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Development of an integrated labor management system with ai, voice commands, and chatbot for Mega Ferretería Bonilla

Desarrollo de un sistema integrado de gestión laboral con inteligencia artificial, comandos de voz y chatbot para Mega Ferretería Bonilla

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ABSTRACT

This research aims to develop an integrated employment and job-matching management system for the company Mega Ferretería Bonilla, incorporating emerging technologies such as artificial intelligence, voice commands, and a chatbot. The project addresses the need to modernize personnel selection processes, which previously showed delays, low accuracy in profile matching, and operational overload in the human resources department. To achieve this, an agile development methodology combined with a mixed research approach was adopted. Functional modules were designed to allow user registration, job posting, interaction with a virtual assistant, and the use of a recommendation engine to match candidate profiles with job openings in real time. The results showed improvements in recruitment process efficiency, increased user satisfaction, and a significant reduction in response times. This system represents an innovative and scalable technological solution.

KEYWORDS: Artificial intelligence; automated recruitment; chatbot; voice commands; talent management

RESUMEN

Esta investigación tiene como objetivo desarrollar un sistema integrado de gestión de empleo y búsqueda de empleo para la empresa Mega Ferretería Bonilla, incorporando tecnologías emergentes como inteligencia artificial, comandos de voz y un chatbot. El proyecto aborda la necesidad de modernizar los procesos de selección de personal, que anteriormente presentaban retrasos, baja precisión en la búsqueda de perfiles y sobrecarga operativa en el departamento de recursos humanos. Para lograrlo, se adoptó una metodología de desarrollo ágil combinada con un enfoque de investigación mixto. Se diseñaron módulos funcionales que permiten el registro de usuarios, la publicación de ofertas de empleo, la interacción con un asistente virtual y el uso de un motor de recomendaciones para vincular los perfiles de los candidatos con las vacantes en tiempo real. Los resultados mostraron mejoras en la eficiencia del proceso de reclutamiento, una mayor satisfacción del usuario y una reducción significativa en los tiempos de respuesta. Este sistema representa una solución tecnológica innovadora y escalable.

PALABRAS CLAVE: Inteligencia artificial; reclutamiento automatizado; chatbot; comandos de voz; gestión del talento

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INTRODUCTION

The Human Talent Unit is a fundamental component within human resources (HR) management, as it serves as the structural foundation for organizing labor processes effectively (Naranjo, 2024). In recent years, organizations have increasingly shown interest in optimizing their internal HR operations, a trend driven by the momentum of digital transformation, which has reshaped the business environment. In this context, artificial intelligence (AI) and data analysis have emerged as key tools, being adopted across various sectors such as education, transportation, industry, law, agriculture, and marketing (León Espinoza, 2024). These technologies are being applied in areas ranging from supervision, planning, and diagnostics to advisory services and training. AI enables companies to shift toward smarter work models, reducing the use of resources in strategic decision-making and improving operational efficiency.

Currently, organizations are constantly seeking innovative solutions related to digitalization, particularly in processes associated with human talent management (Toapanta Arequipa, 2024). One of the most persistent challenges in the Ecuadorian business environment is the inefficiency in selecting the right talent for specific job openings. This results in wasted resources such as time and reduces organizational competitiveness.

In this context, Mega Ferretería Bonilla, a private company located in the canton of La Maná, faces significant difficulties in its recruitment processes, which have led to inefficient outcomes. These inefficiencies affect both productivity and the company's competitive position in the regional market. Consequently, there is a pressing need to implement an automated and integrated solution that leverages technology to significantly enhance the recruitment process.

This study proposes the development of an integrated labor management system that incorporates artificial intelligence, voice commands, and a chatbot, specifically designed to meet the operational needs of Mega Ferretería Bonilla. The system will analyze the profiles of applicants in relation to available job openings, interact through virtual assistants using natural language, and manage the entire selection process with improved efficiency. The main goal of this research is to provide the company with a flexible model that could be adapted by other organizations aiming to implement emerging technologies in the HR field. Additionally, the system is expected to contribute to the company’s digital transformation and improve its positioning as a technological innovation leader in the canton of La Maná.

This project not only represents a technological breakthrough for Mega Ferretería Bonilla, but also contributes directly to the development of the canton of La Maná by efficiently generating new

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employment opportunities for the local population—especially for individuals who are unemployed or lack experience with digital platforms—thereby promoting economic revitalization and strengthening the local labor system.

According to (Sydney, 2019),an automated system with artificial intelligence (AI) uses algorithms and models to perform tasks independently, making processes more efficient and reducing the need for human intervention. These systems apply techniques such as machine learning, data processing, and predictive analysis to carry out complex tasks. Furthermore, they can adapt their behavior based on the data they receive and make decisions in real time.

The development of integrated management systems has been addressed from various perspectives, highlighting their ability to optimize operations through the unification of organizational policies, strategies, and processes. As noted by (Dota C, 2021), an integrated system enables the collection and processing of data to monitor operational activities that yield visible results through web-based platforms.

(Farfán J., 2020) argues that these types of systems improve organizational efficiency by eliminating repetitive tasks, facilitating integrated audits, and promoting transparent management through the clear assignment of responsibilities.

From the perspective of employment management, (Olaverri, 2025) defines it as encompassing practices such as onboarding, selection, and hiring—processes that are essential for any organization to fill vacancies effectively. (Escobar, 2019) suggests that effective employment strategies should also consider continuous training, talent retention, and the integration of new technologies.

Regarding recruitment and selection, (Zambrano, 2020) emphasizes the importance of considering not only the technical requirements of the position but also the employee's satisfaction and professional development as part of a more comprehensive and human-centered process.

Performance evaluation and employee training are also key elements. According to (Bustamante, 2019), assessing skills and providing proper training contribute directly to the achievement of organizational goals, especially in environments where automation and predictive analytics are being implemented.

On the integration of AI in management processes, (Delgado, 2021) points out that AI enables the optimization of repetitive tasks, personalization of user interaction, and enhancement of decision-making based on historical and predictive data. This type of automation, according to (Xia, 2023), is also evident in recommendation systems that help match candidates with job openings accurately, thus optimizing user experience on digital job platforms.

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(Peña, 2019), also highlights that both qualitative and quantitative data analysis are essential for ensuring the validity of implemented systems and must be supported by visualization strategies that facilitate the interpretation of information.

In recent years, several projects have demonstrated the effectiveness of integrating AI into talent management processes. For instance, (Fajardo Vargas, 2023) describes how intelligent systems based on deep learning algorithms have improved profile identification in logistics companies, reducing selection times by 40%. Similarly, the study by (Nosratabadi, 2022) conducted a systematic review of AI models applied to the employee lifecycle, concluding that these technologies make it possible to automate processes from recruitment to talent retention, thereby enhancing the overall user experience.

In Ecuador, (Naranjo Gaibor, 2025) reported the implementation of an AI-based system in a manufacturing company, where a pre-screening chatbot reduced the HR department's operational workload by 60%. Similar initiatives have been observed in the education sector, as highlighted by (Toapanta Arequipa, 2024), who developed an automated applicant management system for a technical institute, integrating predictive analytics to suggest suitable profiles based on required competencies.

These experiences validate that automated recruitment systems not only improve efficiency but also increase objectivity by eliminating human bias, personalize the applicant's experience, and provide organizations with a strategic tool for talent management. The present study aligns with this trend by adapting emerging technologies to a regional business context, through a system developed specifically for Mega Ferretería Bonilla that incorporates modern tools such as chatbots, voice commands, and AI-based job-matching models.

METHODS AND MATERIALS

This research adopted a mixed methodological approach, combining qualitative and quantitative techniques for the analysis, development, and implementation of an integrated employment management system incorporating artificial intelligence (AI), voice commands, and a chatbot. This approach allowed the research problem to be addressed from a functional perspective, considering both user experience and system performance. Qualitative techniques involved the collection of information through interviews with system users, while the quantitative component focused on measuring system performance and validating results after its implementation.

Various technological tools were used for the development of the system. For the presentation layer (frontend), the React.js framework and Tailwind CSS were employed, enabling the creation of a

friendly, adaptable, and aesthetically professional interface. For the server logic (backend), Node.js and Express.js were used to efficiently manage routing, HTTP requests, and integration with external services. PostgreSQL was chosen as the database due to its robust capabilities for handling large volumes of relational data with integrity and scalability.

For the AI and natural language processing (NLP) components, libraries such as TensorFlow and PyTorch were implemented, enabling the training of models capable of performing predictive analysis on candidate profiles. In addition, Google Dialogflow was integrated for chatbot development, and Google Cloud Speech-to-Text was used to enable voice recognition, thereby enhancing natural interaction between the system and users. Finally, the system was deployed using platforms such as Vercel and Render, ensuring high availability, scalability, and operational efficiency in real-world environments.

The sample population for the study consisted of various stakeholders associated with Mega Ferretería Bonilla. Among them, the Human Resources Department staff actively participated in system validation. Additionally, a sample of 3,840 candidates and unemployed individuals was considered as potential system users, along with 48 internal employees and 33 company suppliers, who were identified as indirect beneficiaries of the project.

For data collection, structured interviews were conducted with human resources personnel and selected candidates to identify specific needs and validate system functionality. Subsequently, using a sampling formula with adjustment based on the acceptable margin of error, a satisfaction survey was applied, along with usability tests. The survey utilized a five-point Likert scale. The responses to each question were visualized using bar charts, which facilitated the interpretation of the response percentages and provided a clearer understanding of the collected data. Quantitative results were analyzed using performance metrics such as response times, accuracy in profile matching, and chatbot efficiency. Qualitative data were analyzed through thematic coding, which allowed for adjustments to the system design based on user feedback. The system development process was structured following the agile Scrum methodology, dividing the work into iterative cycles known as sprints. This approach enabled continuous user feedback, resulting in a final product tailored to the real needs of the company.

ANALYSIS OF RESULTS

Figura SEQ Figura * ARABIC 1

System User Profile.

As a result of the development of the employment management system integrating artificial intelligence (AI), voice commands, and a chatbot, the implementation was structured using the agile Scrum methodology. This allowed for an iterative process validated by key users at Mega Ferretería Bonilla. The following are the main results obtained at the organizational, technical, and functional levels.

Application of the Scrum Methodology

The organizational structure of the team played a crucial role in ensuring the efficient execution of the project. Table 1 presents the roles defined within the Scrum framework.

Tabla 1

Definition of Scrum Team Roles

Stakeholders	Role	Main Responsibility
Academic Advisor	Scrum Master	Project direction and coordination
Student Developers	Development Team	Design, development, testing, and implementation
Beneficiary Company	Product Owner	Definition of requirements and product vision

The clear definition of roles allowed for an effective distribution of tasks and responsibilities. This structure supported smooth development processes and fostered agile and well-structured decision-making throughout each phase of the project.

Figura SEQ Figura * ARABIC 2

System administrator profile.

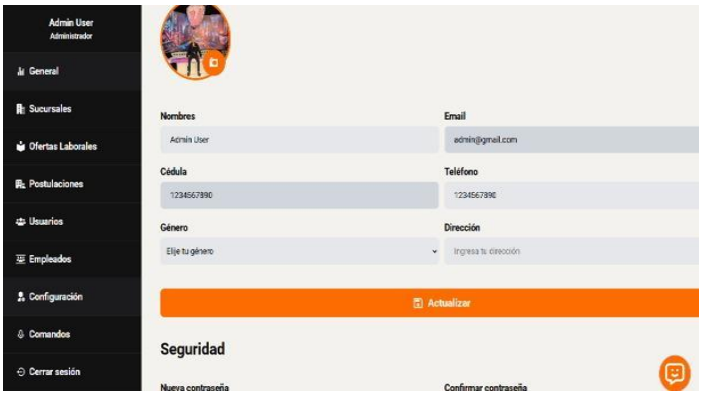
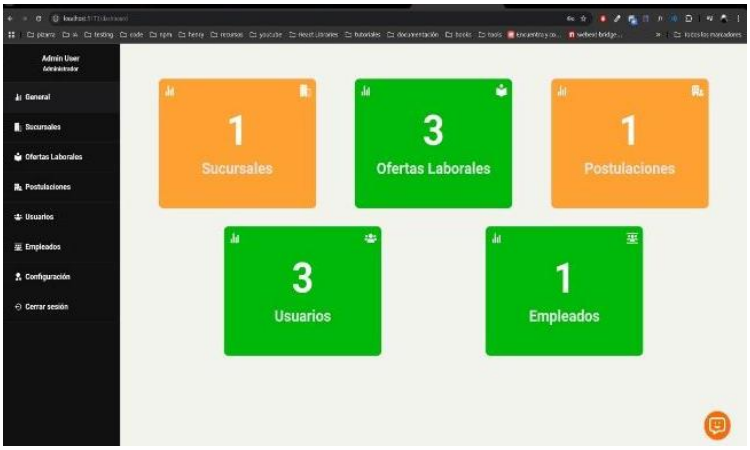


Figura SEQ Figura * ARABIC 3

Administrator Overview.



System Functional and Non-Functional Requirements

Tabla 2

System Functional Requirements.

ID	Functional Requirement	Description
RF-01	Registration Module	Allows candidates to enter information using dynamic forms.
RF-02	Job Posting	The company can post job openings and receive applications.
RF-03	System Administration	Administrators can manage users, postings, and configurations.

RF-04	Automated Matching System	Automatically matches candidates and job offers using intelligent algorithms.
RF-05	Chatbot Integration	Chatbot with natural language processing for interaction and user guidance.
RF-06	Voice Command Recognition	Enables voice interaction to improve accessibility.
RF-07	Data Management	Centralizes resumes, job offers, and system interaction data.
RF-08	Data Visualization	Displays a real-time dashboard with key system metrics such as registered branches, active job offers, received applications, created users, and linked employees.
RF-09	Security and Authentication	Access control through secure authentication.
RF-10	Notifications	Sends alerts about applications, matches, and relevant updates.

Tabla 3

System Non-Functional Requirements.

ID	Non-Functional Requirement	Description
RNF-01	Scalability	Ability to grow in users and data without performance degradation.
RNF-02	Performance	Searches and matches should respond in under 2 seconds.
RNF-03	Availability	System must operate at least 99.9% of working hours.
RNF-04	Security	Data protection ensuring confidentiality and integrity.
RNF-05	Usability	Intuitive and accessible interface for all user types.
RNF-06	Adaptability	Ability to integrate new technologies and adapt to labor market needs.
RNF-07	Compatibility	Guaranteed operation across modern browsers and mobile devices.
RNF-08	Interoperability	Integration with voice APIs, external systems, and analytics tools.
RNF-09	Maintainability	Modular structure and documentation for future updates.
RNF-10	Personalization	Ability to customize user experience according to profile and preferences.

The identification of functional requirements made it possible to design a system architecture focused on solving problems in Mega Ferretería Bonilla's recruitment process. The developed modules not only automate traditional tasks like user registration and job posting, but also integrate contemporary tools such as AI for hiring and inclusive technologies like voice commands. On the other hand, the non-functional requirements ensure system reliability, considering aspects such as performance, security,

and compatibility to deliver a secure and adaptive technological solution that meets the technical and business environment requirements.

Developed System Modules

The system was structured into six functional modules according to the company's requirements.

Tabla 4

Main System Modules.

Module	Main Functionality
User Registration	Captures personal and professional data from applicants
Job Posting	Allows the company to manage job vacancies
Administrative Management	User and system settings control
Chatbot	Virtual assistant trained to guide users
Voice Commands	Voice-based navigation throughout the platform
Recommendation Engine (AI)	Automated profile-job matching using artificial intelligence

These modules ensure comprehensive coverage of recruitment processes. The integration of AI and voice technologies enhances the system's efficiency and personalization, distinguishing it from traditional selection methods.

User Types

The system was designed to support two main user profiles, as shown in Table 5.

Tabla 5

User Types.

User Type	System Role
Job Seekers	Register, search for offers, and receive recommendations
Administrators	Supervise the system, manage users, post job offers, and review applicants

User segmentation allows the interface and features to be tailored to each group's specific needs, improving usability and the overall system experience.

Functionalities by User Type

Tabla 6

System Functionalities by User Type.

Functionality	Job Seeker	Administrator
Profile Registration	Yes	No
Job Posting	No	Yes
Applying to Job Offers	Yes	No
Use of Chatbot and Voice Cmds	Yes	No
AI-Based Match Review	Yes	Yes
Account Management	No	Yes

This functionality matrix demonstrates a balanced distribution of tools between the involved stakeholders, maintaining operational security—such as limiting account management to

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administrators—while empowering end users with essential features like AI, chatbot, and voice interaction.

Languages and Tools Used

Tabla 7

System Technologies and Tools.

Component	Technology/Tool
Frontend (Client)	React.js, Tailwind CSS
Backend (Server)	Node.js, Express.js
Database	PostgreSQL
AI & NLP	TensorFlow, PyTorch
Chatbot	Google Dialogflow
Voice Recognition	Google Cloud Speech-to-Text
Deployment	Vercel, Render
Methodology	Scrum

The technology stack demonstrates a robust integration of modern, scalable, and efficient tools. The use of advanced libraries for AI and NLP, combined with cloud services, provides a solution ready for high-demand, real-world environments.

Sprint Execution

Tabla 8

Sprint Planning Overview.

Sprint No.	Tasks Completed	Priority
1	User Registration Module	High
2	Job Posting Feature	High
3	Administrative Module	Medium
4	Chatbot Integration	High
5	Final System Testing and Tuning	High

Sprint planning facilitated modular and controlled system development. High-impact tasks were prioritized in the initial phases, ensuring that critical functionalities were available for early testing. The product backlog was organized by priority and distributed across five sprints. The first sprint completed the user registration module, the second addressed job postings, the third included administrative features, the fourth integrated the AI-powered chatbot, and the final sprint focused on testing, adjustments, and system validation.

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Functional Testing and Validation

Tabla 9

System Functional Tests.

Test No.	Evaluated Module	Status	Evidence
1	User Registration	In progress	Screenshot
2	Job Posting	In progress	Screenshot
3	Chatbot Interaction	In progress	Screenshot

Although testing is still in the validation phase, it is evident that the system's core functionalities are already operational. Collected screenshots support the system's stability and functionality in real environments.

Observed Functional Results

Tabla 10

System Impact Observations.

Observed Impact	Functional Evidence
Improved Recruitment Efficiency	Faster registration, job application, and posting features
AI Matching Accuracy	Recommendation engine matches profiles and vacancies by competencies and experience
Increased User Satisfaction	Friendly interfaces, chatbot, and voice features simplify interaction
Strategic Decision Support	System records and analyzes trends in vacancies, profiles, and applications

The developed system already shows tangible improvements in talent management processes. While some features such as the chatbot remain under validation, the technical and operational implementation has proven to be functional, efficient, and adaptable to the real business environment of Mega Ferretería Bonilla. These results position the system as an innovative solution, replicable by other companies in the commercial sector.

User Experience Evaluation

As part of the system validation process, a satisfaction survey was administered to a sample of users, including candidates, human resources staff, and job offer providers. The goal was to assess key

aspects such as usability, the effectiveness of the chatbot, and the usefulness of the recommendation engine.

Sample Size Formula

To determine the appropriate number of participants to survey, the sample size was calculated using the sample size and adjustment formula:

N = Population size → 175

Z = Confidence level → 95% = 1.96

E = Margin of error → 5% = 0.05

P = Probability of success → 90% = 0.9

Q = Probability of failure → 10% = 0.1

The application of this formula ensured a representative sample of the system's target population, contributing to the reliability of the survey results and the usability analysis.

$$n° = \frac{z^2\,(p)(q)}{e2}$$

$$n° = \frac{1.96^2\,(0.9)(0.1)}{0{,}052}$$

$$n° = \frac{0.3456}{0.0025}$$

$$n° = 138{,}24$$

$$\underline{n° = 138}$$

Readjustment

$$n^1 = \frac{n^{\circ}}{1 + \frac{(n^{\circ} - 1)}{N}}$$

$$n^1 = \frac{138}{1 + \frac{(138 - 1)}{175}}$$

$$n^1 = \frac{138}{1 + \frac{(137)}{175}}$$

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$$n^1 = \frac{138}{1 + 0.7828}$$

$$n^1 = \frac{138}{1.7828}$$

$$n^1 = 77.40 \qquad n^1 = 77$$

Tabla 11

Satisfaction Survey Questions (n = 77).

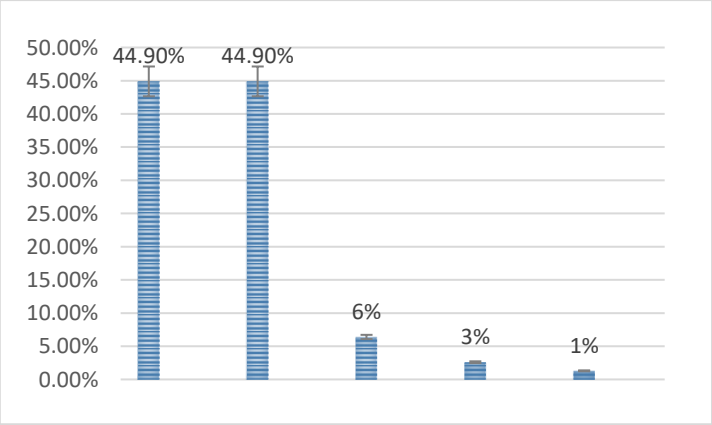
No.	Questions
1	Navigation within the system was easy and intuitive.
2	The chatbot responded clearly and usefully to my questions.
3	The system provided job recommendations that matched my profile.
4	The system's functions were fast and error-free.
5	I am satisfied with the overall experience of using the system.
6	I felt accompanied throughout the job search or job posting process.
7	I believe the system facilitates access to job opportunities in my local area.
8	I would recommend this system to others seeking employment or looking to post job offers.

Survey Results and Interpretation

Question 1:

Figura SEQ Figura * ARABIC 4

Ease of navigation.



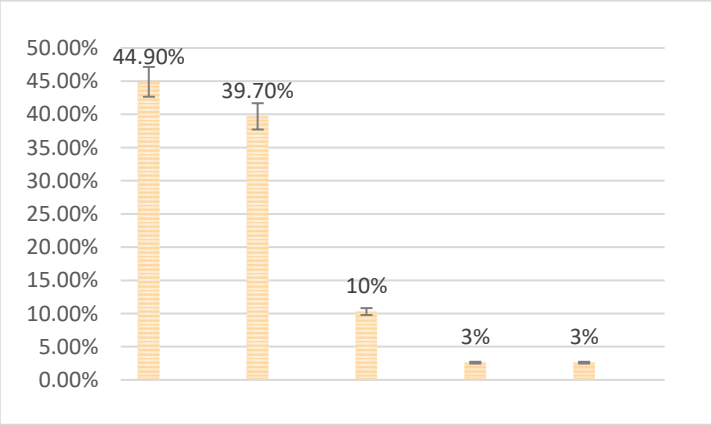
The results show that 89.8% of respondents expressed satisfaction with the system's navigation, equally distributed between "Agree" (44.9%) and "Strongly Agree" (44.9%). Only 6% remained neutral,

while negative evaluations were minimal: 3% disagreed and just 1% strongly disagreed. These results indicate a high level of user acceptance regarding the system's usability, demonstrating that the interface and navigation structure were clearly understood.

Question 2:

Figura SEQ Figura * ARABIC 5

Chatbot response.

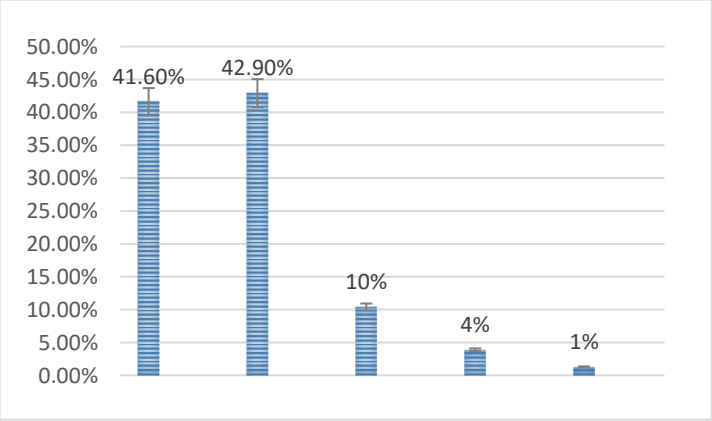


A total of 84% of users rated the chatbot interaction positively, highlighting its clarity and usefulness in responding to their inquiries. Around 10% remained neutral, possibly due to specific expectations or experiences, while only 6% expressed disagreement. This supports the chatbot's effectiveness as a virtual assistant integrated into the platform.

Question 3:

Figura SEQ Figura * ARABIC 6

Work recommendations.



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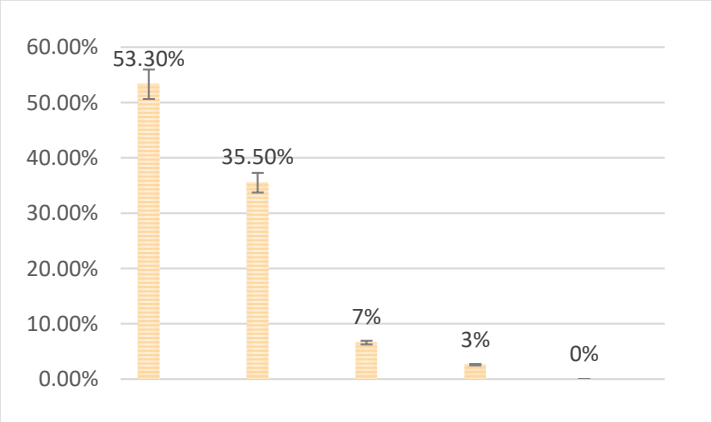
Results show that 85% of participants found the job recommendations to be appropriate for their profiles. Another 10% responded neutrally, and 5% disagreed. These findings confirm that the AI-powered matching engine fulfilled its intended function, though there is still room for improving the personalization of recommendations.

Question 4:

Figura SEQ Figura * ARABIC 7

System speed.

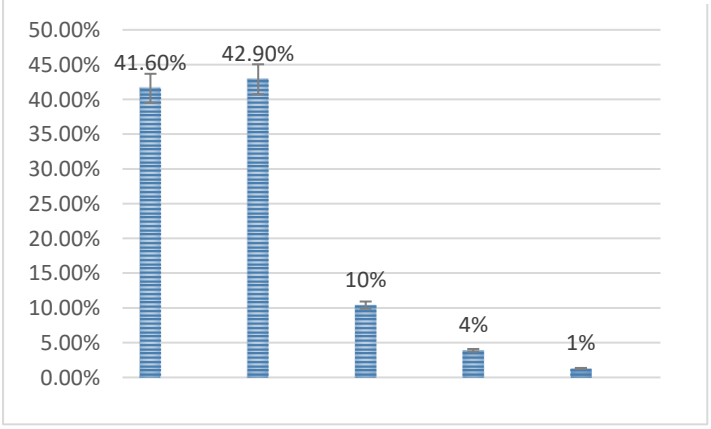


This item received the highest proportion of "Strongly Agree" responses (55.3%), indicating an excellent perception of system performance. A total of 90.8% evaluated the system's speed positively, while neutral or negative opinions were minimal. This confirms that the response time was optimal during testing.

Question 5:

Figura SEQ Figura * ARABIC 8

Overall satisfaction.

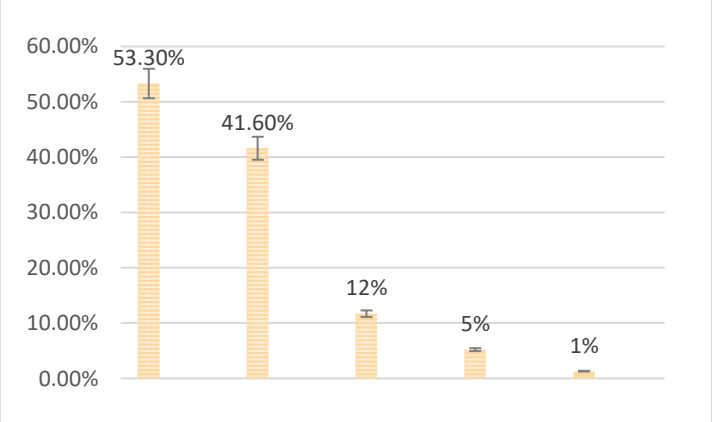


Overall user experience was rated favorably by 89.7% of respondents. The high satisfaction level reflects that the technological solution met expectations, integrating practical and efficient functions.

Question 6:

Figura SEQ Figura * ARABIC 9

Sense of support during the process.

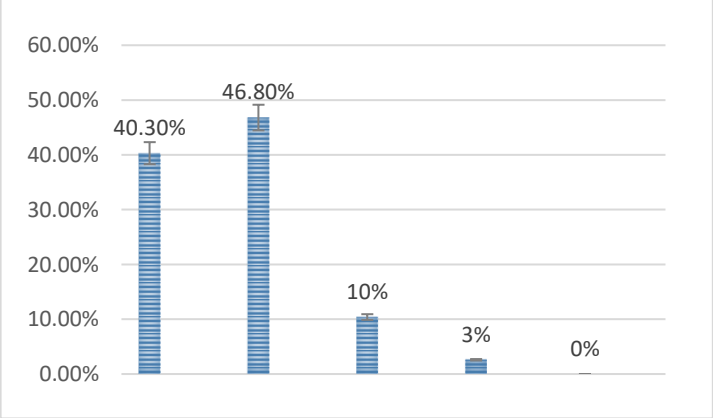


Although 82% of users reported feeling supported throughout the process, this question had the highest percentage of neutral responses (12%). This may suggest that some users still prefer human interaction or require more direct guidance. Nonetheless, the overall satisfaction level remains high.

Question 7:

Figura SEQ Figura * ARABIC 10

Access to local job opportunities.

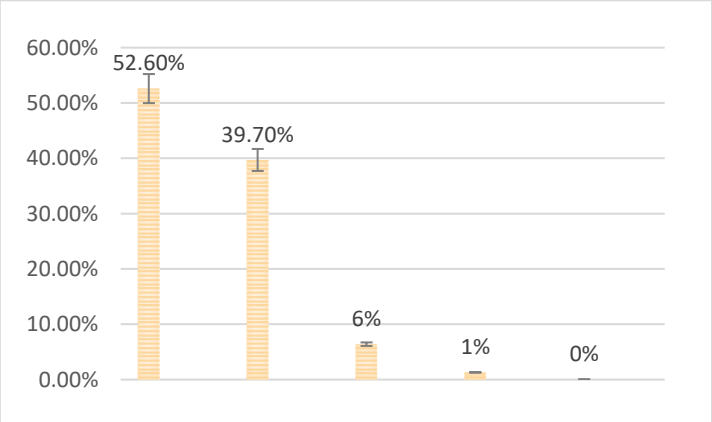


Results indicate that 87.1% of users believe the system facilitates access to job opportunities in the canton. Only 10% were neutral, and disagreement was very low (3%). This suggests a positive social impact of the project at the local level.

Question 8:

Figura SEQ Figura * ARABIC 11

System recommendation to others.



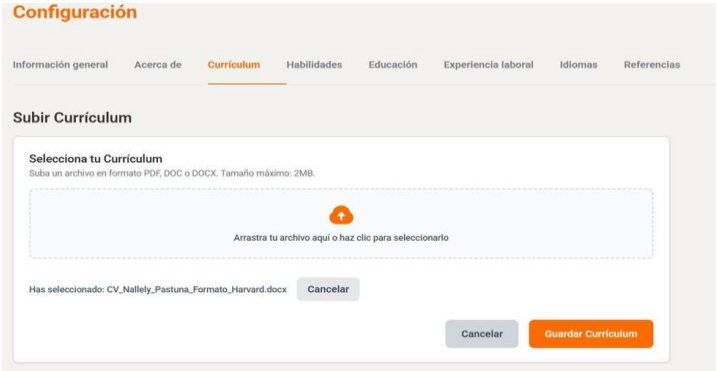
Finally, 92.3% of participants stated they would recommend the system to other users. This is one of the most robust indicators for evaluating the success of a digital tool, as it reflects not only satisfaction but also trust in its functionality.

Summary of User Experience Evaluation

The results reveal high user acceptance of the system. Features related to artificial intelligence—such as the chatbot and the recommendation engine—were well received, while the navigation experience received particularly strong ratings. These findings support the system's effectiveness as a functional and innovative tool for employment management.

Figura SEQ Figura * ARABIC 12

Setting up the applicant user profile.



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DISCUSSION

The implementation of the integrated employment management system at Mega Ferretería Bonilla has demonstrated that the use of emerging technologies—such as artificial intelligence and virtual assistants—can significantly transform recruitment processes. The most notable outcomes include the reduction in time required to complete a job application and the improvement in the accuracy of matching candidates' profiles to available positions.

During the validation phase, human resources personnel expressed a positive perception of the system's ease of use, while candidates appreciated the speed and simplicity of the overall experience. In particular, the AI-powered recommendation engine proved to be a useful tool for filtering profiles more efficiently than traditional methods. Additionally, the natural interaction achieved through the chatbot was remarkable, as it provided appropriate responses to users' frequent inquiries, thereby reducing the operational burden on staff.

Although some aspects still require refinement—such as strengthening the training dataset to improve the chatbot's semantic understanding—the preliminary results support the conclusion that this system meets a real need for modernization in mid-sized companies. Its modular and adaptable structure even allows for the possibility of future expansion into other sectors.

Another important finding was that the implementation of this tool increased motivation among work teams, as it enabled the HR department to focus more on strategic tasks. Moreover, it was observed that candidates appreciate companies using technology to facilitate access to job opportunities, which in turn reinforces the company's institutional image.

CONCLUSION

The development of the proposed system not only addressed a specific problem at Mega Ferretería Bonilla, but also opened up new possibilities for improving talent management from a more agile and accessible perspective. Through the integration of artificial intelligence, voice commands, and conversational assistants, it was possible to simplify processes that previously required significant operational effort and were prone to errors.

This project demonstrated that technological innovation is feasible even in local business settings, and that significant impact can be achieved without large-scale investment. The system not only met the technical objectives, but was also well received by users, who highlighted its user-friendliness and speed in matching job vacancies.

In the end, a practical and functional solution was achieved—one that can serve as a reference for other companies seeking to digitize their personnel selection processes. For future versions of the system, it is recommended to expand the capabilities of the AI engine, integrate new performance metrics, and explore integration with public employment platforms to broaden its reach. Ultimately, well-applied technology can serve as a strategic ally for organizational growth.

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CONFLICTO DE INTERÉS:

Los autores declaran que no existen conflicto de interés posibles

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NOTA:

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