

Scientiarum: A Multidisciplinary Journal
Vol. 2 No. S1 (2026): Supplement Issue
DOI: 10.54646/SAPARS.2026.66

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MULTI-AGENT BUSINESS ANALYTICS ASSISTANT USING ARTIFICIAL INTELLIGENCE

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Abstract

The Multi-Agent Business Analytics Assistant (MABA) is an intelligent Business Intelligence system developed to assist business owners and staff in managing business operations and making data-driven decisions. In many traditional business environments, information related to products, inventory, sales, customers, finance, GST, and business performance is maintained across different files or systems. Analysing these data manually can be time-consuming and may make it difficult for users to identify important business trends, operational problems, and opportunities. MABA addresses these challenges by integrating business data management, analytics, artificial intelligence, and a multi-agent architecture into a single web-based platform. MABA supports the integration of real business data through structured sources such as CSV datasets and MongoDB. The system processes the available data and converts it into useful information through dashboards, reports, analytics, alerts, and AI-assisted recommendations. The platform also provides separate functionalities for business owners and staff, allowing users to access information according to their responsibilities. Business owners can monitor overall business performance,

staff activities, inventory, sales, financial information, reports, and complaints, while staff can manage assigned business activities and access relevant analytical information. The proposed MABA system aims to reduce manual data analysis, improve business information accessibility, support inventory and sales monitoring, simplify reporting, and provide intelligent decision support. By combining multi-agent artificial intelligence, business analytics, database management, real-time business information, and an interactive web interface, the system provides an integrated platform for small and medium-sized businesses. The system is intended to support business decision-making by presenting useful information and recommendations in an understandable manner rather than replacing the decisions of business owners or managers.

Keywords: Multi-Agent Systems, Business Intelligence, Business Analytics, Artificial Intelligence, Data Analytics, Inventory Management, Sales Analytics, MongoDB, AI Chatbot, GST and Finance, Decision Support System.

Introduction

In today's competitive business environment, organizations generate and collect large amounts of data from different business activities such as product management, inventory, sales, customers, finance, and daily operations. The ability to analyse this information and convert it into useful insights is important for improving business performance and making informed decisions. However, many small and medium-sized businesses still depend on manual methods, spreadsheets, and separate systems to maintain and analyse their business information. This can make data management time-consuming and may make it difficult for business owners and staff to identify important trends, stock conditions, sales performance, and operational problems quickly.

Traditional business management systems generally provide basic facilities for storing and retrieving business information, but they may require users to manually examine data and

prepare reports. When the amount of business data increases, manually analysing different sources can become more difficult. Business owners may need to check inventory records, sales information, financial details, customer information, and reports separately before making a decision. This creates a need for an integrated system that can collect business information, analyse it automatically, and present useful insights through a simple interface.

Artificial Intelligence (AI) and Business Intelligence (BI) technologies provide opportunities to improve the way business data is processed and analysed. AI-based systems can identify patterns, generate recommendations, automate repetitive tasks, and provide interactive assistance to users. Business analytics can further help organizations understand historical data, monitor current performance, identify trends, and support future planning. However, using a single intelligent component for all business activities can make the system difficult to organize when different types of operations require different forms of analysis.

To address this challenge, the Multi-Agent Business Analytics Assistant (MABA) uses a multi-agent approach in which different intelligent agents are assigned to specific business functions. The system can include an Inventory Agent for monitoring stock, a Sales Agent for analysing sales information, an Analytics Agent for generating business insights, a GST and Finance Agent for financial analysis, a Chatbot Agent for user interaction, and a Notification Agent for alerts and important updates. By dividing business activities among specialized agents, the system can organize complex analytical tasks into smaller and more manageable operations.

MABA also integrates business data from structured sources such as CSV files and MongoDB. The system processes this information and presents it through dashboards, reports, analytics, notifications, and AI-assisted recommendations. Users can interact with the system through a web-based interface and access information according to their responsibilities. The business owner can monitor overall business performance and manage important business

activities, while staff can work with assigned operational functions such as products, inventory, sales, and analytics.

The proposed MABA system is designed to reduce manual data analysis and provide a centralized environment for business information and intelligent assistance. It aims to help users understand their business data more easily, identify important operational conditions such as low-stock products, analyse sales performance, monitor financial information, and obtain useful recommendations. The AI assistant also provides a conversational method for accessing business information, allowing users to interact with the system without depending entirely on manual report analysis.

The main contribution of MABA is the integration of multi-agent artificial intelligence, business analytics, database management, real business data, reporting, alerts, and an interactive AI assistant within a single platform. The system is intended to function as a business decision-support tool that helps owners and staff understand available data and make more informed decisions. It does not replace human decision-making; instead, it provides organized information, analytical results, and AI-assisted insights that can support business planning and daily operations.

Literature Review

The use of Artificial Intelligence (AI), Business Intelligence (BI), and data analytics in business management has increased significantly as organizations generate large amounts of operational data. Traditional business applications mainly focus on recording transactions, maintaining databases, and generating predefined reports. Business Intelligence systems extend these capabilities by collecting data from different sources and presenting it through dashboards, charts, reports, and performance indicators. These systems help organizations understand business performance and support management decisions based on historical and current information.

Business analytics has become an important area for organizations that need to convert large volumes of business data into useful information. Analytics techniques can be applied to sales analysis, inventory management, customer behaviour, financial analysis, demand forecasting, and performance monitoring. Descriptive analytics can explain what has happened, diagnostic analytics can help identify why an event occurred, predictive analytics can estimate possible future outcomes, and prescriptive analytics can support possible actions. However, conventional analytics platforms may still depend on users to select appropriate reports, interpret results, and decide which information is important.

The development of Machine Learning and Artificial Intelligence has introduced more automated approaches to business analytics. AI-based systems can identify patterns in datasets, detect unusual conditions, classify information, generate predictions, and provide recommendations. In areas such as sales forecasting and inventory management, intelligent models can analyse historical business information and identify trends that may not be easily recognized through manual analysis. However, many AI applications are designed for individual analytical tasks rather than providing a unified environment for several business operations.

Another important research area is the Multi-Agent System (MAS). A multi-agent system consists of multiple agents that can operate independently or cooperatively to perform specific tasks. Each agent can be designed with a particular responsibility while communicating with other agents or a central system. The use of multiple specialized agents can help divide complex problems into smaller tasks. In a business environment, separate agents can be assigned to inventory, sales, finance, customer support, analytics, and notifications. This approach can provide a more modular architecture than depending on a single component for all business operations.

AI-powered conversational assistants have also become an important part of intelligent business applications. Chatbots and natural-language interfaces allow users to communicate with software using questions or commands instead of manually navigating through multiple reports and screens. In business analytics, a conversational assistant can help users obtain information about sales, inventory, products, and performance. However, the usefulness of such an assistant depends on its connection to reliable business data and analytical components. A chatbot without access to current and structured business information may provide limited business value.

Data integration is another important consideration in business analytics. Business information can be distributed across databases, spreadsheets, CSV files, transaction systems, and other sources. Integrating these sources allows organizations to obtain a more complete view of their operations. NoSQL databases such as MongoDB can provide flexible storage for different types of business information, while structured files such as CSV can be used to import and manage existing datasets. Combining these data sources with analytics and intelligent agents can provide a centralized environment for business information processing.

Existing studies and systems therefore demonstrate the usefulness of Business Intelligence, AI-based analytics, multi-agent architectures, conversational assistants, and data management techniques. However, these areas are often implemented separately or are focused on specific business functions. There is a need for an integrated platform that combines these capabilities and provides a common environment for business owners and staff.

The proposed Multi-Agent Business Analytics Assistant (MABA) builds on these concepts by integrating specialized business agents with centralized business data and analytics. The system includes agents for inventory, sales, analytics, GST and finance, chatbot interaction, and notifications. These agents process business information according to

their respective responsibilities and contribute to a common decision-support environment. MABA therefore combines the concepts of Business Intelligence, AI-assisted analytics, multi-agent processing, database management, and conversational interaction to provide a unified platform for managing and understanding business data.

Problem Statement

Many businesses generate large amounts of information from daily activities such as product management, inventory, sales, customer management, finance, and GST operations. In many existing environments, this information is maintained using separate files, spreadsheets, databases, or independent applications. Managing and analysing these different sources manually can be time-consuming and makes it difficult for business owners and staff to obtain a complete view of business performance.

Existing business management systems often focus mainly on storing and displaying business information. Users may have to manually check inventory levels, analyse sales records, prepare reports, monitor financial information, and identify important business trends. As the volume of business data increases, this manual process can make it difficult to detect low-stock products, understand sales performance, identify trends, and obtain timely information for business planning.

Another problem is that different business functions are often handled independently. Inventory, sales, finance, analytics, notifications, and customer support may not be intelligently connected within a single system. Although AI and Business Intelligence technologies can provide automated analysis, a unified platform that uses multiple specialized agents to handle different business functions is not always available.

Therefore, there is a need for an integrated and intelligent system that can collect business data, store and process it, analyse different business operations, and provide useful insights through a single platform. The proposed Multi-Agent Business Analytics Assistant

(MABA) addresses this problem by using specialized agents for inventory, sales, analytics, GST and finance, chatbot interaction, and notifications. The system aims to reduce manual analysis, centralize business information, provide AI-assisted insights, and support business owners and staff in making informed decisions based on available business data.

System Architecture

The system architecture of the Multi-Agent Business Analytics Assistant (MABA) describes how users, the web application, multi-agent processing layer, database, analytics components, and business outputs interact with each other. The architecture is designed to provide a centralized platform for managing and analysing business information. The system consists of several layers, where each layer performs a specific function and communicates with the other layers.

At the user layer, MABA provides two main types of users: the Business Owner (Admin) and Staff. The Business Owner can monitor overall business performance, manage staff, view reports, analyse sales and inventory information, monitor complaints, and access decision-support features. Staff members can perform assigned operational activities such as managing inventory, processing sales, viewing products, and accessing relevant analytics.

The presentation layer provides the web-based MABA interface through which users interact with the system. It contains modules such as Home, Products, Inventory, Sales, Analytics, Reports, Notifications, GST and Finance, AI Assistant, Help Desk, and Profile or Settings. The interface sends user requests to the backend and displays the results generated by the system.

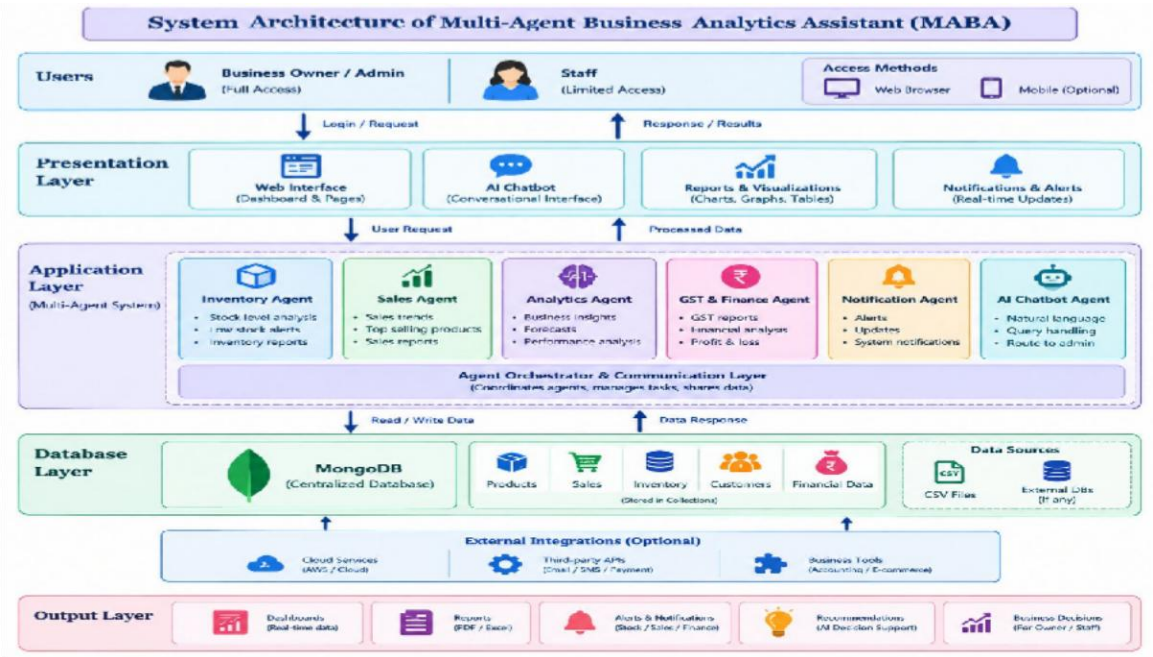
The multi-agent processing layer is the main intelligent component of MABA. It consists of several specialized agents. The Inventory Agent handles stock-related information and identifies low-stock conditions. The Sales Agent analyses sales transactions, sales trends, and top-selling products. The Analytics Agent generates business insights and performance

analysis. The GST and Finance Agent handles financial and GST-related information. The Chatbot Agent allows users to ask questions and obtain business information through natural-language interaction. The Notification Agent generates alerts and notifications for important business events.

The data layer stores and manages the business information required by the agents. MABA uses MongoDB as the primary database for storing application and business information. Structured data can also be imported from CSV files or datasets, allowing existing product, inventory, and sales information to be integrated into the system. The data layer provides the required information to the different agents for processing and analysis.

Above the agent-processing layer, the Business Analytics and AI Decision Support layer processes the results generated by the specialized agents. It can provide sales analysis, inventory insights, business performance information, trend analysis, forecasting, financial insights, and AI-assisted recommendations. The processed information is then presented to users through dashboards, reports, alerts, and chatbot responses.

Figure 1: *System Architecture of Multi Agent Business Analytics Assistant*



Modules

User Authentication Module

- Admin and Staff login
- Role-based access
- Secure authentication

Product Management Module

- Product details
- Product categories
- Product availability

Inventory Management Module

- Stock monitoring
- Low-stock detection
- Inventory status

Sales Management Module

- Sales records
- Sales trends
- Top-selling products

Business Analytics Module

- Data analysis
- Performance analysis
- Business trends

GST & Finance Module

- GST information
- Financial analysis
- Profit and loss information

AI Decision Support Module

- AI-based insights
- Business recommendations
- Forecasting

AI Chatbot Module

- Natural-language queries
- Business information assistance
- User interaction

Notification Module

- Low-stock alerts
- Important updates
- Business notifications

Reports Module

- Business reports
- Charts and analytics
- PDF/Excel reports

Complaint & Help Desk Module

- Complaint submission
- AI-assisted support
- Admin escalation

Staff Management Module

- Staff information
- Staff activity monitoring
- Role management

Data & Database Module

- CSV data import
- MongoDB storage
- Business data management

Admin Dashboard Module

- Overall business overview
- Sales and inventory monitoring
- Analytics and alerts

Methodology

The methodology of the Multi-Agent Business Analytics Assistant (MABA) involves collecting business data such as product, sales, inventory, customer, and financial information from CSV files and databases. The collected data is stored and organized in MongoDB for efficient management and processing. Different specialized agents analyze specific business activities, including inventory, sales, analytics, GST and finance, and notifications. The processed data is used to generate business insights, reports, alerts, forecasts, and AI-based recommendations. Finally, the Admin and Staff can access the results through dashboards and an AI chatbot to support effective and data-driven business decisions.

Step 1 – Data Collection

The system collects business information such as product details, inventory records, sales transactions, customer details, GST information, and financial data. Existing business data can also be imported from CSV files or structured datasets.

Step 2 – Data Storage

The collected information is stored in a centralized MongoDB database. The data is organized into appropriate collections so that different modules and agents can easily access the required information.

Step 3 – Data Preprocessing

The collected data is checked, cleaned, and organized before analysis. Duplicate, incomplete, or inconsistent records can be handled to improve the quality and reliability of the data used by the system.

Step 4 – Multi-Agent Processing

The system divides business activities among specialized intelligent agents. The Inventory Agent handles stock information, the Sales Agent analyses sales, the Analytics Agent generates business insights, the GST and Finance Agent handles financial information, the Chatbot Agent manages user queries, and the Notification Agent generates important alerts.

Step 5 – Business Analytics

The processed data is analysed to understand business performance. The system can identify low-stock products, top-selling products, sales trends, inventory conditions, and other important business patterns.

Step 6 – AI Decision Support

The analysed information is provided to the AI Decision Support component. It generates useful insights, recommendations, and forecasting information that can assist business owners and staff in understanding current and possible future business conditions.

Step 7 – Result Generation

The results generated by the agents and analytics components are presented through dashboards, charts, reports, notifications, and AI chatbot responses. This makes complex business information easier for users to understand.

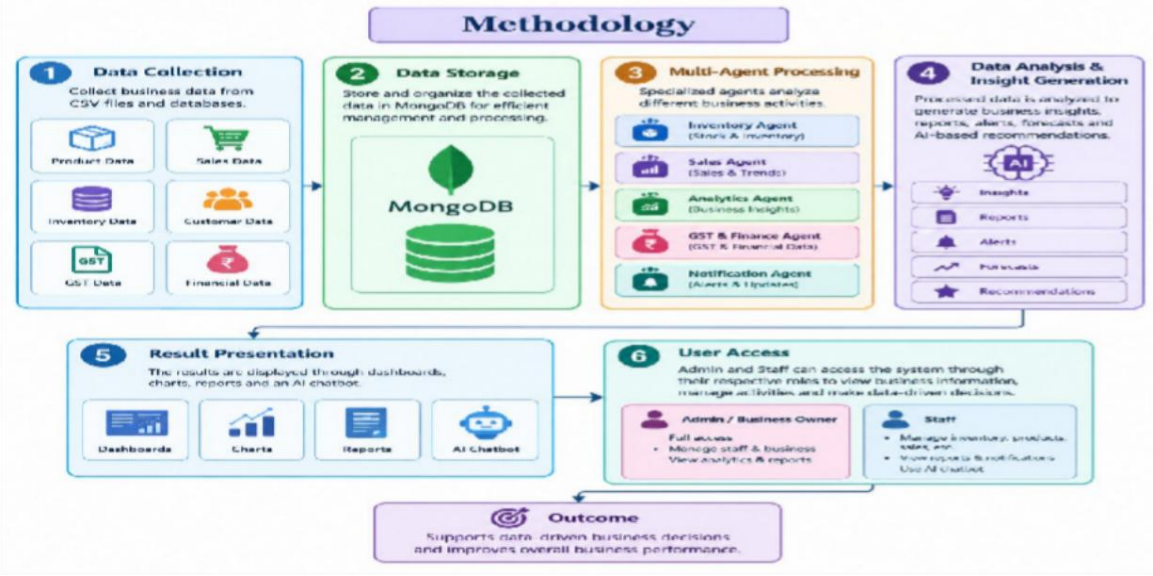
Step 8 – User Interaction

Admin and Staff can access the system according to their assigned roles. Users can view business information, check analytics, receive alerts, generate reports, and interact with the AI chatbot.

Step 9 – Decision Support

Finally, the system provides organized business insights that help users monitor operations and support data-driven decision-making. The system acts as a decision-support tool while the final business decisions remain with the business owner or authorized staff.

Figure 2: *Methodology*



Results and Analysis

The proposed Multi-Agent Business Analytics Assistant (MABA) was designed to provide an integrated platform for business data management, analytics, and intelligent decision support. The system combines multiple specialized agents to process different types of business information and present meaningful results to the Business Owner and Staff.

The system successfully collects business data such as product details, inventory information, sales records, customer information, and financial data from sources such as

CSV files and the MongoDB database. The centralized database helps organize and manage the information efficiently, reducing the need for maintaining business information in multiple separate files.

The Inventory Agent analyzes stock information and identifies products with low or insufficient stock levels. These results are displayed through the dashboard and notifications, helping staff monitor inventory more effectively. The Sales Agent processes sales records to identify sales trends, frequently sold products, and overall sales performance. This information helps the business owner understand product demand and sales patterns.

The Analytics Agent combines processed business data to generate useful business insights. It can provide information such as total sales, top-selling products, inventory status, sales trends, and business performance. The GST and Finance Agent organizes financial and GST-related information and provides summarized financial insights. These modules reduce the need for manually analyzing large amounts of business data.

The AI Decision Support Agent uses the processed analytical information to generate recommendations and forecasts. For example, the system can identify low-stock products, highlight changes in sales trends, and provide suggestions based on available business data. These recommendations are intended to support the business owner in making informed decisions.

The AI Chatbot Agent provides a natural-language interface through which users can ask questions about business information. Instead of manually searching through different reports, users can ask questions related to sales, products, inventory, or analytics and receive responses based on the available data.

The system also generates dashboards, charts, reports, alerts, and notifications to present analytical results in an understandable form. The Admin and Staff users receive

information according to their respective roles. This improves accessibility and allows users to interact with business information without requiring advanced technical knowledge.

Overall, the analysis shows that the multi-agent approach can divide business analytics tasks among specialized agents while allowing them to work as part of a single integrated system. The combination of centralized data storage, business analytics, AI-based decision support, and conversational interaction provides a structured approach to managing business information. The final decisions remain with the Business Owner or authorized Staff, while MABA provides the required information and analytical support.

Advantages

- Automated Business Analysis – Automatically analyzes sales, inventory, and other business data.
- Centralized Data Management – Stores business information in a centralized MongoDB database for easier access and management.
- Real-Time Monitoring – Helps monitor inventory, sales, and important business activities.
- Low-Stock Alerts – Identifies products with low stock and provides notifications.
- AI-Based Decision Support – Provides business insights, recommendations, and forecasts based on available data.
- Multiple Specialized Agents – Different agents handle inventory, sales, analytics, finance, chatbot, and notifications.
- Easy User Interaction – The AI chatbot allows users to ask questions using natural language.
- Improved Productivity – Reduces the amount of manual work required for analyzing business information.

- Reports and Dashboards – Presents business information through dashboards, charts, reports, and notifications.
- Role-Based Access – Provides different functions for the Business Owner/Admin and Staff users.

Disadvantages

- Data Dependency – The accuracy of the results depends on the quality and correctness of the available business data.
- Initial Development Cost – Developing and maintaining a multi-agent system may require technical resources and time.
- Technical Knowledge Required – Some technical knowledge is required to configure, maintain, and troubleshoot the system.
- Database Dependency – Problems with the database can affect data access and system functionality.
- AI Limitations – AI-generated insights may not always be completely accurate and should be reviewed by authorized users.
- Security Risks – Business information must be properly protected from unauthorized access.
- Maintenance Required – The system requires regular maintenance, updates, and monitoring.
- Integration Complexity – Connecting multiple agents and different data sources can increase system complexity.
- Large Data Processing – Processing large amounts of business data may require additional computing resources.
- Internet/System Dependency – Some features may depend on the availability of the application, database, or network services.

Applications

- Retail Business Management – Helps retail businesses manage products, inventory, sales, and customer information.
- Inventory Management – Monitors stock levels and identifies low-stock or fast-moving products.
- Sales Analysis – Analyzes sales records to identify sales trends, top-selling products, and business performance.
- Financial Management – Helps organize financial information, profit and loss data, and GST-related information.
- Business Decision Support – Provides AI-based insights and recommendations to support business planning and decision-making.
- Business Forecasting – Uses available historical business data to identify trends and support future sales and inventory planning.
- Customer Support – The AI chatbot can answer business-related queries and help users find required information.
- Staff Performance Monitoring – Helps the Business Owner monitor staff activities and business operations.
- Business Reporting – Generates reports, charts, dashboards, and summaries for business analysis.
- Small and Medium Businesses – Can be used by small and medium-sized businesses to manage business information and reduce manual analysis.
- Multi-Branch Business Management – Can be extended to manage sales, inventory, and analytics across multiple business branches.
- Data-Driven Business Planning – Helps business owners use collected business data to identify trends, problems, and opportunities for improvement.

Outcomes

- Centralized management of business data using MongoDB.
- Automated analysis of sales, inventory, and product information.
- Identification of low-stock products and inventory conditions.
- Identification of top-selling products and sales trends.
- Generation of business insights and performance analysis.
- AI-based recommendations and decision-support information.
- Generation of reports, charts, and dashboards.
- Notifications and alerts for important business activities.
- AI chatbot for natural-language business queries.
- Support for GST and financial analysis.

Future Scope

The Multi-Agent Business Analytics Assistant (MABA) can be further enhanced with advanced technologies and additional business features. In the future, the system can be extended to support real-time data processing, allowing business information such as sales and inventory to be updated and analyzed immediately. The system can incorporate more advanced Machine Learning models for accurate sales forecasting, demand prediction, inventory planning, and business trend analysis. The AI Decision Support Agent can also be improved to provide more personalized recommendations based on the business history and current market conditions.

Future versions can include integration with cloud platforms, allowing business owners to securely access their business information from different locations and devices. The system can also support integration with external business applications, accounting systems, billing software, and e-commerce platforms. The AI chatbot can be enhanced with voice-based interaction and multilingual support so that users can communicate with the

system more easily. Additional specialized agents can also be introduced for areas such as customer relationship management, marketing, supplier management, and employee performance analysis.

Security can be strengthened through advanced authentication, encryption, access control, and activity monitoring. The system can also be extended to support multiple companies and branches, allowing organizations with larger operations to manage their business data through a single platform.In the future, MABA can evolve into a more scalable and intelligent business analytics platform that combines AI, Machine Learning, Business Intelligence, cloud computing, and multi-agent systems to provide comprehensive decision-support capabilities for different types of businesses.

Conclusion

The Multi-Agent Business Analytics Assistant (MABA) provides an integrated approach for managing and analyzing business data using Artificial Intelligence, Business Intelligence, and multi-agent technology. The system brings together important business functions such as inventory management, sales analysis, business analytics, GST and finance, reporting, notifications, and AI-based decision support within a single platform.The use of specialized agents allows different business activities to be processed independently while working together as part of the overall system. The Inventory Agent helps monitor stock levels, the Sales Agent analyzes sales information, the Analytics Agent identifies business trends, and the GST and Finance Agent supports financial analysis. The AI Chatbot provides an easier way for users to interact with business information and obtain relevant responses.

MABA also helps reduce manual data analysis by providing dashboards, reports, alerts, and analytical insights. By using centralized data storage and automated processing, the system can help business owners and staff understand business performance more effectively. The AI-based decision-support features can provide recommendations based on

available business data, while the final business decisions remain with the authorized users.Overall, the proposed MABA system demonstrates how AI, Business Intelligence, data analytics, and multi-agent systems can be combined to create a useful business decision-support platform. The system provides a foundation that can be further enhanced with advanced machine learning, real-time processing, cloud integration, voice-based interaction, and support for multiple businesses and branches.

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