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Procedure to Reduce Evaluation Time in the Selection of Professional Staff in Medium-Sized Multi-Family Construction Companies Using the AHP Method

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Abstract - In the construction sector, the selection of personnel for the technical office faces challenges such as the lack of structure and subjectivity in the evaluation criteria, which makes it difficult to quickly identify the most suitable candidates. This article proposes an optimized procedure to address this problem through the use of the AHP multicriteria method and Expert Choice software. The process involves applying AHP to establish priorities and evaluate candidates based on previously defined objective criteria. Through interviews and surveys, deficiencies in the traditional approach were identified, such as the lack of planning and the reliance on subjective judgments. The proposal demonstrates how the application of AHP reduces the evaluation time by 70%, improving transparency, traceability, and reliability of the process, contributing to the formation of technical teams more aligned with the specific requirements of the projects.

***Keywords*:** Selection of Personnel, Technical Office, AHP Method, Multicriteria Method, Expert Choice

1. Introduction

The selection of personnel in the technical offices of construction companies faces significant challenges due to the lack of clear criteria and subjectivity in the process, making it difficult to quickly identify suitable candidates. This problem significantly impacts the quality, time, and costs of projects [1].

In medium-sized construction companies, hiring decisions are often made under pressure, leading to inefficient processes and errors in selection. Traditional methods often lack structure, prioritizing speed over accuracy [2]. These practices result in poorly prepared technical teams, directly affecting the success of projects.

In this context, optimizing the selection process becomes imperative. This study proposes an innovative procedure based on the AHP multicriteria method and Expert Choice software. Using mathematical tools and expert interviews, this approach aims to prioritize objective criteria, reduce selection time by 70%, and improve decision-making accuracy¨ [3]. The following sections detail the methodology, analyze its impact, and discuss how this approach contributes to improving the selection processes in the construction sector [4].

2. Data and Methods

2.1. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a multicriteria tool used to facilitate decision-making in complex scenarios by evaluating alternatives through hierarchically structured criteria [5]. In this study, AHP was integrated with the Expert Choice software to optimize personnel selection in the construction sector.

The procedure involves structuring the decision-making process into a hierarchy of criteria and alternatives, where each level represents key aspects such as work experience, technical skills, and problem-solving ability [2]. Expert Choice facilitates pairwise comparison of these criteria, assigning relative weights based on expert judgments and allowing the prioritization of the specific needs of each project [6].

The final results are obtained by integrating the assigned weights with the candidate evaluations, generating a composite score for each alternative. This approach combines mathematical analysis with expert knowledge, eliminating subjective bias

and increasing decision-making precision [7]. Expert Choice also contributed with graphical visualizations, improving the understanding and validation of the results.

In cases where information about the candidates was limited, the model allowed the use of default values based on prior experience and sector requirements. This reduced the evaluation time by 70%, improved transparency, and ensured the consistency of the process.

2.2. Study Area: Republic of Peru

The Republic of Peru, located on the west coast of South America, is known for its geographical diversity, which includes coast, highlands, and jungle. With an area of 1,285,216 km², the country's main political, economic, and cultural center is Metropolitan Lima. This region, which houses more than 30% of the Peruvian population, is characterized by a high concentration of economic activities, particularly the construction sector.

Metropolitan Lima is not only the core of the country's urban and industrial development but also a point of increasing demand for professionals specialized in various technical fields. This dynamism creates significant challenges in the management and selection of qualified personnel, particularly in construction companies, where the quality of the workforce is critical to ensuring project success [1].

Personnel selection in the construction sector in Lima faces multiple issues, such as the lack of clear criteria, subjectivity in evaluations, and processes that are often lengthy and poorly structured. These shortcomings directly impact the quality and efficiency of projects [8].

Fig. 1: Study Area: Metropolitan Lima, Peru.

2.3. Methodology

The multicriteria method and the Expert Choice software were applied to personnel selection in the technical office of any type of project without restrictions. However, this research focused on residential projects, such as multifamily buildings, due to the higher frequency of constructions in this type of project. The sample evaluated in this study included the projects listed in Table 1.

Table 1: Summary of the Evaluated Projects

	Project 1	Project 2	Project 3
Number of Floors	8	10	8
Company Size	Medium	Medium	Medium
Project Type	Multifamily Building	Multifamily Building	Multifamily Building
Use	Residential	Residential	Residential

To conduct the study, a research methodology was developed that followed a series of processes, detailed in Figure 2, allowing for the systematic organization and structuring of the analysis, ensuring that each phase contributed to the study's objective and facilitated the understanding of the results obtained.

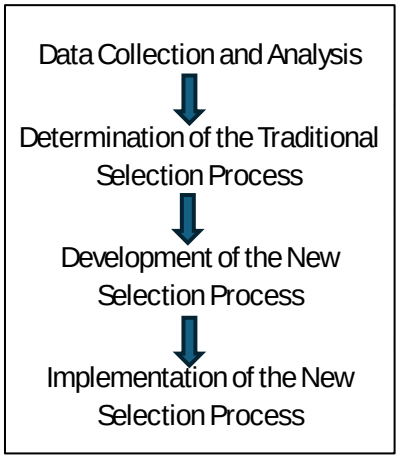

Fig. 2: Research Process.

For the data collection and analysis, interviews were conducted with three engineers from the technical office across three different multifamily building projects, aiming to identify the root causes of inadequate technical staff selection in construction and to determine the specialties most prevalent in these projects. To understand the traditional selection process, surveys were applied to twenty engineers and architects with extensive experience in such projects, in order to gather data on the selection methods used by current construction companies and the main pre-qualification criteria in the technical office.

Using this information, a new selection process was developed that applied the AHP methodology to choose the most suitable staff for the technical office. This new process utilized Expert Choice software, a tool that facilitated the evaluation of job-specific criteria, allowing weights to be assigned and the most appropriate candidate to be determined. Finally, the updated process was implemented in Project 2 (P2) through a simulation, allowing the measurement of the contribution of this approach in optimizing the selection time in the construction technical office, ensuring greater safety, transparency, traceability, and efficiency in the process [9].

2.4. Results

2.4.1. Data Collection and Analysis

The interviews and surveys were crucial in identifying that the activities of professionals in the technical office required a high level of specialized knowledge in each area. Additionally, it was confirmed that proper selection of the technical team in construction positively impacted the project outcomes in terms of cost, time, and quality of the work. Furthermore, it was observed that one of the main causes of poor selection in the technical office was the tendency to hire professionals without prior planning, due to a lack of time and the urgent need to assemble a complete specialized team [1].

This accelerated process could result in the incorporation of staff who did not fully meet the job requirements, which represented a risk for the project's success. In this context, the research objective was to develop a procedure that streamlined the personnel selection process, focusing on reducing the time required for selection and improving the accuracy of job assignments. To achieve this, clear and structured criteria were defined to guide the candidate evaluation process.

In this regard, Tables 2 to 6 present the 10 pre-selection criteria identified for the technical office staff in construction, which were validated through individual surveys applied to industry professionals, ensuring their relevance and applicability [10].

Table 2: Category: Academic Qualification

	Criterion Description
CRTA01	Professionals must have a university degree in civil engineering, architecture, or a related specialty.
CRTA02	Membership in the College of Engineers of Peru (CIP) is an essential requirement for working in the technical office.

Table 3: Category: Professional Experience

	Criterion Description
CREP01	It is important for professionals to have minimum experience in similar construction projects.
CREP02	Previous experience in project supervision is essential for the selection of professional staff.

Table 4: Category: Knowledge and Certification in Technical Standards

	Criterion Description
CRCCNT01	Professionals should be familiar with the Building Technical Standard and the National Building Regulations (RNE).
CRCCNT02	Knowledge of health and safety regulations in the workplace is essential for technical management in construction.

Table 5: Category: Technical Software Proficiency

	Criterion Description
CRMST01	Proficiency in specialized software (such as AutoCAD, Revit, SAP2000) is crucial for professionals in the technical office.
CRMST02	The ability to use digital tools significantly contributes to the efficiency in project management.

Table 6: Category: Management and Technical Coordination Skills

	Criterion Description
CRCGCT01	Professionals must possess project management skills, including subcontractor coordination.
CRCGCT02	The management of schedules and budgets is a key aspect in the selection of technical office staff.

Through interviews with the general managers of three construction companies specializing in multifamily housing in Lima, the traditional selection process for hiring technical staff was identified, which presented several significant challenges. This process began with the definition of selection criteria by the General Manager (GM), who established the fundamental requirements for candidates. Then, the Human Resources Manager (HRM) would post job vacancies and manage the receipt of resumes. After receiving applications, the HRM would manually pre-select candidates, verifying that they met the minimum required qualifications [4].

Candidates who passed this initial stage were invited to a personal interview with the General Manager, who evaluated their skills and abilities for the position. If the candidate demonstrated the necessary aptitude, they would proceed to a technical evaluation conducted by the Head of the Technical Office (HTO). In this phase, the HTO examined the candidate's technical competencies in relation to the specific demands of the role being filled. If the candidate met the required technical standards, the process moved forward to the formal selection and hiring stage.

Finally, the Human Resources Manager handled the negotiation and formalization of the contract, completing the hiring of the new professional. This process involved three key figures: the General Manager, the Human Resources Manager, and the Head of the Technical Office, who collaborated on critical activities such as defining the selection criteria, conducting interviews, and evaluating technical skills. Despite its structure, the process presented challenges, such as reliance on subjective assessments and the lack of standardized methods for measuring technical skills, which led to suboptimal personnel selection.

2.4.2. Determination of the New Selection Process

The optimization of the selection process in the technical office of construction focused on developing a structured system tailored to the challenges of the traditional method, prioritizing the prequalification of technical professionals through validated criteria such as experience, specialized competencies, and specific requirements (degree and professional certification). This new approach prevented rushed hiring and improved the candidate evaluation process.

Using Expert Choice software and the AHP methodology, objective criteria were weighted, and the assignment of scores was automated, eliminating subjectivity and streamlining the selection process. The process, represented in a flowchart, covered everything from the receipt of resumes to the final selection, with the participation of the General Manager, the Head of Human Resources, and the Head of the Technical Office.

The methodology was tested in Project 2 (P2), demonstrating a significant improvement in the efficiency of the process, ensuring reliable, traceable selection that met the specific needs of the technical roles, with a positive impact on time, quality, and project outcomes.

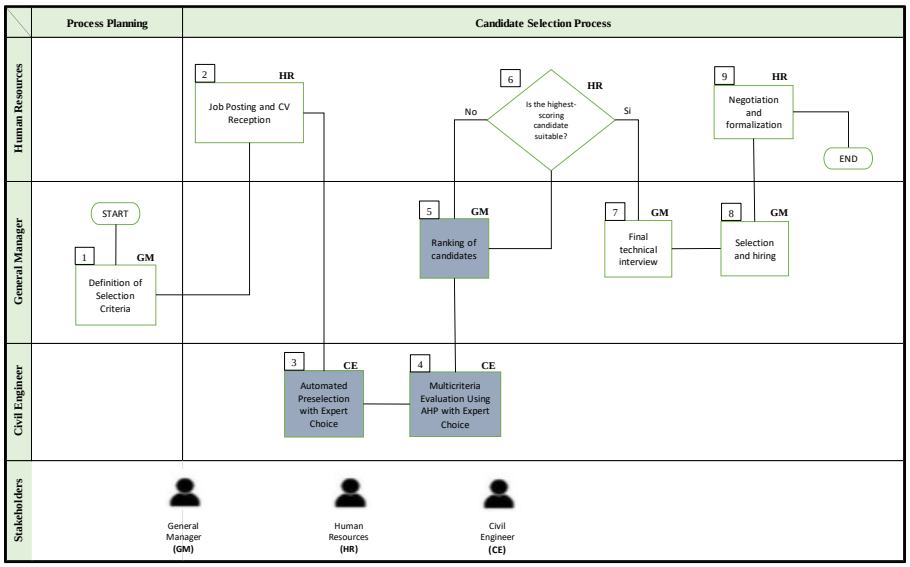

Fig. 2: Flowchart of the new selection process.

2.4.3. Implementation of the new recruitment process

The proposal was implemented in Project 2 through a simulation of a technical recruitment process for the technical office, specifically for the position of structural engineer. This process involved the general manager, the head of the technical office, the head of human resources, and four structural engineer applicants. The selection began with the definition of the specific job criteria, an activity carried out by the general manager and the head of the technical office, who established the competencies and requirements based on the project's needs.

Subsequently, the job vacancy was published considering the defined criteria. Then, the candidate adjudication process began, in which the Analytic Hierarchy Process (AHP) method was applied using Expert Choice software. This process was executed by a civil engineer trained in the use of the software, who conducted an automated pre-selection of the candidates. Using the AHP method, each applicant was evaluated based on the established criteria, assigning weights and generating an objective ranking that reflected the degree of alignment of each candidate with the job requirements. This evaluation ensured a selection based on precise standards aligned with the project's needs, as shown in Figure 3.

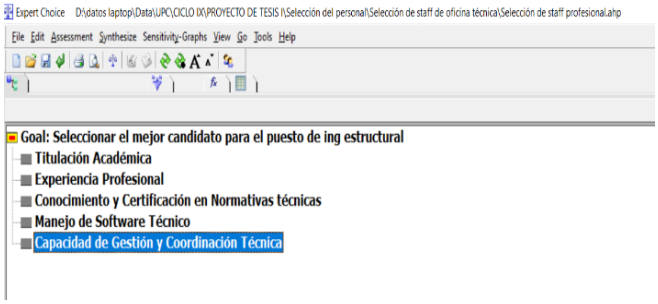

Fig. 3: Required criteria according to the project

The Expert Choice software generated a candidate ranking based on the scores obtained according to the 10 relevant prequalification criteria. In this simulation, candidates 3 and 4, with scores of 322 and 242 respectively, were preselected for achieving the best results in the multicriteria evaluation, as shown in Figure 5. Based on these results, the general

manager reviewed whether the highest-ranked candidate met the specific requirements. If so, the process moved to the next stage; otherwise, the next candidate in the ranking was evaluated.

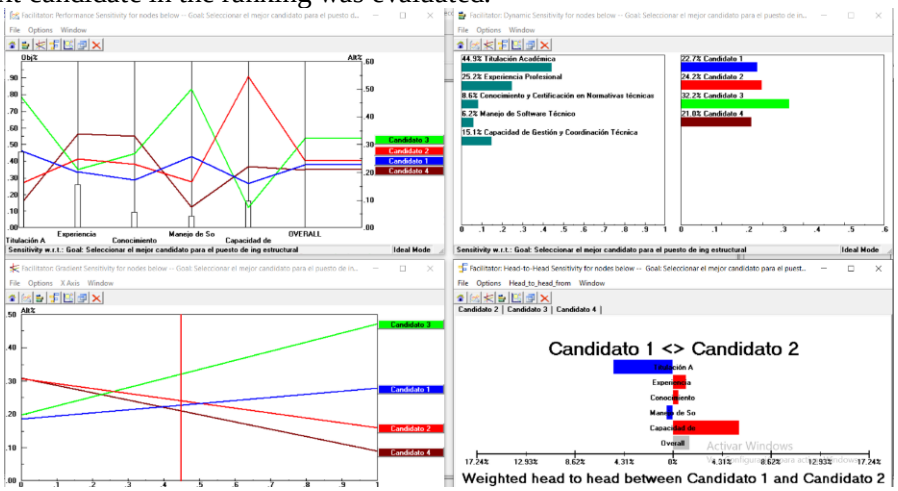

Fig. 4: Candidate ranking

In the final phase of the selection process, a technical interview was conducted, led by the general manager and the civil engineer, where the candidates' technical skills and their ability to integrate into the team were evaluated. This stage confirmed the suitability of the selected candidate. Subsequently, the general manager made the final decision, while the head of human resources formalized the hiring, including the negotiation and signing of the contract.

The use of Expert Choice software allowed for the configuration of evaluation criteria and management of candidate data, significantly reducing the time required for the process and providing greater transparency and traceability. Figure 5 shows the results of the analysis, highlighting the most relevant criteria and the rating of each candidate.

The proposal was validated through a simulation of the process involving the general manager, the head of the technical office, and the head of human resources. The evaluation showed a significant improvement in the average evaluation time, which decreased from 595 minutes in the traditional process to 175 minutes, representing a 70.59% reduction. This result demonstrated the effectiveness of the AHP method and Expert Choice software in optimizing selection processes.

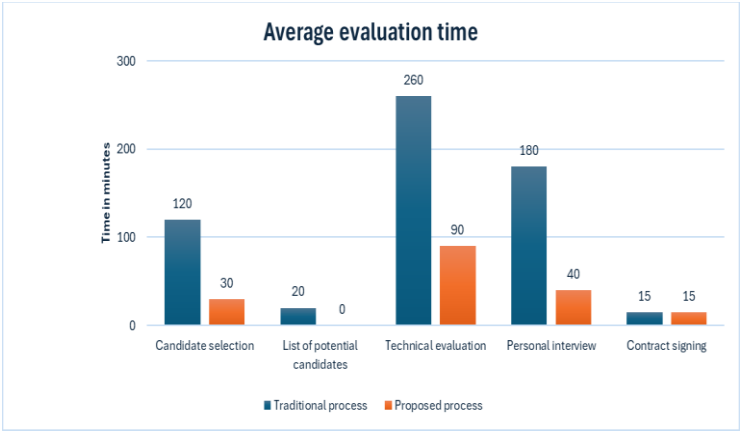

Fig. 5: Bar chart of the average evaluation time in the professional staff selection process.

The reduction in evaluation time was achieved through the application of AHP and Expert Choice, which streamlined the process by eliminating redundancies. In the traditional process, four candidates were evaluated, whereas with the optimized method, only the two highest-ranked candidates in the ranking obtained through AHP and Expert Choice were

considered. This initial filter allowed for a more precise pre-selection and accelerated the process, especially in projects with tight deadlines. As a result, the proposed method not only reduced time but also increased accuracy and efficiency from the initial selection stage, enabling a faster and more appropriate response to the project's needs.

4. Conclusion

The research developed a personnel selection procedure for technical offices in construction companies, based on the AHP method and Expert Choice software, achieving a 70.59% reduction in evaluation time (from 595 to 175 minutes) without compromising quality. This approach overcame the limitations of traditional methodologies by incorporating clear criteria and systematic tools for a more precise, traceable, and transparent selection process. The results in residential projects demonstrated its effectiveness and replicability, contributing to the optimization of selection processes in the construction sector [2].

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