

Need Analysis for Developing an Intelligent Chatbot Service System for Virtual Persona Simulation to Reduce Workload and Enhance Service Efficiency

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Abstract— This research explores user requirements, essential functions and features, and the suitability of technologies and techniques for developing an intelligent chatbot system designed to simulate human interactions. The primary goal is to reduce workload and enhance service efficiency. Data were collected from 70 participants, including 20 employees, 20 organizational executives, and 20 business owners, while suitability evaluations were conducted by 10 technology experts.

The chatbot system comprises eight subsystems: user data management, knowledge base management, large language model management, automation management, intermediary chatbot interface management, expense management, analysis and reporting, and support and feedback systems. The study revealed that employees value the chatbot's ability to quickly respond to customer inquiries (60%) and manage documents (55%). Organizational executives prioritize customer management improvements (50%), customer data analysis for marketing recommendations (60%), and system integration with ERP or CRM platforms (70%). Business owners focus on reducing operational costs (45%), supporting business expansion (60%), and increasing customer satisfaction (65%).

Technology experts evaluated the applied technologies and techniques as highly suitable (average score = 4.6), demonstrating alignment with user expectations. The findings provide essential guidance for designing and developing intelligent chatbot systems that meet the specific needs of different user groups, ultimately reducing workloads, improving service efficiency, and fostering long-term organizational success.

Index Terms— Intelligent Chatbot, Human Simulation, Workload Reduction, Service Efficiency Enhancement, Requirements Analysis

I. INTRODUCTION

In the modern era, the adoption of artificial intelligence (AI) in service processes has become widespread, particularly with the use of chatbots to meet customer needs and provide quick initial consultation. Chatbots have become an essential component for organizations aiming to enhance efficiency and reduce employee workloads [1], [2], [3]. However, most existing chatbots still face limitations in understanding and processing complex queries, responding without clear context, and failing to fully simulate human-like communication.

Consequently, employees often need to intervene, preventing the achievement of the desired workload reduction [4], [5].

Studies on chatbots utilizing Large Language Models (LLMs) have shown that models like GPT-4 significantly enhance the ability of chatbots to generate high-quality conversations and effectively analyze business data. Additionally, task-oriented chatbots have been found to provide more natural conversational experiences without the need for explicitly defined intents. This allows for more flexible and diverse responses during interactions [6].

Despite these advancements, challenges remain in managing operational costs, preserving data, and systematically organizing knowledge. These issues limit the chatbot's ability to retrieve and utilize information efficiently.

To address these challenges, this research focuses on studying user requirements and analyzing the development of an intelligent chatbot system capable of accurately simulating human interactions. The proposed system integrates multiple components to overcome the identified limitations. A User Management System will support user authentication and access control, while a Knowledge Management System, leveraging vector databases and Retrieval-Augmented Generation (RAG) technology, will enable the chatbot to retrieve relevant knowledge with high precision and efficiency.

The implementation of LLMs, such as ChatGPT, will allow the chatbot to respond to complex queries within appropriate contexts. Additionally, an Automation Tasks Management System (AI Agents) will connect with external services through APIs, enabling the chatbot to automate a wide range of tasks and significantly reduce employee involvement.

To ensure cost-effective operation, a Cost Management System will be developed to monitor API usage of LLMs and accurately calculate associated costs. Moreover, an Analytics and Reporting System will provide organizations with insights into chatbot usage patterns and predict future trends.

In conclusion, studying and analyzing the requirements for intelligent chatbot systems is crucial for developing chatbots capable of simulating human-like communication effectively. Such systems not only reduce employee workloads but also enhance customer service efficiency and foster long-term satisfaction.

II. RESEARCH OBJECTIVES

- To explore expectations and requirements for an intelligent chatbot system designed to simulate human interactions, aiming to reduce workloads and enhance service efficiency.
- To identify the specific needs of employees for utilizing an intelligent chatbot system that simulates human interactions to reduce workloads and improve service efficiency.
- To evaluate the suitability and capabilities of an intelligent chatbot system in simulating human interactions for workload reduction and service efficiency enhancement.

III. LITERATURE REVIEW

A. Review of Existing Literature Review

The development of chatbots capable of effectively meeting user demands has become a widely researched topic. Studies have focused on integrating artificial intelligence technologies and Large Language Models (LLMs) to create increasingly capable chatbots.

The research by [7] proposed the development of a chatbot using internal organizational data, emphasizing its ability to respond to user queries based on internal documents. This chatbot was designed to be embedded into existing websites and featured the use of entirely open-source technologies, enabling the creation of customizable and privacy-focused software. However, the study encountered challenges related to citation accuracy, multilingual responses, and deployment on platforms such as OpenStack.

Another study [2] examined the feasibility of developing a chatbot powered by LLMs for public administration services, particularly integrating with "MITOS," a database for administrative processes in Greece. This chatbot was designed to allow users to inquire about and understand various processes easily, utilizing GPT-4 alongside a database embedded and stored in Elasticsearch. The research highlighted the integration of technologies to enhance response efficiency and user experience.

Additionally, the study by [3] introduced a method for creating task-oriented chatbots using LLMs, which reduced the complexity of intent definition while enabling more natural conversations. This approach employed a lightweight domain-specific language for chatbot definition and the ReAct framework for user query processing and response generation. The evaluation indicated that this method reduced the specification size, enhanced conversational flexibility, and increased response diversity.

From the reviewed literature, it is evident that the use of LLMs and Retrieval-Augmented Generation (RAG) technology holds significant potential to enhance chatbot performance, particularly in response accuracy and task-oriented functionality. However, challenges remain, including data source management, multilingual support, and customization for organizational needs.

This research aims to address these gaps by developing an intelligent chatbot system capable of accurately simulating human interactions. The system focuses on reducing workloads and improving service efficiency while leveraging LLM and RAG technologies. Additionally, knowledge management through vector databases will be employed to create a highly capable chatbot that meets organizational demands effectively.

B. Theoretical Framework

1. Large Language Models - LLM

Large Language Models (LLMs) are AI models trained on massive amounts of natural language data, enabling them to comprehend and generate complex text that closely resembles human communication. Models like GPT-4 exhibit advanced language processing capabilities, allowing them to respond to user queries and commands effectively [8], [9], [10].

LLMs play a crucial role in developing flexible chatbots that can adapt to user needs without requiring predefined intents. This reduces system design complexity and enhances the naturalness of conversations [11], [12], [13].

2. Retrieval-Augmented Generation - RAG

Retrieval-Augmented Generation (RAG) is a technique that combines information retrieval and content generation. When a user submits a query, the system retrieves relevant information from a database or knowledge source and processes it using an LLM to generate accurate and contextually appropriate responses.

RAG enhances chatbots' ability to provide precise and up-to-date information by integrating the latest data into responses. This is particularly beneficial in scenarios where information frequently changes or is highly specific [14], [15].

3. Vector Database

Vector databases are systems designed to store data as vector representations, enabling efficient similarity measurements between various data points. In the context of chatbots, vector databases allow the system to quickly and accurately retrieve information or documents relevant to user queries.

Representing data as vectors enables the efficient processing of unstructured data, such as text or documents. When combined with RAG techniques, vector databases significantly improve the accuracy of information retrieval [16], [17], [18].

C. System Design Concept Diagram

The system design concept for the intelligent chatbot service aims to simulate human interactions, reduce workloads, and enhance service efficiency. This concept serves as a tool to improve the operational capabilities of businesses and organizations, enabling them to deliver effective information and services to personnel or customers. The system is composed of nine subsystems, as outlined in Table 1, which provides a detailed overview of the system design:

Intelligent Chatbot Service System for Virtual Persona Simulation to Reduce Workload and Enhance Service Efficiency						
(1) Chatbot Management System - CMS						
(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)	(1.7)
User Management System (Authorization and Authentication)	Knowledge Management System	Large Language Model Management System	Automation Tasks Management System	Cost Management System	Chat Interface Agent Management System	Analytics and Reporting System (Dashboard)
(1.8) Support and Feedback						

Table 1. System Design Concept for an Intelligent Chatbot Service for Simulating Human Interactions

1. **Chatbot Management System (CMS):** Responsible for managing and controlling the chatbot's operations to ensure efficient responses to user queries. It includes functionalities for user management, knowledge storage and retrieval, integration with large language models (LLMs), automation of tasks, and analytics for continuous improvement of services and system

performance.

2. **User Management System:** Handles the creation, modification, and deletion of user data while managing authentication and access control. This system ensures secure interactions by defining appropriate access levels for users, tailored to their roles and permissions.
3. **Knowledge Management System:** Collects, stores, and manages knowledge and data relevant to chatbot services. By leveraging vector database technology and retrieval techniques, it enables the chatbot to access accurate information efficiently for answering questions, resolving issues, or providing insights to users.
4. **Large Language Model Management System:** Manages the addition, removal, and configuration of large AI models, selecting suitable models via cloud APIs and defining specific roles for each. This system integrates seamlessly with the Automation Tasks Management System and Knowledge Management System to enhance automation and collaboration between models and organizational data.
5. **Automation Tasks Management System:** Oversees external service calls through APIs to support automated processes. It organizes task sequences and ensures systematic execution, allowing the chatbot to perform complex tasks with minimal human intervention.
6. **Chat Interface Agent Management System:** Facilitates the management of intermediary agents for chatbot interactions, including platforms like Line, Facebook Messenger, Google Chat, and custom widgets. It also maintains conversation histories, enabling the analysis of communication patterns and improving user interaction experiences.
7. **Cost Management System:** Tracks and reports the usage of tokens and costs associated with LLMs and chatbot agents. This system helps monitor resource usage, providing valuable insights for optimizing operational costs and supporting financial decisions.
8. **Analytics and Reporting System:** Generates comprehensive reports on chatbot performance, such as document retrieval and API usage, and visualizes the data on dashboards with charts and graphs. Using machine learning, it predicts future trends, aiding in strategic planning and informed decision-making.
9. **Support and Feedback System:** Collects and analyzes user feedback to identify areas for improvement. It also facilitates direct communication with support teams, enabling prompt issue resolution. This system uses collected data to refine chatbot services, ensuring they meet user needs and provide high-quality interactions.

D. System Overview

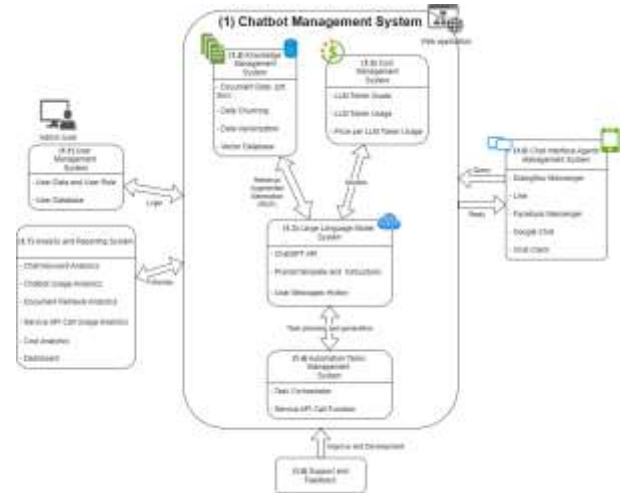


Figure 1. The Intelligent Chatbot Service System for Simulating Human Interactions to Reduce Workloads and Enhance Service Efficiency.

The Intelligent Chatbot Service System for Simulating Human Interactions aims to reduce workloads and enhance service efficiency. It consists of various subsystems within the Chatbot Management System (CMS), each playing a crucial role in ensuring the chatbot operates effectively. The details of these subsystems are as follows:

1. **User Management System**
 - Purpose: Manages user data and roles, allowing administrators to add, delete, and modify user accounts, as well as define access permissions to ensure appropriate access to system data and functions.
 - Features:
 - Manage user accounts (create, edit, delete).
 - Define access permissions for data and subsystems.
2. **Knowledge Management System**
 - Purpose: Responsible for importing, managing, and storing knowledge to enable the chatbot to effectively retrieve and use information for answering user queries.
 - Features:
 - Document import: Supports multiple file types, including PDF, Word, Excel, CSV, TXT, HTML, and Markdown.
 - Document management: Add, delete, edit, and categorize document data.
 - Vector database: Store data in vector format for fast retrieval, including data chunking and metadata addition.
 - API integration: Support for external system connections via API.
3. **Large Language Model Management System**
 - Purpose: Manages large language models (LLMs), allowing administrators to add, delete, and configure models to respond effectively to user queries while supporting integration with automation and knowledge management systems.
 - Features:
 - AI model management: Add, delete, and edit AI models and select models via Cloud API.
 - Role and prompt configuration: Set prompts and roles for each model.

- API support: Integrate LLMs via API.
- 4. Automation Tasks Management System
 - Purpose: Oversees automation processes and API services to ensure efficient workflows by managing the sequence and execution of automated tasks.
 - Features:
 - API service management: Add, delete, and edit API service data.
 - Task sequencing: Define the order and priority of automated tasks.
- 5. Chat Interface Agents Management System
 - Purpose: Manages intermediary agents for chatbot usage, including integration with platforms like Line, Facebook Messenger, and Google Chat, as well as handling conversation histories and connecting to the LLM Management System.
 - Features:
 - Interface management: Add, delete, and modify settings for platform connections.
 - Conversation history: Store and organize conversation logs for data analysis.
- 6. Cost Management System
 - Purpose: Monitors and reports usage and costs related to LLMs and chatbot agents to manage resources and budgets effectively.
 - Features:
 - Quota setting: Define usage quotas for LLMs.
 - Usage reporting: Report token consumption and costs for models and chat agents.
- 7. Analytic and Reporting System
 - Purpose: Provides insights into chatbot usage and performance while predicting future trends to support strategic planning.
 - Features:
 - Chatbot usage reports: Summarize key conversation topics and keywords.
 - API usage analysis: Monitor API calls and usage.
 - Dashboards and predictions: Display data through graphs and use Machine Learning for trend forecasting.
- 8. Support and Feedback
 - Purpose: Collects user feedback and support requests to guide system development and improve service responsiveness.
 - Features:
 - Feedback grouping: Categorize feedback and support requests by type.
 - Feedback summarization: Extract key points from feedback for system improvements.

This overview demonstrates how the various subsystems within the Chatbot Management System work together to enhance chatbot performance, reduce workloads, and improve user satisfaction.

IV. METHODOLOGY

A. Data Collection Methods

Questionnaires were used to gather data from employees, managers, business owners, and technology experts. The objective was to understand their requirements, expectations, and the suitability of the system.

B. Data Analysis Methods

The collected data were analyzed using statistical methods to summarize quantitative information, such as percentages, mean values, and standard deviations, to identify trends and opinions of relevant system users. Additionally, qualitative analysis was employed to summarize suggestions and feedback to identify factors influencing the system's success and efficiency.

C. Population and Sample

- Employees (Officers): Individuals working in organizations who use technology for their daily tasks (20 participants).
- Managers: Individuals responsible for organizational management who use technology for communication and processing critical information (20 participants).
- Business Owners: Individuals involved in strategic decision-making and interested in the outcomes of technology adoption within their organizations (20 participants).
- Technology Experts: Professionals with expertise in application design and artificial intelligence systems (10 participants).

V. RESULTS

This research conducted a study and analysis of the requirements for an intelligent chatbot system designed to simulate human interactions, aiming to reduce workloads and enhance service efficiency. A total of four sets of questionnaires were developed, yielding the following results:

- Findings on the expectations and requirements for the intelligent chatbot system to simulate human interactions for reducing workloads and enhancing service efficiency were gathered from a group of 20 employees.

Question	Answer
Q1: Age	30-20 years: 8 people (40%) 40-31 years: 6 people (30%) 50-41 years: 4 people (20%) Over 50 years: 2 people (10%)
Q2: Job Position	Customer Service Staff: 10 people (50%) Marketing Staff: 4 people (20%) IT Staff: 3 people (15%) Human Resources Staff: 2 people (10%) Others: 1 person (5%)
Q3: Work Experience in the Current Organization	Less than 1 year: 4 people (20%) 3-1 years: 8 people (40%) 6-4 years: 4 people (20%) More than 6 years: 4 people (20%)

Table 2. Basic Data Survey of Employees

คำถาม	คำตอบ
Q1: How quickly do you expect the chatbot to respond to customer queries?	Immediately: 12 people (60%) Within 1-2 minutes: 6 people (30%) Within 5 minutes: 1 person (5%) No need to respond quickly: 1 person (5%)
Q2: How well do you expect the chatbot to handle complex queries?	Should handle all queries: 8 people (40%) Should handle some queries: 6 people (30%) Should handle only simple

	queries: 4 people (20%) No need to handle complex queries: 2 people (10%)
Q3: How versatile should the chatbot be in understanding languages or commands?	Should understand all languages and commands: 10 people (50%) Should understand only major languages: 6 people (30%) Should understand only some commands: 3 people (15%) No need for extensive understanding: 1 person (5%)
Q4: Should the chatbot recommend additional products or services to customers?	Should be able to recommend: 12 people (60%) Should recommend in some cases: 5 people (25%) No need for recommendations: 2 people (10%) Not sure: 1 person (5%)
Q5: How well should the chatbot remember previous conversations with customers?	Should remember everything: 8 people (40%) Should remember only important information: 7 people (35%) No need to remember: 4 people (20%) Not sure: 1 person (5%)
Q6: Should the chatbot assist with managing documents on behalf of employees?	Desired: 11 people (55%) Desired partially: 5 people (25%) Not needed: 3 people (15%) Not sure: 1 person (5%)
Q7: Should the chatbot update customer or product-related information in real time?	Desired: 12 people (60%) Update only critical information: 5 people (25%) Not needed: 2 people (10%) Not sure: 1 person (5%)
Q8: Should the chatbot monitor and evaluate employee service performance?	Desired: 10 people (50%) Desired partially: 5 people (25%) Not needed: 4 people (20%) Not sure: 1 person (5%)
Q9: Should the chatbot interact with customers when you are unavailable?	Desired: 13 people (65%) Desired partially: 4 people (20%) Not needed: 2 people (10%) Not sure: 1 person (5%)
Q10: Should the chatbot escalate unresolved issues to employees immediately?	Should escalate immediately: 14 people (70%) Escalate only critical issues: 4 people (20%) No need to escalate: 1 person (5%) Not sure: 1 person (5%)

Table 3. Survey on Requirements and Expectations of Employees

The findings from Table 2 and Table 3 indicate that the majority of employees are aged between 20-30 years (40%) and work in customer service roles (50%). Additionally, most employees have 1-3 years of experience in their current organization (40%).

Regarding the requirements and expectations of the intelligent chatbot system, most employees expect the chatbot to provide quick responses to customer queries (60%) and to handle complex questions (40%). Furthermore, employees believe that the chatbot should have the ability to understand a variety of languages or commands (50%) and recommend additional products or services to customers (60%).

In terms of chatbot capabilities, most employees prefer that the chatbot can assist with document management tasks (55%) and update customer- or product-related information in real-time (60%). Additionally, they expect the chatbot to be able to monitor and evaluate employee service performance (50%) and to interact with customers

during times when employees are unavailable (65%).

Overall, these findings show that employees have diverse requirements and expectations for the intelligent chatbot system, aiming for a tool that can effectively assist and enhance workplace efficiency.

- Findings on Requirements and Expectations of the Intelligent Chatbot System from Organizational Executives (20 participants):

Question	Answer
Q1: Age	30-20 years: 40% (8 people) 40-31 years: 30% (6 people) 50-41 years: 20% (4 people) Over 50 years: 10% (2 people)
Q2: Job Position	Senior Executives: 2 people (10%) General Managers: 4 people (20%) Department/Division Managers: 6 people (30%) Assistant Managers: 5 people (25%) Others: 3 people (15%)
Q3: Responsible Department	General Administration: 4 people (20%) Finance and Accounting: 3 people (15%) Marketing and Public Relations: 5 people (25%) Human Resources (HR): 3 people (15%) Information Technology (IT): 3 people (15%) Business Development: 2 people (10%) Others: 0 people (0%)

Table 4. Basic Data Survey of Organizational Executives

Question	Answer
Q1: To what extent do you expect the chatbot to improve customer management?	Fully improve: 10 people (50%) Partially improve: 7 people (35%) No need for improvement: 2 people (10%) Not sure: 1 person (5%)
Q2: Do you want the chatbot to analyze customer data and suggest marketing strategies?	Yes: 12 people (60%) Partially: 5 people (25%) No: 2 people (10%) Not sure: 1 person (5%)
Q3: How often do you expect the chatbot to report performance?	Daily: 6 people (30%) Weekly: 8 people (40%) Monthly: 5 people (25%) No reports needed: 1 person (5%)
Q4: Do you want the chatbot to integrate with your organization's ERP or CRM systems?	Yes: 14 people (70%) Partially: 4 people (20%) No: 1 person (5%) Not sure: 1 person (5%)
Q5: Should the chatbot be able to take executive commands to address issues immediately?	Yes: 15 people (75%) Sometimes: 3 people (15%) Not necessary: 1 person (5%) Not sure: 1 person (5%)
Q6: To what extent do you expect the chatbot to assist with Customer Relationship Management (CRM)?	Maximum assistance: 11 people (55%) Partial assistance: 7 people (35%) No assistance needed: 1 person (5%) Not sure: 1 person (5%)
Q7: Do you want the chatbot to learn and adapt to changing customer needs?	Yes: 13 people (65%) Partially: 5 people (25%) No: 1 person (5%) Not sure: 1 person (5%)
Q8: Do you expect the chatbot to	Significantly: 9 people (45%)

reduce workload in team management?	Partially: 8 people (40%) Slightly: 2 people (10%) Not at all: 1 person (5%)
Q9: Do you want the chatbot to improve organizational data and document management?	Yes: 12 people (60%) Partially: 6 people (30%) No: 1 person (5%) Not sure: 1 person (5%)
Q10: How should the chatbot maintain quality control in its services?	Control every step: 10 people (50%) Control only key aspects: 8 people (40%) No quality control needed: 1 person (5%) Not sure: 1 person (5%)

Table 5. Survey on Requirements and Expectations of Organizational Executives

From Table 4 and Table 5, it is evident that most executives are aged between 30-39 years (40%) and work as department/division managers (30%). Additionally, the majority of executives have experience working in general administration (20%) and marketing and public relations (25%).

Regarding the requirements and expectations for using an intelligent chatbot system, most executives expect the chatbot to significantly improve customer management (50%) and analyze customer data to provide marketing strategy suggestions (60%). Furthermore, they prefer the chatbot to report performance on a weekly basis (40%) and integrate with the organization's ERP or CRM systems (70%).

In terms of chatbot capabilities, the majority of executives want the chatbot to take commands to address issues immediately (75%) and assist with customer relationship management (CRM) to a high degree (55%). Additionally, most executives expect the chatbot to learn and adapt to changing customer needs (65%) and reduce workload in team management (45%).

Overall, the findings indicate that executives have diverse requirements and expectations from the intelligent chatbot system. They expect the chatbot to effectively assist and enhance organizational efficiency.

- Findings on Requirements and Expectations of the Intelligent Chatbot System from Business Owners (20 participants):

Question	Answer
Q1: Age	29-20 years: 3 people (15%) 39-30 years: 6 people (30%) 49-40 years: 6 people (30%) Over 50 years: 5 people (25%)
Q2: Business Type	Retail: 5 people (25%) Service: 5 people (25%) Manufacturing: 4 people (20%) Technology: 3 people (15%) Education: 3 people (15%) Others: 0 people (0%)
Q3: Business Size	General Administration: 4 people (20%) Finance and Accounting: 3 people (15%) Marketing and Public Relations: 5 people (25%) Human Resources (HR): 3 people (15%) Information Technology (IT): 3 people (15%) Business Development: 2 people (10%) Others: 0 people (0%)
Q4: Business Duration	Less than 1 year: 3 people (15%)

	3-1 years: 5 people (25%) 6-4 years: 6 people (30%) Over 6 years: 6 people (30%)
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Table 6. Basic Data Survey of Business Owners

Question	Answer
Q1: How do you expect the chatbot to reduce operational costs in your organization?	Significantly reduce costs: 9 people (45%) Partially reduce costs: 8 people (40%) Slightly reduce costs: 2 people (10%) No cost reduction: 1 person (5%)
Q2: Do you want the chatbot to help expand your business in the future?	Yes: 12 people (60%) Partially: 6 people (30%) No: 1 person (5%) Not sure: 1 person (5%)
Q3: How do you expect the chatbot to assist in managing personnel in your organization?	Maximum assistance: 8 people (40%) Partial assistance: 9 people (45%) Minimal assistance: 2 people (10%) No assistance: 1 person (5%)
Q4: Do you want the chatbot to improve employee performance in your organization?	Yes: 13 people (65%) Partially: 5 people (25%) No: 1 person (5%) Not sure: 1 person (5%)
Q5: How do you expect the chatbot to help with data management and decision-making in your organization?	Maximum assistance: 9 people (45%) Partial assistance: 8 people (40%) Minimal assistance: 2 people (10%) No assistance: 1 person (5%)
Q6: Do you want the chatbot to increase customer satisfaction in your organization?	Maximum satisfaction: 14 people (70%) Partial satisfaction: 4 people (20%) No satisfaction: 1 person (5%) Not sure: 1 person (5%)
Q7: Do you expect the chatbot to help improve your organization's image?	Maximum improvement: 11 people (55%) Partial improvement: 7 people (35%) Minimal improvement: 1 person (5%) No improvement: 1 person (5%)
Q8: Do you want the chatbot to help build customer loyalty toward your organization?	Maximum loyalty: 12 people (60%) Partial loyalty: 6 people (30%) No loyalty: 1 person (5%) Not sure: 1 person (5%)
Q9: How do you expect the chatbot to assist in expanding your customer base?	Maximum assistance: 10 people (50%) Partial assistance: 8 people (40%) Minimal assistance: 1 person (5%) No assistance: 1 person (5%)
Q10: Do you want the chatbot to assist in marketing and selling your products/services?	Maximum assistance: 13 people (65%) Partial assistance: 5 people (25%) No assistance: 1 person (5%) Not sure: 1 person (5%)

Table 7. Survey on Requirements and Expectations of Business Owners

From Table 6 and Table 7, it is evident that most business owners are aged between 30-39 years (30%) and operate businesses in the retail (25%) and service (25%) sectors. Additionally, the majority of business owners have organizations with fewer than 50 employees (70%) and have been in operation for more than 3 years (60%).

Regarding the requirements and expectations for using an

intelligent chatbot system, most business owners expect the chatbot to significantly reduce operational costs (45%) and assist in future business expansion (60%). Furthermore, they want the chatbot to provide maximum support in personnel management (40%) and improve employee performance (65%).

In terms of chatbot capabilities, most business owners desire the chatbot to provide maximum support in data management and decision-making (45%) and enhance customer satisfaction (65%). Additionally, they want the chatbot to improve the organization's image (55%) and build customer loyalty (60%).

Overall, the findings indicate that business owners have diverse requirements and expectations from the intelligent chatbot system. They anticipate that the chatbot will effectively assist and enhance organizational efficiency.

- Findings on Requirements and Expectations of the Intelligent Chatbot System from Technology Experts (10 participants)

Evaluation Items	Assessment Results		
	\bar{x}	S.D.	Meaning
1. Research Objectives for Analyzing the Requirements of Developing an Intelligent Chatbot System for Simulating Human Interactions to Reduce Workloads and Enhance Service Efficiency			
1.1. To explore the requirements and expectations for an intelligent chatbot system for simulating human interactions to reduce workloads and enhance service efficiency.	4.8	0.42	Most Satisfied
1.2. To identify user needs and expectations for this intelligent platform.	4.6	0.52	Most Satisfied
1.3. To specify the features and functions required by users for this intelligent system.	4.7	0.48	Most Satisfied
2. System Design for the Intelligent Chatbot Service for Simulating Human Interactions to Reduce Workloads and Enhance Service Efficiency			
2.1. User Management System	4.5	0.53	Very Satisfied
2.1.1. Adding, deleting, and editing users in the system.	4.5	0.53	Very Satisfied
2.1.2. Defining user access permissions to data and subsystems.	4.4	0.70	Very Satisfied
2.2. Knowledge Management System	4.6	0.52	Most Satisfied
2.2.1. Importing document data.	4.6	0.52	Most Satisfied
2.2.2. PDF files.	4.7	0.48	Most Satisfied
2.2.3. Microsoft Word files.	4.5	0.53	Very Satisfied
2.2.4. Microsoft Excel, .csv files.	4.3	0.67	Very Satisfied
2.2.5. .txt files.	4.2	0.63	Very Satisfied
2.2.6. .html, .md files.	4.1	0.74	Very Satisfied
2.2.7. Managing imported document data.	4.5	0.53	Very Satisfied
2.2.8. Adding, deleting, and editing imported document data.	4.6	0.52	Most Satisfied

2.2.9. Categorizing imported document data.	4.4	0.70	Very Satisfied
2.2.10. Document storage database (vector-based database).	4.3	0.67	Very Satisfied
2.2.11. Segmenting documents into chunks and converting them into vectors.	4.2	0.79	Very Satisfied
2.2.12. Metadata for each row of data in the database.	4.1	0.74	Very Satisfied
2.2.13. Document retrieval through vector and metadata comparison.	4.0	0.82	Very Satisfied
2.2.14. Supporting data connection via API.	4.5	0.53	Very Satisfied
2.3. Large Language Model Management System	4.7	0.48	Most Satisfied
2.3.1. Managing AI Large Language Models.	4.7	0.48	Most Satisfied
2.3.1.1. Adding, deleting, and editing Large Language Models.	4.8	0.42	Most Satisfied
2.3.1.1.1. Selecting model types via Cloud API.	4.7	0.48	Most Satisfied
2.3.1.1.2. Categorizing Large Language Models.	4.6	0.52	Most Satisfied
2.3.1.1.3. Preparing prompts and roles for each AI Large Language Model (Prompt template/Instruction/System Role).	4.5	0.53	Very Satisfied
2.3.1.1.4. Integrating with Automation Tasks Management System and Knowledge Management System.	4.5	0.53	Very Satisfied
2.3.2. Supporting model connection via API.	4.6	0.52	Most Satisfied
2.4. Automation Tasks Management System	4.5	0.53	Very Satisfied
2.4.1. Managing Service API Calls for automation.	4.5	0.53	Very Satisfied
2.4.1.1. Adding, deleting, and editing Service API Call data.	4.6	0.52	Most Satisfied
2.4.1.2. Organizing the sequence of automation tasks.	4.4	0.70	Very Satisfied
2.5. Chat Interface Agents Management System	4.6	0.52	Most Satisfied
2.5.1. Managing chatbot interface agents.	4.6	0.52	Most Satisfied
2.5.1.1. Adding, deleting, and editing chatbot	4.7	0.48	Most Satisfied

	interface agent data.			
2.5.2.	Integrating with the Large Language Model Management System.	4.5	0.53	Very Satisfied
2.5.3.	Chatbot interfaces via Line.	4.6	0.52	Most Satisfied
2.5.4.	Chatbot interfaces via Facebook Messenger.	4.5	0.53	Very Satisfied
2.5.5.	Chatbot interfaces via Google Chat.	4.3	0.67	Very Satisfied
2.5.6.	Chatbot interfaces via Custom Chat Widget.	4.2	0.63	Very Satisfied
2.5.7.	Managing chatbot conversation history.	4.5	0.53	Very Satisfied
2.5.8.	Viewing all conversation histories.	4.4	0.70	Very Satisfied
2.5.8.1.	Viewing individual chatbot conversation histories.	4.5	0.53	Very Satisfied
2.5.8.2.	Chat Interface Agents Management System	4.3	0.67	Very Satisfied
2.6.	Cost Management System	4.4	0.70	Very Satisfied
2.6.1.	Setting usage quotas for LLMs (Tokens or Costs Limit).	4.5	0.53	Very Satisfied
2.6.2.	Reporting token usage for each LLM.	4.4	0.70	Very Satisfied
2.6.3.	Reporting costs for each LLM.	4.3	0.67	Very Satisfied
2.6.4.	Reporting token usage for each chatbot agent.	4.2	0.63	Very Satisfied
2.6.5.	Reporting costs for each chatbot agent.	4.1	0.74	Very Satisfied
2.7.	Analytic and Reporting System	4.5	0.53	Very Satisfied
2.7.1.	Reporting chatbot usage.	4.5	0.53	Very Satisfied
2.7.2.	Summarizing keywords in chatbot usage.	4.6	0.52	Most Satisfied
2.7.3.	Summarizing key conversation topics with the chatbot.	4.4	0.70	Very Satisfied
2.7.4.	Reporting document retrieval.	4.3	0.67	Very Satisfied
2.7.5.	Reporting Service API Call usage.	4.2	0.63	Very Satisfied
2.7.6.	Displaying data on dashboards with usage graphs.	4.5	0.53	Very Satisfied
2.7.6.1.	Predicting future system usage via Machine Learning.	4.4	0.70	Very Satisfied
2.8.	Support and Feedback System	4.6	0.52	Most Satisfied
2.8.1.	Categorizing feedback and help requests.	4.6	0.52	Most Satisfied
2.8.2.	Summarizing key points from feedback and help requests.	4.5	0.53	Very Satisfied

Table 8. Evaluation of Requirements and Expectations for Features, Functions, and Technologies in System Development by Experts

Table 8 highlights the evaluation results on the suitability of the intelligent chatbot system designed to simulate human interactions for reducing workloads and enhancing service efficiency.

The expert assessments indicate that objectives such as exploring user requirements and expectations, as well as identifying desired features and functions, achieved mean scores ranging from 4.6 to 4.8, categorized as the highest level. The standard deviation (S.D.) ranged between 0.42 and 0.52, demonstrating consistency in expert evaluations.

Furthermore, the evaluation of techniques used in developing various subsystems of the intelligent chatbot system, including the User Management System, Knowledge Management System, Large Language Model Management System, Automation Tasks Management System, Chat Interface Agents Management System, Cost Management System, Analytic and Reporting System, and Support and Feedback System, revealed mean scores between 4.2 and 4.7 and standard deviation values from 0.48 to 0.82.

The results indicate that experts consider these techniques and subsystems highly suitable and effective for system development. This supports the advancement of an intelligent chatbot system capable of significantly reducing workloads and enhancing service efficiency.

VI. DISCUSSION

From the research findings on the needs and expectations of using an intelligent chatbot system to simulate human interactions for reducing workloads and enhancing service efficiency, it was observed that different user groups have varied requirements and expectations, reflecting the diversity of roles and responsibilities in various organizations.

- Needs and Expectations of Employees

The survey of employees revealed that the majority want the chatbot to provide quick responses to customer queries (60%) and handle complex questions (40%), indicating a demand for improving customer service efficiency and reducing the workload related to basic inquiries. Additionally, employees expect the chatbot to assist in document management (55%) and provide real-time updates (60%), supporting seamless and modern organizational operations.

- Needs and Expectations of Organizational Executives

Executives primarily focus on improving customer management (50%) and analyzing customer data to suggest marketing strategies (60%), emphasizing the importance of chatbots in strengthening business strategies and strategic decision-making. Furthermore, executives expect the chatbot to integrate with ERP or CRM systems (70%), affirming the need for technological integration to optimize data management and internal processes.

- Needs and Expectations of Business Owners

Business owners prioritize reducing operational costs (45%) and expanding their business in the future (60%), demonstrating the chatbot's role as a tool for sustainable business growth. Additionally, the chatbot's ability to enhance customer satisfaction (65%) and build customer loyalty (60%) is seen as critical for improving the organization's image.

- Evaluation by Technology Experts

The evaluation by technology experts indicates that the techniques and subsystems of the chatbot are highly suitable and effective (Mean = 4.2 - 4.7), supporting the development of an intelligent chatbot system that fully meets user needs. Moreover, the use of intelligent systems and cloud-based databases was highly rated for efficiency (Mean = 4.24 - 4.97), providing a strong foundation for creating a system that can be effectively implemented across various organizations.

A. Research Limitations

The study is limited by its sample group, which was restricted to users from certain organizational types and may not fully represent all user groups with differing needs and contexts. Additionally, the use of questionnaires for data collection may have limitations regarding the accuracy and reliability of the responses.

B. Suggestions for Future Research

Future studies should broaden the sample group to include diverse roles, such as students and parents, and investigate the system's long-term effectiveness. Incorporating qualitative methods, such as in-depth interviews, could provide a deeper understanding of user experiences and challenges. Furthermore, exploring factors influencing system adoption and usage would help enhance the system's responsiveness to user needs.

VII. CONCLUSION

This research explored and analyzed the needs and expectations of users from various groups—employees, organizational executives, business owners, and technology experts—regarding the development of an intelligent chatbot system to simulate human interactions, reduce workloads, and enhance service efficiency.

For employees, the key requirements include a chatbot capable of providing fast and accurate responses to customer queries, managing documents, and offering real-time updates. These features aim to significantly improve work efficiency and reduce repetitive tasks.

For organizational executives, the expectations focus on improving customer management, analyzing data to provide marketing recommendations, and integrating with ERP or CRM systems. These features are intended to support strategic decision-making and enhance data management efficiency. Executives also require regular performance reporting and the ability to issue commands for immediate problem resolution, ensuring agility in organizational management.

Business owners expect the chatbot to help reduce operational costs, improve employee productivity, and support future business expansion. The focus is on enhancing customer satisfaction and loyalty, which contributes to building a positive organizational image and ensuring long-term sustainability.

Technology experts assessed that the techniques and subsystems used in chatbot development are highly suitable and efficient, supporting the creation of a system that effectively meets user needs.

Overall, the findings highlight that all user groups have diverse needs and expectations for intelligent chatbots, but they share a common goal: to reduce workloads and enhance service efficiency.

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