performance through manual updates.

However, the system also has limitations, TANAW is mainly designed to deal with structured business data such as numeric sales records, customer data,

and inventory records. It does not currently support unstructured data types like images, or social media data. While the system uses ai to auto-detect column names and validate formats, its performance still depends on the quality and completeness of the uploaded data. Incomplete, inconsistent, or inaccurate files may still result in flawed predictions.

While TANAW uses AI algorithms to generate insights, it is not capable of performing highly complex data science tasks like advanced clustering beyond predefined models. Its machine learning models are trained using static parameters and not yet capable of real-time or continuous learning unless manually updated. Therefore, recommendations may become outdated over time if models are not retrained with new data.

TANAW does not currently support voice input, optical character recognition (OCR), or natural language querying, which means users must interact with the platform through predefined file formats and button-based navigation. The platform is also not yet domain-agnostic, as it is specifically optimized for SMEs handling tabular sales, inventory, and customer data in the retail and e-commerce sectors. Organizations from other industries such as healthcare, logistics, or manufacturing with different data structures may require customization to achieve full functionality. Likewise, TANAW is not built to handle specialized datasets related to legal, accounting, or human resource

analytics.

**Definition of Terms**

The proponents provide the following conceptual and operational definitions to help readers, especially non-technical users, better understand the technical terms used in this study. These definitions aim to familiarize readers with the terminologies involved in the design, development, and implementation of the TANAW system.

**Artificial Intelligence (AI).** The stimulation of human intelligence processes by machines, especially computer systems [4]. In this project, AI is used to analyze business data and generate automated insights and business recommendations

**Descriptive Analytics.** It is a form of analytics focused on understanding historical data and identifying trends or patterns [5]. TANAW uses descriptive analytics to provide summaries of past sales and inventory data.

**Predictive Analytics.** The practice of using historical data and machine learning algorithms to predict future outcomes [6]. TANAW uses predictive analytics to forecast inventory needs and sales trends.

**Application Programming Interface.** A set of rules and protocols that enable software components to communicate with each other [7]. In this project, APIs are used to link the frontend, backend and AI services for data processing

and retrieval.

**Comma-Separated Values (CSV).** A widely used format for storing tabular data, where each line represents a data row and columns are separated by commas [8]. TANAW accepts data upload in CSV format.

**Machine Learning (ML).** A type of artificial intelligence that enables systems to learn and improve from data without being explicitly programmed [9]. In TANAW, ML models help generate predictions based on user uploaded datasets.

**Optical Character Recognition (OCR).** A technology that converts printed or handwritten text images into machine-readable digital text. OCR allows allows systems to extract text from scanned documents, images, or PDFs [10].

**Fuzzy Matching.** A technique that identifies strings or terms that are approximately equal rather than exactly equal [11]. TANAW uses fuzzy matching to automatically recognize and correct mismatched column names in uploaded datasets.

**Feedback Mechanism.** A system feature that allows users to rate or comment on the recommendations generated by the AI [12]. This feedback is intended to guide improvements and refine model performance in future updates.

# CHAPTER 2

# REVIEW OF RELATED SYSTEMS

This chapter discusses the review of related systems that serve as the basis and foundation of the chatbot. It also covers the technical background to define and discuss the appropriate technologies and development tools that are being used by the proponents in designing and developing the system. The system architecture design, or the overall structure and organization of a system, is also shown here.

## Technical Background

The development of TANAW involves a combination of frontend, backed, and artificial intelligence (AI) technologies. The goal is building a platform that allows non-technical users from small and medium enterprises to upload business data, analyze patterns, and generate insights without requiring programming or data science expertise. To make this possible, the proponents selected a set of modern tools and frameworks that are scalable, user-friendly, and aligned with the best practices in data analytics and web application development.

To build the system's user interface, the proponents will use React.js, a component-based JavaScript library that will be ideal for creating dynamic, responsive web applications. React will enable proponents to modularize different components such as dashboards, login systems, and data upload forms.

Its fast rendering and strong support for interactive elements will make it suitable for a system that will require smooth user experiences when viewing business analytics [13]. To complement the frontend design, TailwindCSS will be used. Tailwind will offer utility-first classes that will enable quick styling and customization, which will make it easier to develop a clean, mobile-responsive layouts without writing custom CSS from scratch [14].

Axios will be integrated to handle sending HTTP request between the frontend and backend of the system. It will be used to optimized the communication between the API microservice and backend APIs, particularly in uploading data, fetching predictions, and collecting feedback. For data visualizations, Recharts will be implemented. This React-based charting library will allow the system to display insights through bar graphs, line charts, and pie charts. Since the target users may not be familiar with data interpretation, Recharts will make information more digestible through visual representation [15]. In addition, jsPDF will be used to enable users to download analytics results in PDF format, allowing them to save, print, or share reports conveniently [16].

On the backend, Node.js and the Express.js framework will be used to manage server-side logic and define API routes. Node.js will provide asynchronous, event-driven capabilities, which will be essential for handling multiple user requests efficiently. Express will allow a structured and modular

backend design, simplifying file processing, user management, and routing [17].

For the handling of file uploads, particularly CSV datasets, Multer will be used. Since the core of TANAW will be based on accurate data input, Multer will provide secure and efficient processing of uploaded files without depending on third-party services [18]. To manage user sessions securely, JSON Web Tokens (JWT) will be implemented. JWT will enable the system to authenticates and authorize the users efficiently without holding session data on the server, thus improving speed and reducing security threats [19].

For the database, MongoDB Atlas will be utilized as a cloud-hosted NoSQL database service. Its document-based nature will provide flexibility in storing different types of data like user accounts, logs, datasets, and feedback. MongoDB will provide scalability and schema-less design, which will be perfect for SME data that tends to change in structure. Proponents will utilize Mongoose to enforce models and schemas, enhancing data consistency and ease of database operations [20].

TANAW's AI microservice will be developed using Python, the most widely used language for machine learning due to its simplicity and vast ecosystem. The AI engine will be hosted separately to allow modular development and scalability. To expose its functionality via HTTP endpoints, the proponents will use Flask, a lightweight Python web framework that will be easy to integrate

with other services [21]. Pandas will be used for data preprocessing. It will help clean, filter, and format user-uploaded CSV files to ensure accurate analytics and model predictions. Since most SME data will come in Excel-like tabular formats, Pandas will be well-suited for this function [22].

To perform sales forecasting, the proponents will use Facebook Prophet. Prophet is a time-series forecasting library developed by Meta (Facebook), and it is especially designed for business users with minimal tuning required. This will make it a practical tool for TANAW's goal of providing accurate sales trend predictions with minimal user input [23].

For predictive tasks such as restocking, classification, or price strategy modeling, Scikit-learn will be used. This Python library offers lightweight, easy-to-train machine learning models such as linear regression, decision trees, and clustering. It will be ideal for small datasets often found in SMEs and will be simpler than deep learning libraries like TensorFlow [24].

For saving trained models and reusing them without the need for retraining, Joblib will be utilized. This utility will enable serialization of machine learning models, enhancing performance and minimizing processing delay. FuzzyWuzzy will be implemented to enhance the platform's capacity to identify and correct mislabeled or inconsistently named columns in uploaded datasets [25]. To further enhance the platform's accessibility and value for non-technical SME users,

TANAW will integrate the OpenAI GPT-4 API. This large language model will be used to automatically translate raw analytics outputs such as model predictions or forecasts into human-readable insights and business recommendations [26].

All the development will be carried out using the Visual Studio Code (VS Code), it's a powerful integrated development environment with built-in tools for both JavaScript and Python. It will support debugging, integration with Git, and extensions that will maximize productivity throughout full-stack website development [27].

**System Architecture Diagram**

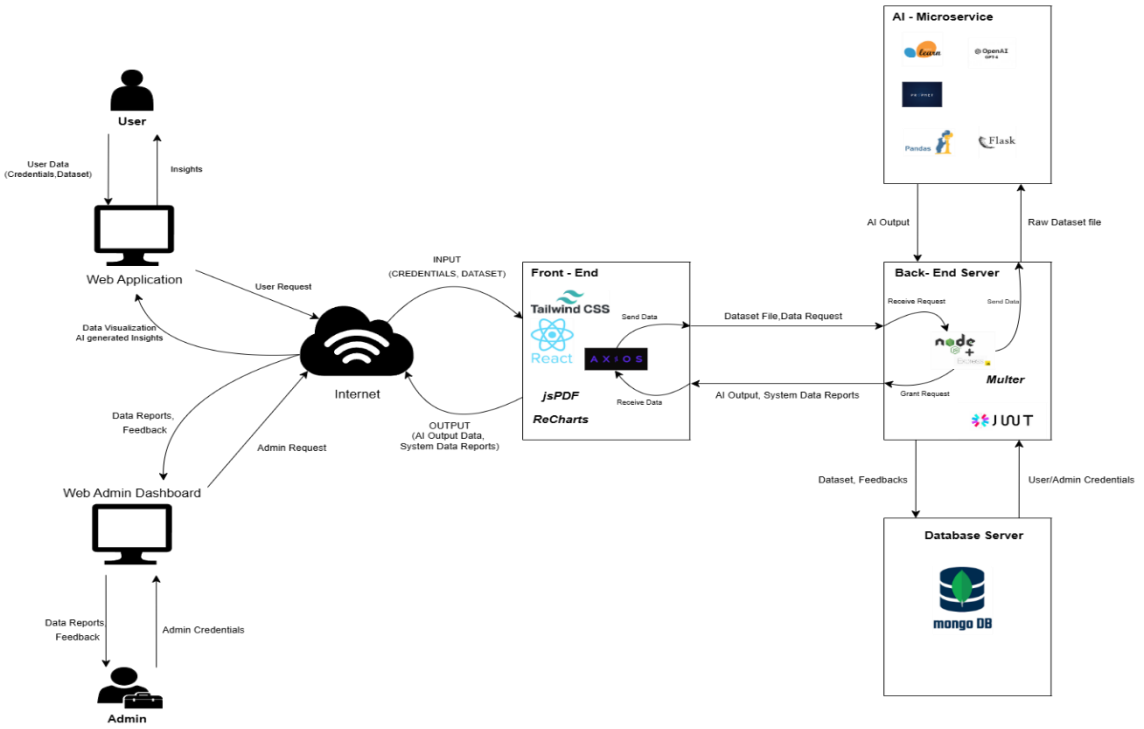


**Figure 1. System Architecture Design of TANAW**

Figure 1 shows the System Architecture Design of TANAW, a web-based

AI analytics platform made for small and medium enterprises (SMEs). The diagram presents the main parts of the system, starting with the frontend, which is built using React.js to provide a user-friendly and responsive interface. TailwindCSS is used for styling the layout, Axios helps with sending and receiving data between parts of the system, Recharts is used to show data in graphs and charts, and jsPDF allows users to download reports.

When a user uploads a CSV file, the backend that will be developed using Node.js and Express will takes care of file processing and authentication using Multer and JWT. After that, the backend sends the data to a separate AI Microservice built with Python and Flask. This microservice uses Pandas to clean the data, Prophet and Scikit-learn to run predictions and forecasting, and GPT-4 (via OpenAI API) to turn technical results into easy-to-understand business tips.

The system uses MongoDB Atlas to store user data, files, reports, and feedback. There's also a feedback loop in place so the AI can get better over time based on how users respond to the insights. This whole setup makes sure that even users with little or no technical background can easily analyze their business data and get smart, useful suggestions from the system.

**Related Systems**

This section examines existing tourist travel systems and their importance in academic and institutional management. Laying the groundwork for

understanding their methodology, features, and overall influence. In today's environment, coordinating resources to achieve certain goals is an example of purposeful action. Many researchers have looked into the development and implementation of a solution to improve tourism in academic contexts. These systems have become very important for promoting and assisting cities' tourism growth. They become crucial instruments for increasing operational efficiency, resolving disagreements, and assuring stakeholder involvement.

Miraj and Gaddala [28] conducted a study to explore how predictive analytics helps improve decision-making in the retail and e-commerce industries. Their research discussed how techniques like machine learning and artificial intelligence are used to understand customer needs, forecast sales, and personalize product recommendations. The authors also pointed out that big companies already benefit from these tools, but small businesses or SMEs often struggle because of high costs, lack of skilled personnel, and complex systems that are hard to use. They emphasized that there is a need for analytics platforms that are more affordable and easier to understand for small business owners who don’t have technical backgrounds.

This study supports the creation of TANAW because it shows the gap between advanced analytics tools and what SMEs can actually use. TANAW was developed to respond to this issue by offering a simple and easy-to-use platform

where business owners can upload data and instantly get forecasts and insights. Like what the study discussed, TANAW makes sure that users don't need to be experts to understand their sales trends, restocking needs, or customer patterns. It takes the key concepts from Miraj and Gaddala's study and applies them to a system that small businesses can actually benefit from in real situations.

Onasanya et al. [29] created a predictive model for small and medium enterprises to help them analyze customer behavior and make better marketing decisions. They used machine learning techniques like Random Forest, Logistic Regression, and XGBoost to build a system that could forecast customer buying patterns and detect the possibility of losing customers (churn). However, they also admitted that many SMEs still struggle to adopt these technologies because of the lack of resources, limited knowledge about data analytics, and challenges in preparing their data. The authors mentioned that having a simple and ethical tool that is focused on the needs of SMEs could really help improve how businesses handle customer retention and strategy planning.

The ideas from this study are reflected in TANAW's purpose. While Onasanya's model focused more on customer behavior and churn prediction, TANAW expands on that by offering not only customer-related insights but also sales forecasts and inventory advice. Both systems aim to help SMEs use data effectively, but TANAW puts a stronger focus on accessibility. It also addresses

the issue of data formatting by including features like fuzzy matching and auto-column mapping. This shows how TANAW takes what Onasanya et al. suggested and turns it into a usable system that doesn't require much technical skill to operate.

Mosbah et al. [30] discussed how using data analytics can improve the competitiveness of SMEs if four key areas are addressed—data, people, technology, and processes. Their study explained that many SMEs face obstacles like poor data quality, lack of clear goals, and no access to trained analysts. They also suggested that these problems can be solved through collaboration with academic institutions and using free or low-cost analytics tools that can help SMEs slowly build up their capabilities. The research showed how businesses can start small, gradually improving how they use analytics for smarter decision-making.

This study aligns with TANAW's approach. Just like Mosbah et al. recommended, TANAW was designed with simplicity and practicality in mind. It uses open-source tools and pre-built machine learning models that can help SMEs make sense of their sales and inventory data. The system also includes a feedback feature that allows users to rate predictions, which connects to the "process improvement" pillar mentioned in the study. TANAW supports SMEs in slowly building their confidence and skill in data use something that is important based on the challenges and solutions presented in the study.

According to Almtiri et al. [31], business analytics and decision support systems (DSS) are critical tools for enhancing the performance and competitiveness of small and medium-sized enterprises (SMEs) operating in the e-commerce sector. Their study highlights how the integration of data-driven technologies enables SMEs to optimize operations, forecast demand, and improve decision-making. By adopting tools such as DSS and enterprise resource planning (ERP) systems, SMEs can better manage customer expectations and supply chains while gaining insights into consumer behavior. However, the authors also identify several limitations, including insufficient resources, lack of skilled personnel, weak data governance, and cultural resistance to digital adoption. These challenges are particularly pressing in fast-paced digital markets where SMEs must rapidly adapt to evolving customer preferences and technological disruptions.

Building upon the DSS-driven framework proposed by Almtiri et al., TANAW is designed to bridge these gaps by offering SMEs a simplified, AI-powered solution for e-commerce analytics. While Almtiri et al. emphasize the importance of integrated DSS for strategic decision-making, TANAW extends this concept by automating data processing, forecasting, and recommendation generation through an accessible, no-code interface. The platform directly addresses the resource and skill constraints identified in the study, empowering SMEs to make real-time, data-driven decisions without requiring technical

expertise. By aligning with the goals outlined by Almtiri et al. Namely, improving adaptability, strategic insight, and operational efficiency TANAW presents a modern, scalable approach to decision support and business intelligence for growing e-commerce enterprises.

A study by Ugbebor et al. [32] was conducted to explore how predictive analytics models can help small and medium enterprises (SMEs) forecast market trends, understand customer behavior, and assess potential business risks. The study emphasized that the adoption of predictive models allows SMEs to improve operational efficiency, customer satisfaction, and strategic decision-making. It also discussed how machine learning algorithms are used for demand forecasting, churn prediction, dynamic pricing, and supply chain management. However, the study identified challenges such as poor data quality, limited access to technical expertise, and the high cost of implementing predictive systems as significant barriers to adoption, especially for SMEs operating with tight budgets and limited IT infrastructure.

This study supports the development of TANAW, as it highlights the real need for user-friendly and accessible predictive analytics platforms specifically designed for SMEs. While Ugbebor et al. showed the potential of predictive analytics to transform business operations, TANAW builds upon this by offering a no-code, AI-powered web platform that allows SMEs to easily upload datasets and

generate forecasts, insights, and recommendations without technical knowledge. By simplifying the process of data-driven decision-making, TANAW helps SMEs overcome the barriers identified in the study, making predictive analytics more practical, scalable, and applicable to their everyday operations.

Lucas and Ahmad's study [33] explores how predictive analytics can transform decision-making for small and medium enterprises (SMEs) by forecasting market dynamics, enhancing customer understanding, and minimizing business risks. Their research highlights the power of integrating machine learning models with data visualization to anticipate customer behavior, detect market trends, and identify operational risks. Practical applications discussed include demand forecasting, fraud detection, and customer segmentation, enabling SMEs to proactively adjust strategies. The study also stresses that although PA provides strong competitive advantages, SMEs still encounter significant hurdles such as data scarcity, high technology adoption costs, and the lack of technical expertise, all of which limit their ability to fully leverage predictive tools. Recommendations were given to make PA tools more scalable, accessible, and affordable to foster sustainable growth.

The design of TANAW draws heavily on the principles outlined by Lucas and Ahmad. While their study focuses on the overall transformative potential of predictive analytics, TANAW turns these concepts into a practical solution

specifically tailored for SMEs in retail and e-commerce. Like the research suggests, TANAW addresses the issues of accessibility and usability by offering a no-code, user-friendly web platform capable of automatically generating insights and forecasts. Additionally, TANAW bridges the gap in data handling capabilities by simplifying data upload, preprocessing, and visualization processes. In this way, the system operationalizes the recommendations from the study, providing SMEs with a tangible, AI-powered decision support tool that encourages data-driven business growth even with minimal technical resources.

Khan and Hamilton [34] conducted a study titled Empowering SMEs with Predictive Analytics to explore how small and medium enterprises can use predictive models to navigate changes in market trends and consumer behavior. The study discusses the use of machine learning and statistical modeling to analyze past data and anticipate future customer actions. These tools assist SMEs in forecasting demand, optimizing marketing campaigns, and making smarter inventory decisions. The study also highlights key challenges like lack of technical expertise, limited financial resources, and difficulty integrating predictive tools into existing systems. Despite these challenges, the researchers emphasize that the increasing availability of user-friendly, cloud-based analytics tools is helping smaller businesses access advanced data capabilities without the need for deep technical knowledge or large capital investments.

This study contributes valuable insight to the development of TANAW by reinforcing the importance of simple, affordable, and predictive tools for SMEs. Similar to what the researchers presented, TANAW will integrate an AI-based microservice capable of generating sales forecasts, restocking suggestions, and customer behavior predictions, without requiring programming knowledge from the user. The study also supports the decision to use cloud services and no-code interfaces, which align with the goal of making TANAW accessible to non-technical business owners. By applying the findings of this research, TANAW is positioned to serve as a reliable and intelligent system that can help Filipino SMEs become more data-informed and competitive in their decision-making.

Bianchini and Michalkova [35] conducted a policy-focused study under the OECD that highlights how data analytics is transforming small and medium-sized enterprises (SMEs), particularly in improving productivity and competitiveness. The report outlines how digitalization, cloud computing, and the Internet of Things (IoT) are reshaping business models, enabling SMEs to harness large volumes of structured and unstructured data for business insights. However, it also identifies key barriers that prevent SMEs from fully utilizing analytics, such as lack of digital skills, insufficient financial resources, and regulatory complexities. The report emphasizes the need for supportive government policies, skill development programs, and tailored infrastructure to ensure SMEs can engage in

data-driven decision-making and compete in the digital economy.

The findings in this report strongly support the objectives of the TANAW system, a web-based AI analytics platform tailored for SMEs. TANAW is designed to overcome the specific challenges identified in the OECD study, such as limited technical expertise and resource constraints, by offering no-code tools, automated forecasts, and visual analytics. It aligns with the OECD's recommended policy direction by enabling businesses to access AI capabilities without large-scale infrastructure or advanced skills. Moreover, TANAW empowers local enterprises by promoting informed business strategies, encouraging technology adoption, and integrating decision-support features that directly address productivity and operational challenges cited in the report. This makes the OECD paper an essential reference in validating TANAW's approach to democratizing AI-powered analytics for SME growth.

Okeke et al. [36] conducted a study that explored the use of artificial intelligence (AI) in helping small and medium-sized enterprises (SMEs) improve their financial decision-making processes. The paper emphasized the common issues SMEs face, such as limited access to capital, inefficient financial tracking, and the absence of advanced forecasting tools. The researchers explained how AI tools like machine learning and predictive analytics could assist in overcoming these challenges by automating tasks such as bookkeeping, forecasting cash flow,

expense tracking, and tax planning. Their study discussed how AI can identify patterns, predict financial outcomes, and support pricing strategies, thereby improving business profitability and reducing errors from manual processing. The research also pointed out obstacles like cost, lack of technical knowledge, and data privacy concerns, which often hinder SMEs from adopting such technologies fully.

The findings from this study support the goal of the TANAW platform to deliver an accessible and AI-powered financial analytics system for SMEs. Just like the AI tools discussed in the study, TANAW incorporates forecasting and decision support features that can assist users in understanding cash flow trends and market behavior. The platform uses Python-based AI models to process historical sales and inventory data, allowing for smarter and faster business decisions. With this, TANAW aims to help SMEs mitigate financial uncertainty without the need for highly technical expertise. Furthermore, TANAW also responds to the challenges identified in the study by offering a user-friendly and low-cost approach that is aligned with the typical budget and skills of small business owners. By doing so, the project ensures AI is not only accurate but also practical and approachable for its intended users.

R. M. Alotaibi and S. Khan [37] conducted a study that explores the integration of Big Data and predictive analytics within small and medium-sized

enterprises (SMEs) through a machine learning approach. The study highlights how predictive models can be effectively applied to enhance operational efficiency, support decision-making, and provide early insights into business trends. It outlines a structured methodology for SMEs to adopt machine learning, covering key phases such as planning, model building, implementation, and monitoring. The researchers emphasize that although Big Data presents significant opportunities for SMEs such as better forecasting, customer segmentation, and personalized services many smaller businesses face critical challenges. These include lack of infrastructure, data expertise, and sufficient resources. The study also discusses the CRISP-DM and ASUM frameworks and introduces practical techniques to build machine learning solutions, particularly for predictive maintenance and business optimization.

This study contributes directly to the development of TANAW, a web-based AI analytics platform made for SMEs. Just like the proposed platform, the study emphasizes the need for a structured and phased approach to building AI solutions, especially in environments where technical skills may be limited. TANAW adopts this same goal by automating and simplifying the use of AI tools, integrating modules for forecasting and customer analytics without requiring the user to code. The study's discussion of using AI for economic advantage and strategic growth strengthens the rationale for TANAW's implementation. It

reinforces the importance of providing SMEs with not just the tools, but also the accessible workflows and visual outputs needed to make practical, data-informed business decisions.

Schwaeke et al. [38] conducted a systematic literature review that explores how artificial intelligence (AI) technologies are currently being adopted by small and medium-sized enterprises (SMEs) worldwide. Their study categorized over 100 peer-reviewed articles using the Technology–Organization–Environment (TOE) framework to identify internal and external factors influencing AI integration. Eight major clusters were identified compatibility, infrastructure, knowledge, resources, culture, competition, regulation, and ecosystem. The researchers emphasized how SMEs face significant challenges in terms of technical compatibility, lack of AI expertise, limited financial resources, and the absence of clear legal guidelines. Despite these limitations, the study found that AI has the potential to drastically improve SME operations by enhancing decision-making, optimizing resource use, and increasing customer satisfaction. The findings also highlight that the successful adoption of AI requires alignment with a company's culture, leadership support, and a readiness to invest in digital transformation.

This study contributes significantly to the development of TANAW as it outlines a clear and research-backed landscape of the current challenges and

opportunities facing SMEs in the realm of AI. The study's TOE-based framework aligns with the core purpose of TANAW, which is to offer a practical AI-powered platform for business forecasting and analytics tailored specifically to the capabilities and limitations of SMEs. By addressing the common concerns raised in Schwaeke et al.'s research such as the need for a user-friendly interface, compatibility with existing systems, and minimal technical barriers—TANAW aims to make AI adoption more feasible. Additionally, the identified gaps such as the lack of trend-identification features and regulatory clarity are also taken into account in TANAW's ongoing system design. This ensures that the platform is not only innovative but also grounded in the current realities of SME digital transformation, thus increasing its relevance and potential impacts.

# CHAPTER 3

# DESIGN AND METHODOLOGY

This chapter discusses the methodology that the proponents used to develop the project. This chapter also presents the diagrams used and the type of data gathered by the developers in successfully completing the system. The chapter also explains the type of research utilized in the study and how it is related to the completion of the system.

## Data Gathering

The proponents applied a quantitative method for data collection that would inform the development of TANAW, a web-based AI analytics platform aimed at assisting small and medium enterprises (SMEs) in retail and e-commerce. Quantitative methods involve collecting numerical and measurable data through structured tools to identify patterns, user behavior, and system requirements. This approach was chosen to ensure objectivity, scalability and relevance in knowing the real needs and expectations of the intended users of the platform.

For the development of TANAW, the primary data collection tool used was a survey questionnaire, which consisted of closed-ended and Likert scale-type questions. The questionnaires were created to obtain specific information on business practices, data management processes, decision-making, and the degree of awareness and responsiveness to AI-powered analytics. The use of structure

of awareness and receptiveness to AI-powered analytics. The use of structure surveys allowed the proponents to obtain consistent and comparable responses.

The survey was distributed to individuals who are directly involved in managing business operations and analyzing sales or inventory data within SMEs. These included small business owners, inventory managers, and sales associates. The selected participants represent the target user of TANAW, they are the who will gain most benefit from a system that offers simplified data analysis and AI-powered business recommendations.

The proponents made sure the questionnaire was clear and formal in form, making it accessible for SMEs respondents from different educational and technical backgrounds. The distribution was conducted both online and through physical means to increase reach and diversity among the participants. Ethical considerations, such as anonymity, voluntary participation, and informed consent, were strictly observed throughout the data collection process.

The data collected through the survey revealed common business challenges in organizing and interpreting sales and inventory data, highlighted the limitations of existing tools such as spreadsheets and manual logs, and validated the high level of interest among SMEs in features like automated insights, data visualization, and downloadable reports. In addition to surveys, the proponents conducted a review of related studies and systems to further validate the relevance

of the platforms concept and to support the formulation of its core features. This combination of primary data collection and secondary research has provided a solid basis for the design of the system and ensuring TANAW is built to address real-world needs and promote practical, data- driven decision-making among SMEs.

**Project Concept**

The core concept of the TANAW system is to provide an AI-powered, web-based analytics platform specifically designed for small and medium enterprises (SMEs) in the retail and e-commerce industries. The platform enables business owners who lack direct access to advanced analytics tools or technical expertise to make better decisions based on their own data, without the need for programming or data science knowledge.

The idea behind TANAW originated from the observation that many SMEs still rely on manual processes, spreadsheets, or basic transaction logs to manage their sales, inventory, and customer records. While larger corporations use advanced tools like ERP systems and BI platforms, these are often too complex or expensive for smaller businesses. TANAW addresses this gap by offering a no-code system where users can simply upload Excel or CSV files to generate insights.

Specifically, SME users can register and log in, upload structured datasets

(e.g., sales, inventory), and immediately receive descriptive summaries, predictive forecasts, and strategic recommendations. These insights help them identify top-selling products, optimal restocking schedules, or trends in customer behavior. The system visualizes data through interactive charts and allows users to download reports in PDF format.

Administrators of the platform can oversee all registered users, monitor system usage, manage feedback logs, and evaluate the performance of the AI prediction models. TANAW is also equipped with a feedback loop mechanism, allowing users to rate AI-generated insights to help improve future predictions through manual model refinement.

In the long term, the proponents aim to expand TANAW to support other SME domains beyond retail and to integrate more advanced AI capabilities based on user needs and feedback. The system is not just a dashboard, it is a digital assistant that simplifies complex analytics into actionable insights for business growth.

**Development Methodology**

The proposed system, TANAW. Will be developed using Agile Methodology. This approach is known for its flexibility, iterative process, and adaptability to change, which makes it ideal for developing systems that need to respond to user feedback and evolving requirements. This method allows as the

developers to focus on continuous improvement and collaboration, especially when building a data-driven platform like TANAW, which combines frontend interfaces, backend APIs, and artificial intelligence services.


**Figure 2. Agile Methodology**

In the Figure 2 shows that Agile Methodology has seven phases. In the Plan phase, the researchers gathered the system requirements and analyzed the technical specifications needed for TANAW. Both functional and non-functional requirements were listed, and the appropriate technologies were selected, including React.js, TailwindCSS, and Axios for the frontend, along with Node.js, Express.js, and MongoDB Atlas for the backend. The team also identified AI tools such as Pandas, Prophet, and GPT-4, which would be used to process business data and provide predictive insights to users.

In the Design phase, the researchers developed the layout and flow of the user interface, including components for user login, data upload, dashboards, and report generation. A database schema was also designed to organize and store data

such as user information, uploaded datasets, and analytics results. These designs helped ensure the system would be user-friendly and suitable for SME owners with little technical background.

The Develop phase will focus on building the core functionalities of TANAW. The team will code the features, create APIs, and integrate all parts of the system, including the connection between the frontend and backend using Axios, file upload through Multer, and PDF generation using jsPDF. At the same time, the AI microservice will be developed separately using Flask and Python libraries to handle forecasting, classification, and insight generation.

In the Test phase, the entire system will be checked for functionality, security, and usability. Test cases will be done to ensure the platform correctly processes uploaded data, displays accurate visualizations with Recharts, and provides helpful predictions using AI models. Errors and bugs will be fixed before moving forward.

The next stage will be Deployment, where the system will be made available for actual use. A pilot version will be deployed online and tested with real users from the target audience. After deployment, the team will enter the Review phase, where feedback will be collected to improve usability, content clarity, and performance. This feedback will be used to improve the features and design of the platform. Finally, in the Launch phase, the final version of TANAW

will be released for wider access, while the system continues to be monitored for stability and possible updates.

**Development Approach**

This section introduces the development methodology that will be followed by the proponents in creating TANAW, a web-based AI analytics platform for SMEs. The top-down approach will be employed throughout the system development lifecycle. This approach supports centralized decision-making, where planning and key system structures are determined at the higher levels before breaking down into more detailed development tasks. The main advantage of this method is that it maintains a clear hierarchy of actions and simplifies project control, communication, and coordination among developers.

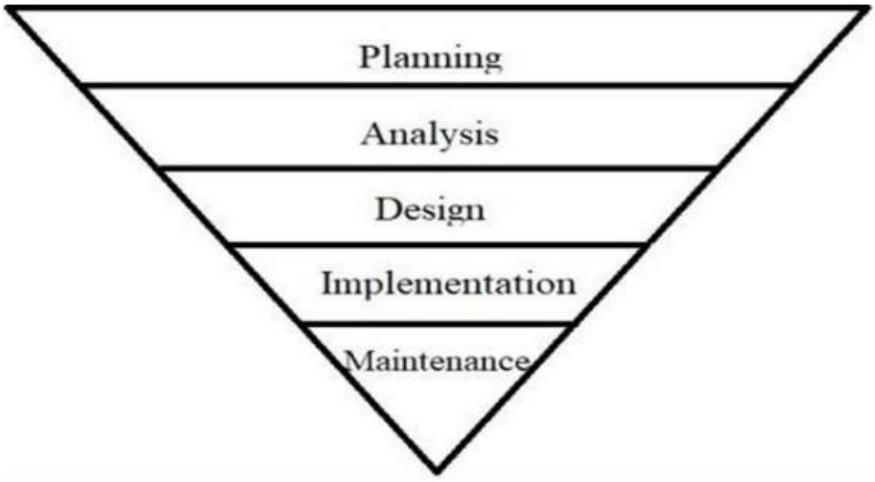


**Figure 3. Top-Down Approach**

The initial phase was Planning, where the proponents defined the system objectives, identified the project scope, set development timelines, and selected

the appropriate tech stack. During this phase, they finalized the use of tools such as React.js, Tailwind CSS, Node.js, Flask, MongoDB Atlas, and other relevant libraries. Responsibilities were distributed among team members, and initial coordination with stakeholders was conducted through surveys to gather needs from SME users. In the Analysis phase, the proponents outlined the system requirements based on the problems encountered by SMEs in data-driven decision-making. They examined existing systems and determined the data types to be supported. They also evaluated potential challenges in data handling, forecasting accuracy, and user accessibility, forming the foundation for the system logic and features. The Design phase followed, during which the proponents developed the system architecture, data flow diagrams, and database schema. User interface mockups were also prepared with emphasis on simplicity, accessibility, and a no-code interaction model. The backend structure was drafted to support user registration, file uploads, data processing, and visualization, while the AI microservice logic was outlined for predictive analytics functions. In the Implementation phase, the proponents will translate the planned features and designs into actual system components. This will include building the frontend using React and Tailwind CSS, setting up the Express.js backend with secure routes, integrating the Python-based AI microservice, and connecting all components with MongoDB. Rigorous testing will be conducted, such as

functional testing, user acceptance testing (UAT), integration testing, and performance testing to ensure that the system operates correctly and meets user expectations. Finally, during the Maintenance phase, the proponents will perform continuous monitoring of system performance, collect user feedback, and apply updates and fixes as needed. This phase will focus on improving the AI model over time, addressing usability issues, and ensuring system reliability. The goal is to maintain a fully functional, low-downtime platform that continuously adapts to user needs and data behavior.

**System Analysis and Design**

TANAW is a web-based AI analytics platform designed for small and medium enterprises (SMEs), and it is important that the system remains responsive and easy to use on different types of devices like laptops or tablets. Since the users of the platform may not be highly technical, the system will follow a user-centered design approach. This means the system will be designed in a way that focuses on what the users need, and any issues or problems will be reviewed through user feedback. If the feedback shows that users find something confusing or hard to use, the system design will go through changes and improvements until the users are satisfied.

In building TANAW, the developers will make sure that all parts of the system from uploading data to viewing charts are working together properly. Since

the platform will use different technologies like React for the frontend, Node.js for the backend, and Python for the AI microservice, the researchers will plan out the system flow carefully. The use of these tools was chosen not just for their popularity but because they work well together and are efficient for handling tasks like data upload, user registration, and analytics. MongoDB Atlas will be used for the database to store user data and uploaded files, and secure file handling will be done using Multer and JWT authentication.

For the system's appearance and behavior, the interface will be kept clean and simple, using Tailwind CSS. Charts and reports will be shown using Recharts and jsPDF so that users can understand the insights easily and download them when needed. As for testing, the researchers will follow a structured process using test cases and the ISO/IEC 25010:2011 software quality model. This will help evaluate how well the system performs in terms of usability, functionality, reliability, and security.

Overall, the system design of TANAW aims to make things easier for SMEs that want to make smarter business decisions using data. By focusing on user needs, choosing the right tech stack, and following good testing practices, the researchers hope to build a platform that is helpful, efficient, and easy to use.

**Context Flow Diagram**

The Context Flow Diagram shown in Figure 4 illustrates the high-level data

flow and interaction between the two main entities of the TANAW system, the User and the Administrator. It presents how these external actors communicate with the TANAW platform, as well as what kind of information is exchanged within the system to fulfill its core functionalities. This diagram helps visualize how information moves from users to the system and how the system responds to those inputs.

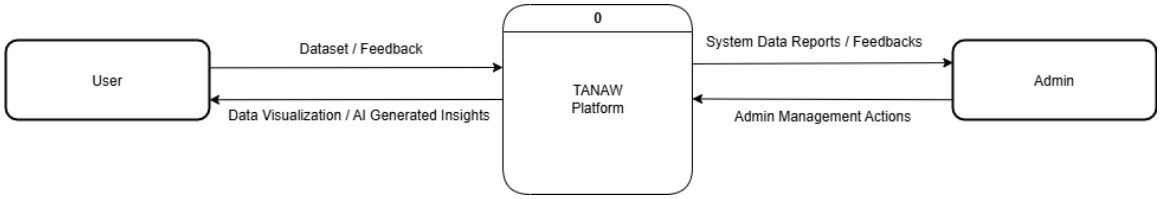


**Figure 4. Context Flow Diagram of TANAW**

On the left side of the diagram, the User (representing SME staff or business owners) performs key actions such as uploading datasets, which typically include sales, inventory, or customer data. The users can also provide feedback regarding their experience with the platform or the AI results. In response, the system processes these inputs and returns AI-powered charts, forecasts, and recommendations to support their decision-making. This creates a helpful loop of user input and system output centered on predictive analytics and business insights.

On the right side, the Administrator is responsible for managing the platform's backend operations. They can view feedback and system reports, which help them monitor how well the AI is performing. Administrators also have access

to user management tools to oversee platform permissions and access controls. Through these actions, they help maintain the stability and security of the system.

Overall, this context flow diagram demonstrates that TANAW is a two-way platform where users contribute operational data and receive data-driven insights in return, while administrators oversee and maintain the system to ensure it stays functional, accurate, and useful.

**Data Flow Diagram**

A data flow diagram (DFD) is a visual tool used to illustrate how data moves throughout a system. It highlights the sources of data, the processes that handle it, and where the data ends up. Using basic shapes such as arrows, circles, and rectangles, the DFD clearly represents the input, output, storage, and flow of data. This kind of diagram is especially useful for developers and system designers because it provides a clear and straightforward view of how information is handled within the system.

The user-side data flow diagram is shown in Figure 5. After logging in, users can start by uploading their sales, inventory, and customer data. This information is stored directly in the database. Once the user uploads a dataset, the system automatically analyzes the data using appropriate AI techniques and generates visualizations and insights without requiring manual input. Users simply need to wait as the system processes the data and presents results. In cases where

the automatic analysis encounters mapping issues or unexpected outputs, users can provide feedback. All feedback is saved in the database and plays a role in improving the AI model's accuracy and performance over time.

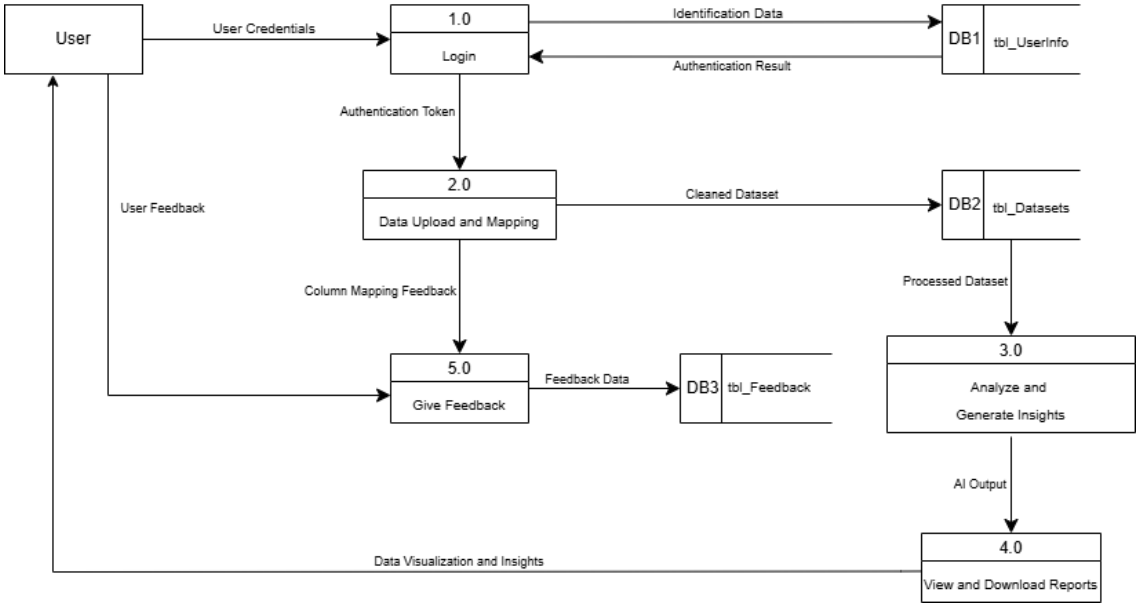


**Figure 5. Data Flow Diagram for Users**

The admin-side data flow diagram is shown in Figure 6. Admins begin by logging into the system using their credentials. These credentials are checked against the admin records stored in the database. If the login is successful, the admin can access different features of the system.

One of the main functions for the admin is managing users. This includes viewing, updating, or removing user accounts. Any changes made are saved in the

database. Admins also have access to evaluate the AI's performance. They can view feedback left by users about the AI's suggestions, helping them understand if the AI is performing well or needs adjustment.

Another important feature is generating usage reports. Admins can request system logs and performance data, which the system gathers and processes. These reports give a better idea of how the system is being used and how often the AI features are accessed. All logs, feedback, and report-related data are stored and retrieved from specific database tables during this process.

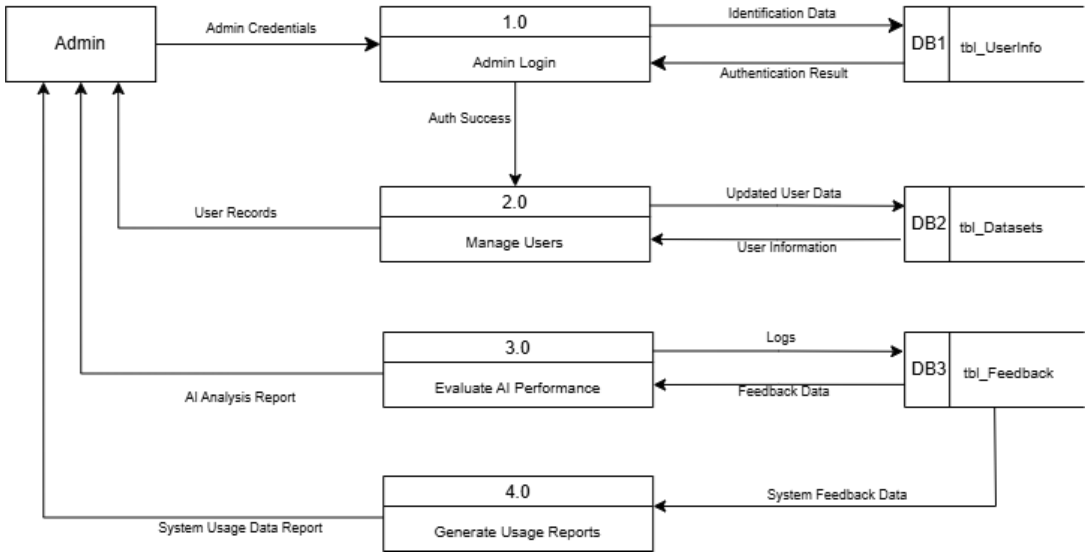


**Figure 6. Data Flow Diagram for Admin**

## Hardware Requirements

Hardware refers to the physical components of a computer system that are required to operate and run software applications. For the development of

TANAW, having the appropriate hardware ensures that the system functions smoothly, especially since it involves web development, server operations, and machine learning tasks. Each hardware component plays an important role in the overall performance of the system.

**Table 1.**
**Hardware Requirements for the Developers**

| Hardware | Specifications |
|---|---|
| Processor | Intel Core i5 or AMD Ryzen 5 |
| RAM | 8 GB |
| Operating System | Windows 10 (64-bit), macOS Monterey, or Ubuntu 20.04+ |
| Storage | At least 50GB disk free or higher |

Table 1 shows the hardware requirements for the developers working on the TANAW system. These specifications are set to support the tools and frameworks used in the project such as React.js for the frontend, Node.js and Express.js for the backend, and Python with Flask, Prophet, and Scikit-learn for the AI microservice. Since developers will be using these tools together, a decent processor and enough memory are needed to avoid slowdowns.

A minimum of an Intel Core i5 or AMD Ryzen 5 is recommended to ensure that local servers and scripts can run without issues. At least 8GB of RAM is

needed to support multitasking like running VS Code, browser, and local server all at once, while the storage should have at least 50GB of free space to accommodate software installations, project files, and large dataset uploads during testing. The recommended operating systems are Windows 10 (64-bit), macOS Monterey, or Ubuntu 20.04 and above, which are compatible with the development tools used.

**Table 2.**
**Hardware Requirements for the Users**

| Hardware | Specifications |
|---|---|
| Operating System | Windows 10 (32/64 bit) or higher; macOS Mojave or higher |
| CPU | Intel Core i3 or higher for desktop and laptop |
| RAM | 8 GB or higher for both desktop and laptops |
| Storage | At least 20GB free disk space or higher |

Table 2 shows the hardware requirements needed for the users to fully access and utilize the TANAW system. Since TANAW is a web-based platform, users do not need to install any heavy software or programs, but they do need a stable device and internet connection that meets basic system requirements.

To ensure that desktops or laptops can smoothly run the system, they must have at least Windows 10 operating system, whether 32-bit or 64-bit, or macOS Mojave or higher. The minimum processor required is an Intel Core i3 or any

equivalent CPU model that can handle browser-based applications and basic file uploads. This ensures that users can interact with the system without experiencing delays or freezing.

For better performance, especially when uploading datasets and viewing AI-generated charts and insights, at least 8GB of RAM is required. Having enough RAM helps prevent the system from slowing down, especially when viewing dashboard data and exporting PDF reports. In terms of storage, the device should have at least 20GB of free disk space. While TANAW does not require installation, users may want to download and save reports, exported PDFs, or other supporting files generated by the system.

**Software Requirements**

The software requirements that will be used by the development team are presented in Table 3. These tools will support the implementation of TANAW's frontend, backend, AI microservice, and database components. The developers will utilize Visual Studio Code as the primary code editor, along with Git for version control. For the frontend, libraries such as React.js, Tailwind CSS, and Recharts will be used to build the user interface. On the backend, Node.js and Express.js will be responsible for handling logic and routes, while Multer and JWT will support file handling and secure authentication.

To process and analyze business data, an AI microservice will be developed

using Python and Flask, using libraries like Pandas, Scikit-learn, Prophet, FuzzyWuzzy, and Joblib. The developers also plan to integrate the OpenAI GPT-4 API for generating readable insights. All data will be stored in MongoDB, and Postman will be used to test API endpoints throughout development.

**Table 3.**
**Software Requirements for the Developers**

| Software | Specifications |
|---|---|
| Operating System | Windows 10 (64-bit) or higher; macOS Monterey; or Ubuntu 20.04+ |
| Integrated Development Environment | Visual Studio Code |
| Browser | Google Chrome, Mozilla Firefox, Microsoft Edge |
| Frontend Libraries and Framework | React.js, Tailwind CSS, Recharts, jsPDF, Axios |
| Backend Framework | Node.js, Express.js, Multer, JWT |
| AI Microservice Libraries | Python, Flask, Pandas, Scikit-learn, Prophet, FuzzyWuzzy, Joblib |
| AI Integration API | OpenAI GPT-4 API |
| Web Server and Database | MongoDB |
| Version Control | Git |
| Testing Tool | Postman |

As shown in Table 4, users of TANAW will not be required to install any application to access the system. Since TANAW is a web-based platform, users will only need a modern web browser and an updated operating system to access

features such as uploading data, generating reports, and viewing analytics.

**Table 4.**
**Software Requirements for the Users**

| Software | Specification |
|---|---|
| Operating System | Windows 10 (32/64 bit) or higher; macOS Mojave or higher |
| Browser | Chrome, Firefox, Safari, Edge |

**Functional Requirements**

This section outlines the main features and functions of the TANAW system. Table 5 shows the different features the system will offer, focusing on what users and admins can do on the platform. These are the basic functions that the system must include to work properly and meet its goals.

**Table 5.**
**Functional Requirements**

| Features | Description |
|---|---|
| **User Login and Account Access** | Users must be able to create an account and log in securely. Admins and regular users will have different access rights. There will also be a password reset option in case the user forgets their login info. |
| **Data Upload and Mapping** | Users can upload their own datasets. The system will try to automatically |

| | |
|---|---|
| | detect and match data fields for proper analysis. |
| **Automated Analytics and Insights** | Once the data is uploaded, the system will process it and show useful visualizations along with summarized insights based on patterns found in the data. |
| **AI Report Generation** | The platform can generate a downloadable repot with in-depth analysis, predictions, and recommendations based on the uploaded dataset. |
| **Feedback Submission** | Users can submit feedback about the AI insights, the accuracy of results, or the overall system experience. |
| **Admin can Manage Users** | Admins can manage user accounts by approving new users, deactivating accounts, or updating user information. |
| **Generate Usage Reports for Admins** | The system will generate usage reports that show how often the platform is used, what features are accessed the most, and other useful admin-related statistics. |

**Non-functional Requirements**

These are the requirements that describe how the TANAW system should perform and behave, especially when used in real-world scenarios by its target users, which are small and medium enterprises (SMEs) and system administrators. This includes important aspects like performance, security, usability, and overall reliability. These requirements help make sure the platform is not only working but also stable, secure, and easy to use over time. Table 6 below shows the

system's non-functional requirements and gives a better idea of what qualities and behaviors the TANAW platform should meet in order to run smoothly and provide a good user experience.

**Table 6.**
**Non-functional Requirements**

| Features | Descriptions |
|---|---|
| **Performance and Scalability** | The system should be able to handle multiple users uploading and processing data at the same time. It must remain responsive even when working with large datasets. |
| **Usability** | The website should be user-friendly and easy to navigate even for people with little technical experience. It should clearly guide users through uploading, viewing, and understanding their data. |
| **Security and Privacy** | All uploaded data should be protected. The system will use secure logins and encrypt sensitive information. Only authorized users should have access to reports and data. |
| **Availability and Maintainability** | The platform should be accessible 24/7 and work properly on different browsers and devices. It should also be built in a way that makes it easy to fix bugs and update features when needed. |

**Software Development Tools**

The proponents will use several software development tools to build

TANAW, a web-based AI analytics platform made for small and medium enterprises (SMEs). These tools will help in writing, testing, and managing the code efficiently.

Visual Studio Code (VS Code) will be the main Integrated Development Environment (IDE) used in the development of TANAW. It is easy to use and supports many useful extensions for writing and debugging code. For the frontend, the team will use React.js for building the user interface and Tailwind CSS for styling the web pages. These tools make it easier to create a clean and responsive design. For charts and graphs, the team will use tools like Chart.js or Recharts.

For the backend, the team will use Node.js with Express.js to handle the server and API requests. MongoDB Atlas will be used as the cloud database to store user data, analytics results, and feedback. For the AI features, the team will use Python with Flask API to build a separate AI microservice. This part of the system will use libraries like pandas, scikit-learn, and Prophet for data processing and prediction.

To manage the code and work together, the team will use Git and GitHub. These tools help in tracking changes and saving backup copies of the project. For testing APIs, the team will use Postman.

**User Design Interface**

The TANAW landing page is shown in Figure 7, which is accessible to

users who have not yet logged in. Located at the top-right corner is the Login button (1), which users can click to navigate to the login page and input their credentials to access the platform.

Beneath the main heading on the landing page, there is a "Get Started Now" button (2). This button serves as a smart redirect based on the user's session status. If the user does not have an account or is not logged in, clicking the button will take them to the login page. If the user is already authenticated, the button will direct them straight to the TANAW Data Tool, where they can access their dashboard, view insights, and begin interacting with uploaded datasets and AI-generated visualizations.

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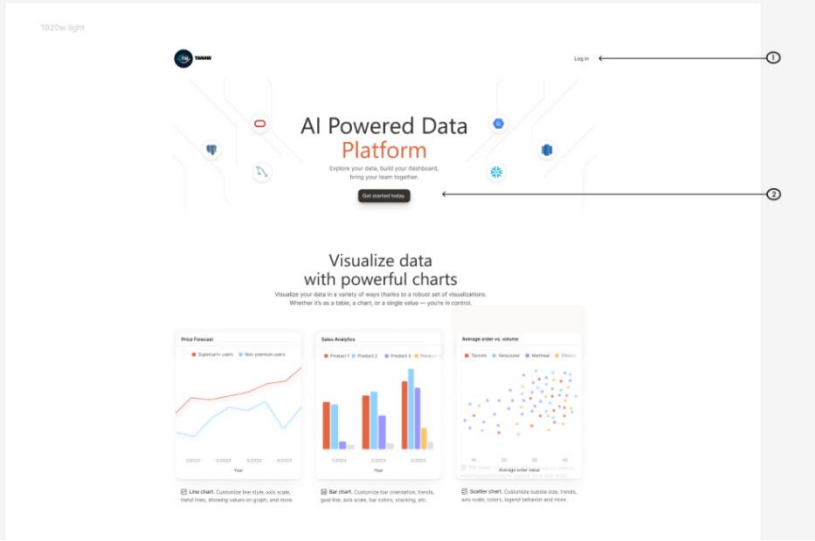


**Figure 7. Landing Page of TANAW**

1. **Log-in Hyperlink**
2. **Get Started Button**

The TANAW login interface of user is illustrated in Figure 8, guiding users through a secure and role-specific authentication process. At the top of the form is the User Role Selector (1), allowing individuals to choose between logging in as a User or an Admin. This selection determines the level of access and the specific sections of the platform that will be available after authentication. Below the role selector is the Email Textbox (2), where users enter their registered email address, which serves as a unique identifier in the system. Next is the Password Field (3), where users input their confidential password. This field is masked by default to enhance privacy and prevent unauthorized viewing during input.

Underneath the password input is the “Remember Me” Checkbox (4), which allows the user to remain logged in across sessions, improving convenience for frequent users. Following this is the CAPTCHA Verification (5) labeled “I'm not a robot,” a security feature that prevents automated login attempts and ensures that access requests come from real users. After completing all required fields, the user proceeds by clicking the “Log in” Button (6), which triggers backend authentication to verify the credentials and grant access if both the email and password are valid and correspond to the selected role.

To assist with accurate password input, the system includes a Password Visibility Toggle (7) labeled “Hide,” allowing users to switch between masked and visible text. In cases where the user has forgotten their password, they can

click the “Forgot your password?” Link (8) to initiate a password recovery or reset process.Beneath the login section, users are informed that by logging in, they agree to the platform’s Terms of Use and Privacy Policy (9), ensuring transparency about user rights and data handling practices. Lastly, for users without an account, the “Sign Up” Link (10) directs them to the registration page, enabling new users to onboard seamlessly into the TANAW platform.

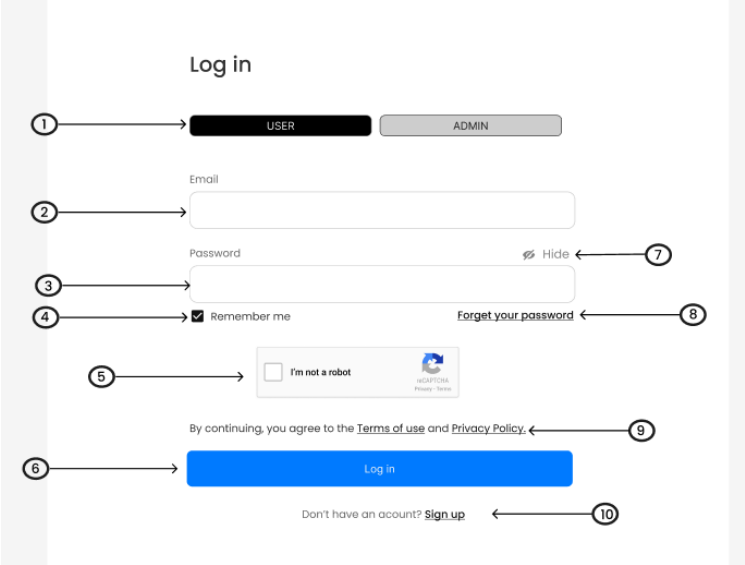


**Figure 8. Log in for User**

1. **USER Role Button**
2. **Email Textbox**
3. **Password Textbox**
4. **Remember me Check Box**
5. **Captcha Check Box**
6. **Log in Button**
7. **Hide Button**
8. **Forget your password Hyperlink**
9. **Terms of use and Privacy Policy Hyperlink**
10. **Sign up Hyperlink**

The TANAW login interface of admin is illustrated in Figure 9. The login process begins with the User Role Buttons (1) labeled USER and ADMIN. Selecting a role determines the type of account and access level. Clicking the ADMIN button sets the system to authenticate admin credentials, triggering relevant validations and dashboards upon successful login.


**Figure 9.Log in for Admin**

1. **USER Button**

The TANAW registration interface is shown in Figure 10, where new users can create an account. To begin, the user enters their Full Name (1) and Business Name (2) to personalize their profile and identify their SME. The Email address (3) serves as their unique login and contact's channel. They then set and confirm their

Password (4) and Confirm Password (5) to secure the account. After completing the reCAPTCHA, they click the Sign in button (6) to finalize registration and submit their details for account creation.

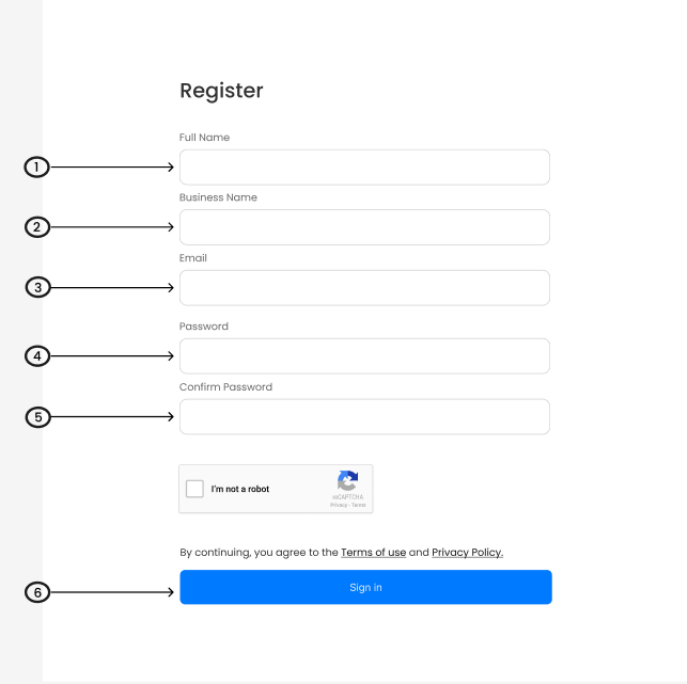


**Figure 10. Register Interface**

1. **Full Name Textbox**
2. **Business Name Textbox**
3. **Email Textbox**
4. **Password Textbox**
5. **Confirm Password Textbox**
6. **Sign in Button**

The TANAW Admin Dashboard Overview is illustrated in Figure 11, providing quick access to system statistics and navigation. When an admin logs into the dashboard, they are first introduced to the Sidebar Menu (1) on the left. This panel includes a highlighted “Overview” button, which displays key statistics

like views, visits, new users, and active users. This section helps the admin monitor platform performance at a glance. At the top of the interface, the Collapse Button (2) allows the admin to collapse the sidebar. This provides a more spacious view of the analytics content, making it easier to focus on data without the distraction of the menu.

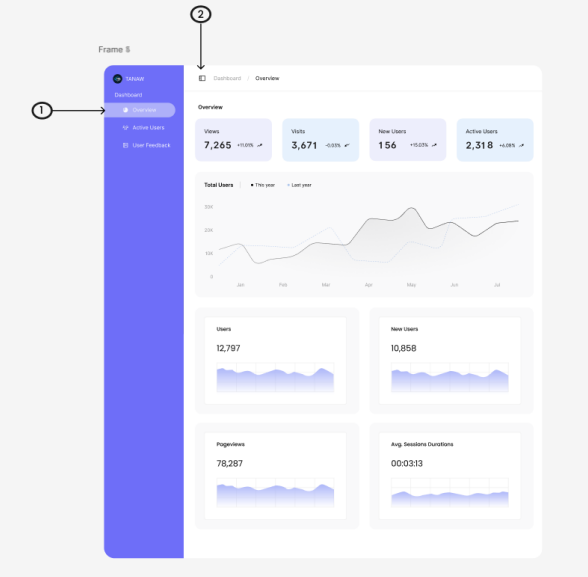


**Figure 11. Admin Dashboard**

1. **Overview Button**
2. **Collapse Button**

Figure 12 displays the TANAW Admin User Management Interface. In the user interface, the admin starts by clicking the “Active Users” button (1) located in the sidebar to access the user management page. Here, they can search for specific users by clicking the search icon (2) at the top right corner. Within the user table, the Actions column provides several options: the View button (3) allows the

admin to open a detailed user profile, including login history and business activity; the Suspend button (4) temporarily deactivates a user account for issues like misuse or security concerns; the Activate button (5) restores access to previously suspended accounts; and the Delete button (6) permanently removes a user from the system, an irreversible action used when necessary.

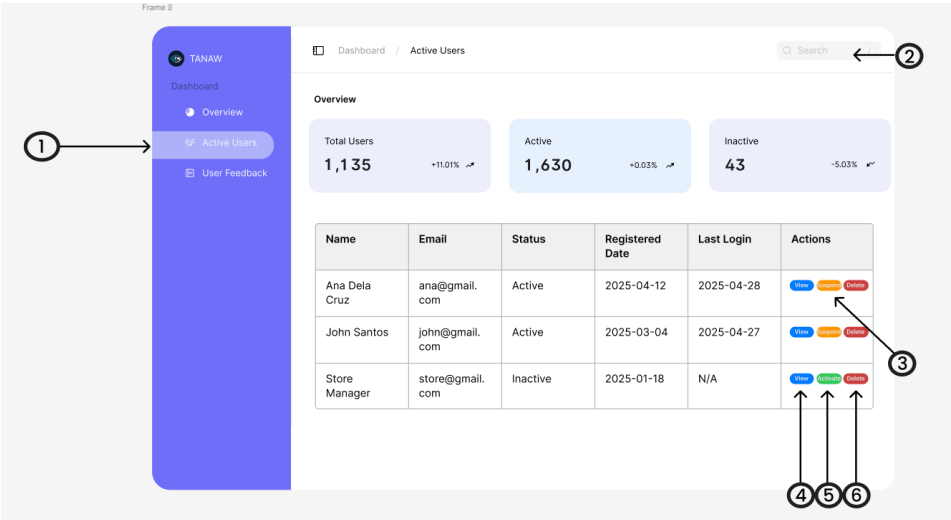


**Figure 12. Admin Dashboard (Active Users)**

1. **Active User Button**
2. **Search Textbox**
3. **Suspend Button**
4. **View Button**
5. **Activate Button**
6. **Delete Button**

The Admin Feedback Dashboard of TANAW is shown in Figure 13. The admin accesses the feedback dashboard by clicking the “User Feedback” button (1) in the sidebar. This page displays an overview and detailed breakdown of user responses regarding system performance. At the top, four summary cards highlight

key metrics: Positive Feedback shows the number of favorable responses along with the percentage change from the previous period; Negative Feedback tracks unfavorable responses and their trend; Average Rating displays the overall user satisfaction on a 5-point scale; and Total Comments reflects the number of written user inputs. Below these cards, a detailed feedback table presents individual entries, including the Date of submission, User (an anonymized ID), Query Snippet (a preview of the user's input), Rating (1 to 5), Type (Positive, Negative, or Neutral), and the Comment explaining the user's experience.

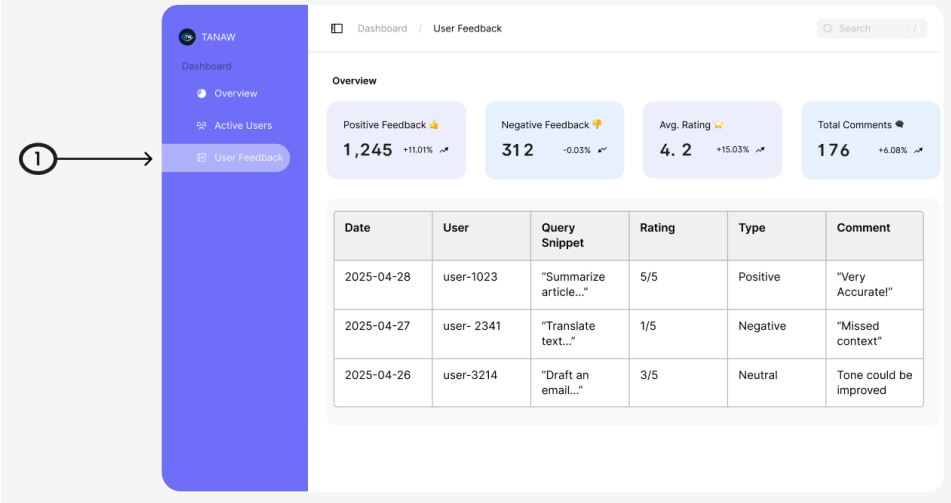


**Figure 13. Admin Dashboard (User Feedbacks)**

1. **User Feedback Button**

The User Dashboard is shown in Figure 14. The user starts by clicking the "Dashboard" button (1) in the left sidebar to access the main panel. From here, they can use the search icon (2) at the top right to quickly locate files or content.

Clicking on their profile image (3) reveals a dropdown menu where they can select "Profile" (4) to view or edit personal details such as name, email, or password, or choose "History" (5) to review past uploads or activities. To end their session securely, the user clicks the "Logout" button (6), which redirects them to the login page. At the center of the dashboard, the "Load File" button (7) serves as the main interaction point, opening a file upload interface for users to submit files supporting a smooth and focused user experience.

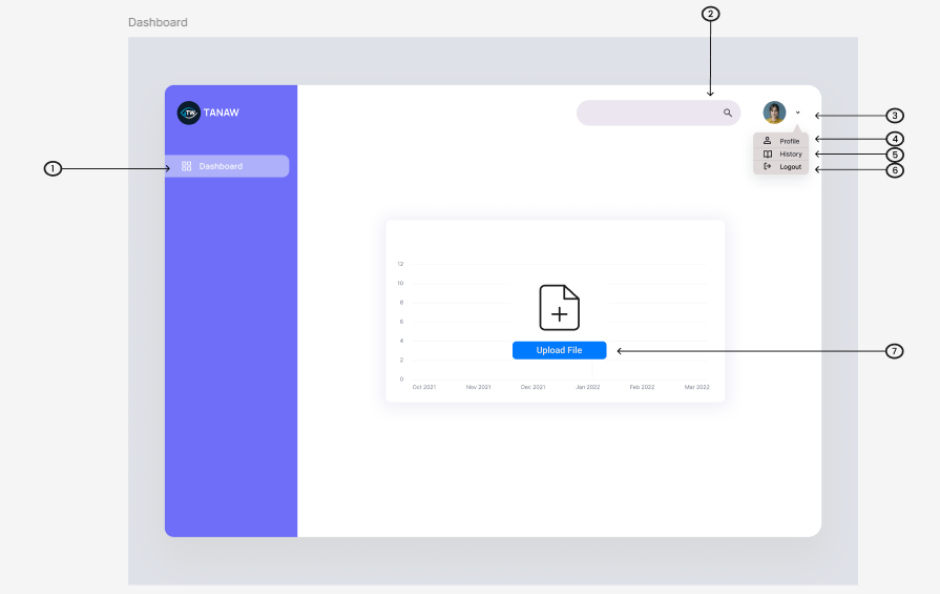


**Figure 14. User Dashboard**

1. **Dashboard Button**
2. **Search Textbox**
3. **Drop down**
4. **Profile Button**
5. **History Button**
6. **Logout Button**
7. **Upload File Button**

The TANAW AI Analytics Interface is shown in Figure 15, providing users with automated insights based on their uploaded dataset. Upon entering this screen, users see the Analytics Tab Buttons (1) such as Forecasting, Inventory, and Segmentation. These tabs adjust dynamically based on the types of analytics that are possible for the dataset provided. When a user clicks on a specific tab, the Graph Panel (2) updates to display the corresponding visualization, such as sales trends, inventory alerts, or customer clusters. Below the chart, the AI Prediction Text (3) also dynamically adjusts to reflect insights from the selected analysis type, providing a clear and concise summary of the AI's findings.

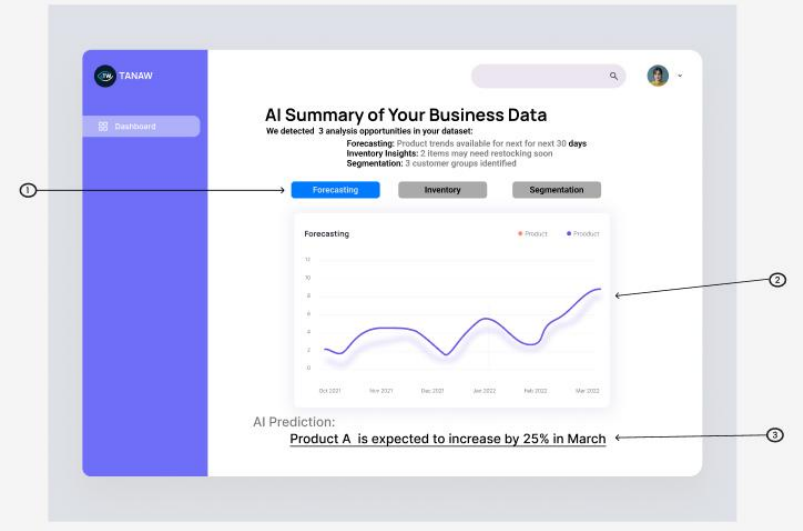


**Figure 15. User Dashboard (AI Visualization)**

1. **Analytics Tab Buttons**
2. **Data Visualization**
3. **AI Generated Insights**

The AI Feedback Form is shown in Figure 16, allowing users to rate the clarity and accuracy of the AI model. Users begin by selecting a star rating (1) from 1 to 5 based on their experience. Below this, they can provide more context in the text feedback box (2) to explain their rating or suggest improvements. At the bottom, the user can click Cancel (3) to discard the form or Submit (4) to send their feedback. A Close button (5) is also available in the top-right corner for quick dismissal of the form. This feedback helps the system refine its AI features and enhance user experience.

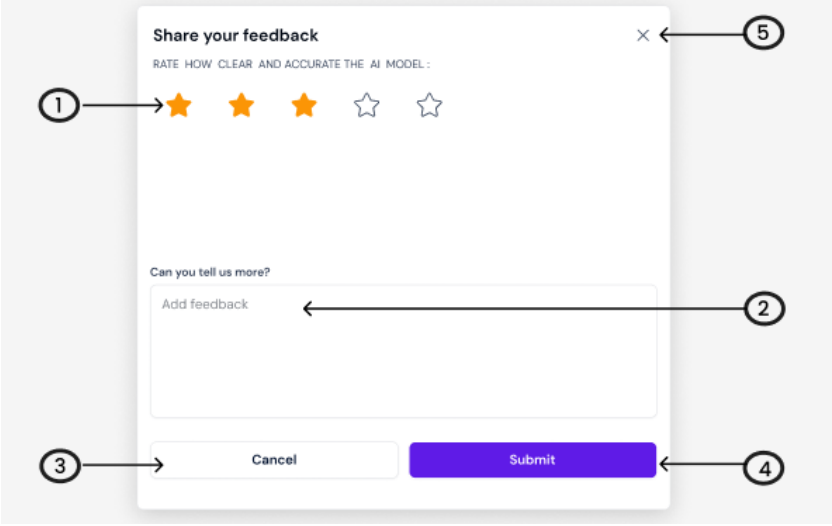


**Figure 16. User Feedback**

1. **Star rating Button**
2. **Comment Textbox**
3. **Cancel Button**
4. **Submit Button**
5. **Close Button**

## Testing and Evaluation

To evaluate the performance and quality of the proposed system, the researchers will use the ISO/IEC 25010:2011 software evaluation standard as the basis for designing a survey. This standard helps measure different aspects of the system, such as functionality, performance efficiency, usability, and reliability. These categories were considered to check if TANAW works properly and meets the expectations of the users.

Functionality checks whether the system performs its tasks correctly such as logging in, analyzing data, and generating accurate visual reports. Efficiency focuses on how fast the platform can process sales or inventory data and return results. This helps in identifying how responsive the system is when users perform common tasks.

Usability refers to how easy the system is to use for SME owners and admins, even if they are not very familiar with technology. Since TANAW is designed to be user-friendly, this part of the evaluation is important to ensure the platform is accessible and comfortable for non-technical users. Reliability measures if users can depend on the system to consistently return correct results from the AI model, display accurate insights, and store feedback properly without failure.

Table 7 below shows the Likert Scale that users will use to rate TANAW

after trying the system. The feedback gathered through the survey will help validate the system's usability and quality.

**Table 7.**
**Likert Scale**

| Scale | Verbal Interpretation |
|---|---|
| 5 | Strongly Agree |
| 4 | Agree |
| 3 | Fair |
| 2 | Disagree |
| 1 | Strongly Disagree |

Table 8 presents the different mean ranges along with their corresponding verbal interpretations. After the users have interacted with the TANAW system, their responses to the survey will help the researchers assess if the feedback aligns with the expected interpretation. A weighted mean between 4.20 and 5.00 will be categorized as strongly agree. If the result falls between 3.40 and 4.19, it will be interpreted as agree. A score within the 2.60 to 3.39 range may be viewed as either fair or leaning toward disagree. Meanwhile, a mean of 1.80 to 2.59 will fall under disagree, and the lowest rating of strongly disagree applies to averages between 1.00 and 1.79. The corresponding values and their interpretations are detailed in the table below.

**Table 8.**
**Range of Verbal Interpretation**

| Mean Range | Verbal Interpretation |
|---|---|
| 4.20 - 5.00 | Strongly Agree |
| 3.40 - 4;19 | Agree |
| 2:60 - 3.39 | Fair |
| 1.80 - 2.59 | Disagree |
| 1.00 - 1.79 | Strongly Disagree |

**Method of Testing**

The testing phase will play an important role in the development of the TANAW system. It will allow the proponents to gather actual feedback from users and evaluate how well the system performs based on their experiences. Selected respondents will be asked to use TANAW and answer evaluation forms designed to assess the system's effectiveness. This section will outline the planned approach to testing and explain the different methods that will be used to ensure TANAW works properly and meets its objectives. The results of the evaluation will be used by the developers to identify any areas that require adjustments or improvements, helping to enhance the platform before deployment. Through this process, the system will be improved to make it more reliable, functional, and user-friendly for both SMEs and admin users.

To ensure the quality and performance of TANAW, several testing methods will be conducted. One of the methods to be used is black-box testing, where testers will interact with the system without knowing its internal code structure. This will help confirm whether the inputs and outputs behave as expected. The team will also perform exploratory testing, where they will freely navigate the system to identify possible bugs, errors, or unusual behaviors that might not be detected through predefined test cases. This will allow a more flexible way of uncovering hidden issues. Lastly, acceptance testing will be carried out with selected stakeholders, such as SME representatives and admin testers, to validate whether TANAW meets their business analytics and reporting needs. Their feedback will help ensure that the platform is effective and ready for actual implementation.

**Test Cases**

Test cases will be used to check if the TANAW system meets the needs and expectations of its primary users, which include SMEs and administrators. Each test case will focus on a specific feature of the system to make sure it functions properly and provides a smooth user experience. These test cases will be designed and conducted by the developers, along with selected evaluators who will represent the target users. Through these tests, the developers will be able to observe if the system works as expected or if there are issues that need to be fixed

before full deployment.

The testing process will focus more on qualitative feedback, especially on how the users feel while using the system. If the majority of test results show that the system is easy to use, responsive, and reliable, then TANAW will be considered ready. However, if users experience errors, confusion, or missing features, the system will need revisions to improve its overall performance and usability.

Table 9 will summarize the planned test cases for TANAW's SME-side features. Each task will have an expected result, and the feedback will be used as a basis for improvement or future system maintenance.

**Table 9.**
**Sample Test Case result for Users**

| Task No. | Task Description | Expected Results | Actual |
|---|---|---|---|
| 1 | Verify that SMEs can register and log in using valid credentials. | SMEs should be able to create an account and access the system after successful login. | |
| 2 | Verify that SMEs can upload datasets in CSV or XLSX format. | Uploaded files should be stored securely and appear correctly on their dashboards. | |
| 3 | Check if SMEs can view visual analytics based on | Charts and graphs should be | |

| | | | |
|---|---|---|---|
| | uploaded data. | generated accurately using uploaded data. | |
| 4 | Verify that SMEs can request an AI-generated report. | A detailed report should be returned and displayed within a few seconds/minutes. | |
| 5 | Verify if SMEs can send feedback about AI suggestions. | Feedback should be saved and visible in the admin dashboard for future review. | |
| 6 | Check if SMEs can view historical analytics or past uploads. | The system should display past records and allow easy navigation to view them. | |

Table 10 will summarize the test cases created for the admin features of TANAW. These will help ensure the admin has full control over account management, feedback reviews, and overall system monitoring.

**Table 10.**
**Sample Test Case Result for Administration**

| Task No. | Task Description | Expected Results | Actual |
|---|---|---|---|
| 1 | Check if the admin can remove SME accounts from the system. | Deleted accounts should be disabled and inaccessible from login | |

| | | | |
|---|---|---|---|
| 2 | Verify that the admin can view system-wide analytics and user activity logs. | Admin dashboard should display relevant logs, user activity, and system performance. | |
| 3 | Confirm if admin can receive and review feedback from SME users. | Feedback entries should appear on the admin dashboard with timestamps. | |
| 4 | Verify that the admin can assess the AI model's performance through user feedback. | Feedback related to AI recommendations should be visible to the admin to help evaluate the model's usefulness and accuracy. | |

**System Evaluation using ISO/IEC 25010:2011**

In terms of evaluating TANAW under the ISO/IEC 25010:2011 standard, the system will be assessed in four main areas: functionality, efficiency, usability, and reliability. The proposed system will aim to perform optimally in these areas and fulfill the expected needs of SME users and administrators.

In terms of functionality, TANAW will be designed to support key features that address the common challenges faced by SMEs, particularly in decision-making using AI-generated analytics. These functions will include data uploading,

dashboard viewing, automated data analysis, and report generation. The system will also allow administrators to manage users and gather feedback on AI performance. While TANAW is expected to meet its functional goals, improvements such as support for more data formats or enhanced filtering options could further expand its usefulness.

When it comes to efficiency, TANAW will aim to provide quick data processing and smooth interaction for users. The system will be tested to ensure that analysis results and visualizations are delivered without delays, especially when handling larger datasets. Efficient use of system resources will also be prioritized to maintain consistent performance during periods of increased usage.

Usability will be another critical aspect of TANAW's evaluation. Since the target users include business owners who may not have advanced technical skills, the system will be designed with a simple and easy-to-navigate interface. Key features such as uploading files, interpreting visual data, and accessing reports will be made user-friendly to minimize confusion. Optional customization of visual themes or layout preferences may also be considered to improve user satisfaction.

Reliability will be essential for building trust in the system. TANAW will be expected to consistently return accurate AI-generated outputs, avoid crashes, and maintain the security and integrity of business data. The platform will also include backup systems and error handling to ensure users can continue working

even during minor disruptions or connection issues.

In summary, TANAW is expected to show promising performance in functionality, efficiency, usability, and reliability. While there may still be room for enhancements in some areas, its overall design and planned features will be aligned with the ISO/IEC 25010:2011 standards. This will help ensure that the system supports smart decision-making, improves productivity, and increases user satisfaction among SMEs and administrators.

**Project Teams and Their Responsibilities**

For the proposed capstone project titled "**TANAW: A Web-Based AI Analytics Platform for Accessible Decision Support in Small and Medium Enterprises**", three (3) project team members will be involved in the planning, development, and implementation of the system. **Jelson L. Umpacan** is the project manager and one of the project developers. As project manager, he will oversee the progress of the project, delegate tasks, monitor timelines, and ensure that the project meets its objectives. He will also assist in developing the core features of the system. **Gerard Michael V. Gonzales** is the UI/UX designer and documenter. His main responsibility is designing the system interface, making sure it is user-friendly and visually consistent. He also contributes to writing and compiling the capstone manuscript and other needed documentation. **Nhel Algin M. Sangco** will act as the tester and project developer. His responsibilities will

include testing the system for bugs, ensuring smooth performance, and contributing to both frontend and backend development. All members will participate in documentation, ensuring that each section of the capstone paper is accurate, complete, and updated throughout the duration of the project.

**Schedule of Activities (Gantt Chart)**

| ACTIVITIES | | MONTH | | | | |
|---|---|---|---|---|---|---|
| | | **January** | **February** | **March** | **April** | **May** |
| **1** | Brainstorming | | | | | |
| **2** | Topic Abstract Form and Approval | | | | | |
| **3** | Data Gathering | | | | | |
| **4** | Writing Chapter 1 | | | | | |
| **5** | Writing Chapter 2 | | | | | |
| **6** | Writing Chapter 3 | | | | | |
| **7** | Designing Interface | | | | | |
| **8** | Finalization of Chapters 1-3 | | | | | |
| **9** | Accomplishing Gantt Chart and PPT | | | | | |

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