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Human Resource Management Practices Among Electrical Contractors: Impact on the Career Progression of Professionals in the Local Construction Industry

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Abstract

Human resource management (HRM) is a critical factor in the success of construction projects. For electrical contractors, effective HRM practices ensure productivity, cost control, and professional growth of employees. This study assessed HRM practices among 73 electrical engineers, supervisors, and project managers from contracting firms in Metro Manila focusing on four HRM dimensions: recruitment and selection, performance appraisal, compensation and benefits, and training and development. Data were collected through questionnaires distributed electronically and in print, and analyzed using weighted mean, t-test, and ANOVA to assess HRM practices and their contribution to career progression. Findings revealed that HRM practices are generally implemented. Training and development emerged as the strongest practice (mean = 3.77), followed by recruitment and selection (3.63), particularly in hiring licensed (4.16) and experienced personnel (4.22). Performance appraisal (3.46) and compensation systems (3.32) were only moderately implemented. In terms of career progression, training and development contributed most (3.67), while compensation (3.16) and performance appraisal (3.24) showed moderate influence. No significant differences were observed when grouped by age, gender, or company size, but differences appeared by position and years of operation. Results suggest that while HRM systems are present, appraisal and compensation mechanisms are not strongly integrated into career progression frameworks. This gap limits long-term professional mobility for electrical practitioners. Strengthening performance appraisal and compensation systems, alongside training and recruitment, is essential to enhance career progression in the construction industry. The study recommends an integrated HRM policy framework to support sustainable workforce development.

Keywords: Human Resource Management (HRM), electrical contractors, career progression, construction industry

INTRODUCTION

The construction industry is a cornerstone of the Philippine economy, driving infrastructure development, employment generation, and foreign investment. In 2022, the sector achieved 9.2% annual growth, supported by the government's Build! Better! More! (BBM) program, and by 2024 it contributed approximately 7% to the national economy (Siman, 2023; Statista, 2025). This growth underscores the industry's role not only in national development but also in sustaining livelihoods and attracting global capital. Within this sector, electrical professionals occupy a critical position. Their expertise ensures that electrical systems in commercial projects are safe, reliable, and compliant with building standards (Futuregen Consulting, 2026). These systems power elevators, HVAC units, lighting, communication networks, and building management systems – facilities that are essential to modern infrastructure. Because of their complexity, such systems require qualified electrical contractors who can meet project-specific requirements. The success of construction projects, therefore, depends heavily on the competence and career development of electrical practitioners.

Despite their importance, contractors face persistent challenges: shortages of skilled workers, difficulties in managing subcontractors, and constraints in materials,

equipment, and finances. These issues often result in project delays, cost overruns, and reduced productivity (Richer, 2024). Effective human resource management (HRM) is thus indispensable. HRM encompasses workforce planning, recruitment, training and development, performance appraisal, compensation, and compliance with safety regulations, aligning personnel capabilities with project demands (Oluwatosin, 2024).

Human resource development (HRD) further supports organizational and employee growth through training, mentoring, succession planning, and career development. By investing in employees' skills and competencies, companies strengthen workforce capabilities while advancing organizational objectives. However, despite HRM's recognized importance, limited research has examined how these practices are implemented in local electrical contracting firms and how they contribute to the career progression of electrical professionals. This gap is critical, as career development opportunities directly influence employee retention, motivation, and long-term industry sustainability. Therefore, this study aims to:

1. Assess the level of implementation of HRM practices among electrical contractors.

2. Determine the extent to which these practices contribute to the career progression of electrical professionals.

3. Identify differences in HRM implementation across demographic and organizational factors.

4. Propose an integrated HRM policy framework to strengthen workforce development and professional mobility in the construction industry.

By addressing these objectives, the study seeks to provide actionable insights for contractors, policymakers, and educators, while enhancing the valuation and sustainability of electrical professionals in the Philippine construction sector. The findings may also serve as a reference for future researchers and academicians exploring HRM and workforce development in construction.

LITERATURE REVIEW

Human Resource Development Theory: Applications and Future. MacDuffie (1995) identified human capital as a fundamental component of human resource development (HRD), encompassing practices such as training and development, compensation and benefits, job analysis, recruitment, job rotation, labor relations, participatory management, performance management, and employee well-being. Similarly, Wuttaphan (2017) emphasized that labor resources represent a valuable investment for knowledge-based organizations, highlighting Human Capital Theory as a framework for understanding how investment in employees can promote sustainability and competitive advantage. The theory underscores the importance of developing employees as valuable intangible assets while recognizing that human capital practices must be adapted to an organization's culture, context, and national environment. Its implications extend to HRD practices, organizational performance, succession, and workforce development, demonstrating the need for continued research on effective human capital utilization. The close relationship between HRD and Human Capital Theory further emphasizes the strategic value of employees, with human capital being regarded as a source of revenue in productive organizations (Thomas et al., 2023; Mclean, 2014).

Human Resource Management in construction: It's perspectives. Human resource management (HRM) is essential in the construction industry to ensure that projects have sufficient workers with appropriate expertise. It involves workforce planning, recruitment, selection, and management of personnel according to project requirements. Alsakarneh et al. (2015) emphasized that recruitment and selection are central to securing competent talent and maintaining organizational competitiveness. Similarly,

Loosemore et al. (2020) highlighted the importance of adapting HRM practices to the unique operational challenges of construction. Performance management is also critical, although Makhubela et al. (2016b) found concerns regarding the fairness and effectiveness of performance appraisal systems.

Training and development are likewise significant in improving employee capabilities and project performance. Gurmu et al. (2019) found that HRM practice adoption was associated with construction productivity, while Manoharan et al. (2021) emphasized the importance of workers' knowledge, skills, and abilities in improving project performance. Karakhan et al. (2022) further identified employee support programs, health and safety initiatives, rewards, and wellness programs as important factors in worker well-being. Cataraja et al. (2022) demonstrated the importance of effective performance evaluation among training personnel, while Armstrong and Taylor's (2023) stressed clear objectives, feedback, job descriptions, and systematic recruitment and selection. Aljumah (2023) and Aldhuhoori et al. (2022) similarly established the contribution of training to employability and employee performance.

Career progression, compensation, motivation, and employee well-being also influence workforce performance and retention. Chalambo (2023) recommended training and development, competitive compensation, and recognition programs to improve career advancement and retention, while Ndudi et al. (2023) found that competitive pay, bonuses, and promotion opportunities significantly motivate construction workers. Nkuba et al. (2023) highlighted the importance of continuous health and safety training, and Gabriel et al. (2024) emphasized selecting skilled and experienced personnel through broader recruitment channels and practical skills assessment. Mustafa and Lleshi (2024) further demonstrated that lifelong learning improves performance, engagement, adaptability, and organizational outcomes. In the Philippine context, Galve (2025) emphasized compliance with statutory benefits and labor requirements, while John Clements Consultants (2025) stressed adherence to DOLE regulations and updated labor laws. Lacsina (2025) found that fair performance reviews were associated with positive employee perceptions, while Imperial v. Heirs of Bayaban (2018) emphasized due diligence in employee selection and supervision to ensure legal compliance and minimize employer liability.

Significance of Labor Resources in Construction Industry. Labor resources are essential in the construction sector because they constitute a substantial portion of project costs and directly influence task execution, schedules, and quality (Rhumbix, 2023). Labor costs may account for 20% to 60% of total construction costs, making efficient labor management important for controlling overtime, idle time, overstaffing, and understaffing (Lee et al., 2023). In the local setting, labor typically represents 20%–35% of construction costs, compared with 65%–80% for materials, although these proportions vary according to industry and project scope (Richer, 2024).

Efficient labor allocation contributes to productivity, timely task completion, and overall project efficiency, with labor productivity influenced by factors such as work environment, supervision, and training (Lee et al., 2023). Effective labor management also promotes compliance with safety and quality standards, improves employee satisfaction, and reduces accidents, rework, and turnover (Rhumbix, 2023). Furthermore, scheduling, time and attendance tracking, performance monitoring, and resource allocation support accurate labor cost management and identification of project issues (Richer, 2024). Effective labor management directly affects project budgets, schedules, and quality, while labor shortages and skill gaps may cause delays and increased costs (Doranga et al., 2024). Technology-assisted scheduling and resource allocation can therefore improve project performance and profitability (Rhumbix, 2023).

Local Government Guidelines that apply on Construction Human Resources. DOLE Department Order No. 19, s. 1993 established guidelines governing the employment of workers in the Philippine construction industry, including the classification of project and non-project employees and provisions concerning employment conditions, statutory benefits, wages, health, safety, and social welfare. It applies to construction activities and related operations and provides procedures for enforcing labor laws, including provisions on security of tenure, reporting of project employee termination, and reemployment. Meanwhile, DOLE Department Order No. 13, s. 1998 established occupational safety and health guidelines for the construction industry, requiring construction projects to implement safety and health programs, provide appropriate personal protective equipment, designate safety personnel and committees, conduct safety and health training, and submit reports on accidents and workplace hazards. Furthermore, under Republic Act No. 7796, the Technical Education and Skills Development Authority (TESDA) was mandated to establish national occupational skills standards and implement systems for skills assessment and certification. TESDA's competency-based training and assessment system supported the development and certification of workers in construction-related occupations, leading to National Certificates (NCs) or Certificates of Competency (COCs). Through its Training Regulations and collaboration with industry stakeholders and training institutions, TESDA helps standardize construction skills, improve worker employability, productivity, safety, and career advancement. These government policies and programs demonstrate the importance of employment protection, workplace safety, skills development, and certification in strengthening human resource management and workforce development in the Philippine construction industry.

Given the labor-intensive nature of construction projects, effective labor and resource management is essential to reducing project risks and improving efficiency (Kazaz et al., 2008). Singh (2025) emphasized that successful project completion depends on the appropriate planning, allocation, scheduling, and control of resources, while ineffective resource utilization can increase project costs and reduce profitability. For electrical contractors, human resource management is therefore critical in optimizing available personnel and other project resources to support productivity and successful project completion. Moreover, the continuous evolution of HRM and the adoption of advanced HR technologies emphasized the need for organizations to adapt their human resource practices to changing workplace demands (Verma et al., 2026). These considerations provide a basis for examining how HRM and resource management practices influence the productivity and profitability of electrical contractors.

Synthesis. The reviewed literature collectively underscores the strategic importance of human resource management in construction, particularly in labor-intensive and risk-sensitive fields such as electrical contracting. Human Capital Theory highlights employees as valuable assets whose skills and competencies must be continuously developed to sustain organizational performance. Studies on HRM in construction emphasize recruitment and selection, training and development, performance appraisal, and compensation as critical practices, yet also reveal persistent challenges in fairness, consistency, and alignment with career progression. Research on labor resources further demonstrates that efficient workforce allocation directly influences project costs, schedules, and quality, while government guidelines from DOLE and TESDA reinforce the need for compliance, safety, and standardized skills certification. Taken together, these perspectives reveal both the opportunities and gaps in HRM implementation: while training and recruitment are widely recognized as strengths, appraisal and compensation systems often remain underdeveloped, limiting their contribution to long-term professional mobility. This synthesis establishes the rationale for examining HRM practices among electrical contractors in the

Philippines and for proposing an integrated policy framework that strengthens workforce development, enhances career progression, and supports the sustainability of the construction industry.

Theoretical Framework. Employees are regarded as valuable organizational assets, making human resource development (HRD) essential for enhancing employee capabilities and aligning competencies with organizational goals. Okafor et al. (2025) emphasized that HRD initiatives, including succession planning, performance reviews, mentorship, and training, are intended to support employee career advancement, although their effectiveness in translating development efforts into professional progression remains a concern. Mansor et al. (2023) similarly noted that training does not always result in promotions or increased responsibilities, highlighting the influence of leadership commitment and organizational culture. HRD programs should consider employees' individual needs and career aspirations through personalized development plans (Association for Talent Development [ATD], 2022), while Okafor et al. (2025) emphasized that HRD practices were more effective in supporting career progression when they were aligned with career pathways and supported by strategic leadership. Guided by these perspectives, this study examines how human resource management practices may contribute to the professional progression of electrical practitioners in the local construction sector.

Conceptual Framework. This study adopted the Input-Process-Output (IPO) approach to provide a structured framework for examining the workflow and information flow of the study. The inputs included the respondents' profiles in terms of age, gender, position, number of employees, and years of company operation, as well as the assessment of the level of implementation of human resource management (HRM) practices and their extent of contribution to the progression of electrical professionals. The process involved data gathering through a survey, followed by tabulation, presentation, interpretation, and analysis of the results. The output was an integrated policy framework for HRM practices, focusing on areas with lower implementation or contribution levels that require appropriate action.

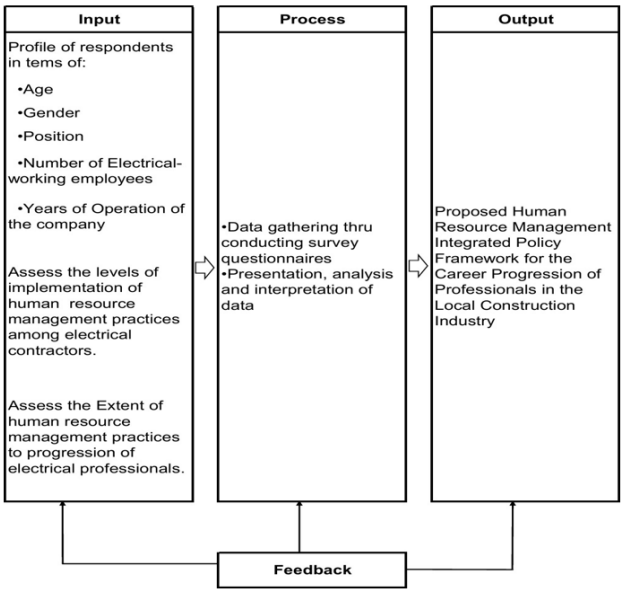

Figure 1
Conceptual Framework

The primary aim of the study was to determine the levels of implementation of human resource management to electrical contractors. It aimed to respond to the following queries:

1. What is the profile of the respondents in terms of:
   1.1 Age;
   1.2 Gender;
   1.3 Position;
   1.4 Number of Employees; and
   1.5 Years of Operation of the company?

2. What is the level of agreement on the implementation of human resource management to electrical contractors in terms of:
   2.1 Recruitment and Selection;
   2.2 Performance Appraisal;
   2.3 Compensation and Benefits; and
   2.4 Training and Development?

3. Is there a significant difference on the respondents' agreement on the

implementation of human resource management to electrical contractors when grouped according to the following profile:
3.1 Age;
3.2 Gender;
3.3 Position;
3.4 Number of Employees; and
3.5 Years of Operation of the company?

4. What is the level of agreement on implementation of human resource management practices to the progression of electrical professionals in the construction industry terms of:
4.1 Recruitment and Selection;
4.2 Performance Appraisal;
4.3 Compensation and Benefits; and
4.4 Training and Development?

5. Based on the findings of the study, what professional recommendations and approach can be proposed?

Hypothesis. With a margin of error of 0.05, the hypothesis tested was:

H_1: There is a significant difference in the level of agreement on HRM implementation when respondents are grouped according to their profile.

METHODS

Research Design. This study employed a descriptive-correlational research design. The descriptive aspect was used to determine the level of implementation of human resource management (HRM) practices among electrical contractors, while the correlational component examined the extent to which these practices contributed to the career progression of electrical professionals. The design was appropriate because it allowed the researcher to describe existing HRM practices and analyze relationships between HRM dimensions, which are recruitment and selection, training and development, performance appraisal, and compensation and benefits, and indicators of career progression. By combining descriptive and correlational approaches, the study provided both a clear profile of HRM implementation and evidence of its influence on professional mobility within the construction industry.

Population and Sampling. The study utilized convenience sampling to select respondents from the population of electrical engineers, supervisors, and project managers working among electrical contractors, as described in the Scope and Limitation of the Study. Data were collected through both electronic distribution via social media platforms and email and in-person distribution of printed questionnaires to accessible respondents. Data collection began on December 24, 2025, and was completed on February 24, 2026, with the assistance of colleagues, former industry peers, and an electrical organization. Cochran's formula was employed using a 95% confidence level, a z-score of 1.96, an estimated population proportion of 0.5, and a ±10% margin of error. Considering the finite population, a finite population correction was applied, resulting in a minimum sample size of 96 respondents. A total of 98 questionnaires were distributed, of which 73 were retrieved and utilized for the study, with the majority of respondents coming from Metro Manila, where the study was conducted.

Research Instrument. The survey questionnaire was designed to measure HRM practices in terms of recruitment and selection, training and development, performance appraisal, and compensation and benefits. To ensure reliability and validity, the instrument underwent expert review by faculty members and industry practitioners, followed by pilot testing. Cronbach's alpha was computed to confirm internal consistency, with values exceeding the acceptable threshold of 0.70.

Data Gathering Procedure. The survey was conducted from July to August 2025, with data retrieval completed by September 2025. Survey questionnaires were distributed electronically via email and social media platforms, particularly through professional groups of construction engineers, to maximize reach

among qualified respondents. Printed copies were also provided to accessible participants in Metro Manila to ensure representation from those with limited digital access. Prior to distribution, respondents were informed of the study's purpose, assured of confidentiality, and asked to provide informed consent. Completed questionnaires were retrieved, checked for completeness, and tabulated. Data were encoded into statistical software for analysis, ensuring accuracy and consistency. The combination of electronic and manual distribution methods helped achieve a diverse sample, while the structured retrieval and verification process ensured that the dataset was valid and ready for statistical treatment.

Data Analysis. Frequency and percentage distribution, weighted mean, independent samples t-test, and analysis of variance (ANOVA) were employed to analyze the data. Frequency and percentage distribution were used to summarize the respondents' profiles in terms of age, gender, position, number of employees, and years of company operation. Weighted mean was used to determine the average responses and level of implementation of human resource management practices. The independent samples t-test was used to determine significant differences between two groups, particularly in terms of gender, while ANOVA was used to determine significant differences among three or more groups in terms of age, position, number of employees, and years of company operation. The F-value in ANOVA was computed by comparing the variance between groups with the variance within groups. These statistical tools ensured robust analysis of HRM practices and their contribution to career progression.

Ethical Considerations. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality of responses was assured, with data used solely for academic purposes. No identifying information was disclosed, and respondents were free to withdraw at any stage of the study.

RESULTS

Profile of respondents. Table 1 presented the frequency and percentage distribution of respondents according to various profile variables.

Table 1

Frequency and Percentage Distribution of Respondents According to Age, Gender, Position/Rank, Number of Electrical Employees, and Years of Company Operation

Age Bracket	Frequency	Percentage (%)
25-30	21	28.80%
31-35	26	35.60%
36-40	14	19.20%
41-above	12	16.40%
Total	73	100.00%
Gender		
Male	58	79.50%
Female	15	20.50%
Total	73	100.00%
Position/Rank		
Managerial	20	27.40%
Supervisory	33	45.20%
Rank and File	20	27.40%
Total	73	100.00%
Number of Electrical Employees		
51-100	1	1.40%
101-150	4	5.50%
151-200	15	20.50%
201-300	15	20.50%
300-above	38	52.10%
Total	73	100.00%
Years of Operation		
1-5 years	0	0.00%
6-10 years	46	63.00%
11-15 years	2	2.70%
16 years and above	25	34.20%
Total	73	100.00%

The respondents were predominantly younger to mid-career electrical practitioners, with the largest group aged 31–35 (35.6%), followed by those aged 25–30 (28.8%). The industry remained male-dominated, as nearly four-fifths of participants were male (79.5%). In terms of organizational role, most respondents held supervisory positions (45.2%), while managerial and rank-and-file employees were equally represented (27.4% each).

A majority came from large-scale electrical contracting firms, with over half (52.1%) employed in companies deploying more than 300 electrical workers. Finally, most firms had been operating for 6–10 years (63.0%), with a substantial proportion also representing companies established for 16 years or more (34.2%). Taken together, these demographics indicate that the study reflects the perspectives of supervisory and managerial employees from relatively mature, manpower-intensive electrical contracting organizations in Manila.

Level of implementation of human resource management to electrical contractors in terms of recruitment and selection. Table 2 presents the level of implementation of human resource management practices among electrical contractors in terms of recruitment and selection, based on the weighted mean, interpretation, and rank of each indicator.

Table 2
Level of implementation of human resource management to electrical contractors in terms of Recruitment and Selection

Item	Weighted Mean (WM)	Interpretation	Rank
Selection of experienced employees	4.22	Implemented	1
Selection of licensed candidates	4.16	Implemented	2
Retention practices	3.97	Implemented	3
Knowledge/ trade tests	3.40	Somewhat Implemented	4
Interview explanation of job roles	3.38	Somewhat Implemented	5
Defined hiring goals	3.30	Somewhat Implemented	6
Selection of fresh degree holders	2.97	Somewhat Implemented	7
Composite Mean	3.63	Implemented	

As shown in the table, recruitment and selection practices were implemented among electrical contractors, with a composite weighted mean of 3.63. The highest-rated practices were the selection of experienced employees (WM = 4.22), licensed candidates (WM = 4.16), and retention practices (WM = 3.97), consistent with findings that these practices were commonly applied in electrical contracting (Chalambo, 2023). Meanwhile, knowledge/trade tests (WM = 3.40), explanation of job roles (WM = 3.38), defined hiring goals (WM = 3.30), and selection of fresh degree holders (WM = 2.97) were somewhat implemented, suggesting greater preference for experienced personnel.

Level of implementation of human resource management to electrical contractors in terms of performance appraisal. Table 3 presents the level of implementation of human resource management practices among electrical contractors in terms of performance appraisal, based on the weighted mean, interpretation, and rank of each indicator.

Table 3
Level of implementation of human resource management to electrical contractors in terms of Performance Appraisal

Item	Weighted Mean (WM)	Interpretation	Rank
Appraisal data used for decisions	3.66	Implemented	1
Recognition of achievement	3.42	Somewhat Implemented	2
Suggestions and counselling	3.40	Somewhat Implemented	3
Professional skill development	3.36	Somewhat Implemented	4
Composite Mean	3.46	Somewhat Implemented	

The performance appraisal practices were somewhat implemented among electrical contractors, with a composite weighted mean of 3.46. The use of appraisal data for decisions was the highest-rated practice (WM = 3.66) and was implemented, consistent with Ndudi et al. (2023), while recognition of achievement (WM = 3.42), suggestions and counselling (WM = 3.40), and professional skill development (WM = 3.36) were somewhat implemented.

Level of implementation of human resource management to electrical contractors in terms of compensation and benefits. Table 4 presents the level of implementation of human resource management practices among electrical contractors in terms of compensation and benefits, based on the weighted mean, interpretation, and rank of each indicator.

Table 4
Level of implementation of human resource management to electrical contractors in terms of Compensation and Benefits

Item	Weighted Mean (WM)	Interpretation	Rank
Statutory benefits compliance	4.23	Implemented	1
Annual physical examination	3.96	Implemented	2
Food allowance/barracks	3.67	Implemented	3
Salary grade compliance	3.19	Somewhat Implemented	4
Promotion and upgrading	3.01	Somewhat Implemented	5
Incentive system	2.64	Somewhat Implemented	6
Salary increase opportunity	2.53	Somewhat Implemented	7
Composite Mean	3.32	Somewhat Implemented	

Table 4 showed that compensation and benefits practices were somewhat implemented among electrical contractors, with a composite weighted mean of 3.32. Statutory benefits compliance (WM = 4.23), annual physical examination (WM = 3.96), and food allowance/barracks (WM = 3.67) were implemented. Meanwhile, salary grade compliance (WM = 3.19), promotion and upgrading (WM = 3.01), incentive systems (WM = 2.64), and salary increase opportunities (WM = 2.53) were somewhat implemented.

Level of implementation of human resource management to electrical contractors in terms of training and development. Table 5 presents the level of implementation of human resource management practices among electrical contractors in terms of training and development, based on the weighted mean, interpretation, and rank of each indicator.

The data in the table shows that training and development practices were implemented among electrical contractors, with the highest composite weighted mean of 3.77. Good training environment (WM = 3.99), project-based training programs (WM = 3.81), and electrical safety training (WM = 3.52) were all implemented. Overall, the results indicated strong institutionalization of continuous learning and project-based training, reflecting the technically demanding and safety-sensitive nature of electrical contracting.

Table 5
Level of Implementation of Human Resource Management to Electrical Contractors in terms of Training and Development

Item	Weighted Mean (WM)	Interpretation	Rank
Good training environment	3.99	Implemented	1
Project-based training programs	3.81	Implemented	2
Electrical safety training	3.52	Implemented	3
Composite Mean	3.77	Implemented	

In Table 6, it was shown that HRM practices were generally implemented among electrical contractors, with Training and Development having the highest level of implementation (WM = 3.77), followed by Recruitment and Selection (WM = 3.63), Performance Appraisal (WM = 3.46), and Compensation and Benefits (WM = 3.32). The results indicated that training and recruitment practices were more established, particularly in employee development and the hiring of experienced and licensed personnel, while performance appraisal and compensation systems were less institutionalized.

Table 6
Overall Level of Implementation of HRM Practices to Electrical Contractors

HRM Dimension	Composite Mean	Interpretation	Rank
Training and Development	3.77	Implemented	1
Recruitment and Selection	3.63	Implemented	2
Performance Appraisal	3.46	Somewhat Implemented	3
Compensation and Benefits	3.32	Somewhat Implemented	4

Extent of human resource management to the progression of electrical professionals in terms of recruitment and selection. Table 7 presents the level of implementation of recruitment and selection practices among electrical contractors, based on the composite mean, interpretation, and rank of each HRM practice.

Table 7
Extent of human resource management to the progression of electrical professionals in terms of Recruitment and Selection

HRM Dimension	Composite Mean	Interpretation	Rank
Selection of licensed candidates	3.93	Extent	1
Selection of experienced employees	3.92	Extent	2
Retention practices	3.73	Extent	3
Interview explanation of job roles	3.23	Somewhat Extent	4
Knowledge/trade tests	3.22	Somewhat Extent	5
Defined hiring goals	3.21	Somewhat Extent	6
Selection of fresh degree holders	2.92	Somewhat Extent	7
Composite Mean	3.45	Somewhat Extent	

In the table above, recruitment and selection practices had a somewhat extent of influence on the progression of electrical professionals, with a composite mean of 3.45. Selection of licensed candidates (CM = 3.93), experienced employees (CM = 3.92), and retention practices (CM = 3.73) had the highest ratings, consistent with Chalambo (2023). Meanwhile, selection of fresh degree holders received the lowest rating (CM = 2.92), while knowledge/trade tests, explanation of job roles, and defined hiring goals were also rated as somewhat extent. Overall, the findings suggested that recruitment practices emphasized operational readiness and professional qualifications, while structured hiring systems and competency mapping had limited influence on long-term career progression.

Extent of human resource management to the progression of electrical professionals in terms of Performance Appraisal. Table 8 presents the extent to which human resource management practices contributed to the progression of electrical professionals in terms of performance appraisal, based on the composite mean, interpretation, and rank of each practice.

Based on the mean results, performance appraisal had a somewhat extent of influence on the progression of electrical professionals, with a composite mean of 3.38. Appraisal data used for decisions received the highest rating (CM = 3.64), indicating an extent of influence on career progression. Meanwhile, suggestions and counselling, recognition of achievement, and professional skill development were rated as somewhat extent (CM = 3.32, 3.29, and 3.29, respectively).

Table 8
Extent of human resource management to the progression of electrical professionals in terms of Performance Appraisal

HRM Dimension	Composite Mean	Interpretation	Rank
Appraisal data used for decisions	3.64	Extent	1
Suggestions and counselling	3.32	Somewhat Extent	2
Recognition of achievement	3.29	Somewhat Extent	3
Professional skill development	3.29	Somewhat Extent	4

Extent of human resource management to the progression of electrical professionals in terms of Compensation and Benefits. Table 9 presents the extent to which human resource management practices contributed to the progression of electrical professionals.

Table 9
Extent of human resource management to the progression of electrical professionals in terms of Compensation and Benefits

HRM Dimension	Composite Mean	Interpretation	Rank
Annual physical examination	3.70	Extent	2
Food allowance/ barracks	3.49	Somewhat Extent	3
Salary grade compliance	3.04	Somewhat Extent	4
Incentive system	2.66	Somewhat Extent	5
Promotion and upgrading	2.64	Somewhat Extent	6
Salary increase opportunity	2.59	Somewhat Extent	7
Composite Mean	3.16	Somewhat Extent	
Annual physical examination	3.70	Extent	2

The table showed that compensation and benefits had a somewhat extent of influence on the progression of electrical professionals, with a composite mean of 3.16. Overall, the findings indicated that welfare and health benefits contributed more to career stability, while financial mobility mechanisms had limited influence on professional progression.

Extent of human resource management to the progression of electrical professionals in terms of Training and Development. Table 10 presented the extent to which human resource management practices contributed to the progression of electrical professionals in terms of training and development, based on the composite mean, interpretation, and rank of each practice.

Table 10 showed that training and development had an extent of influence on the progression of electrical professionals, with the highest composite mean of 3.67. Good training environment (CM = 3.92) and project-based training programs (CM = 3.75) had an extent of influence, while electrical safety training (CM = 3.34) had a somewhat extent of influence. Overall, training and development was identified as the strongest HRM contributor to the professional progression of electrical professionals.

Table 10
Extent of human resource management to the progression of electrical professionals in terms of Training and Development

HRM Dimension	Composite Mean	Interpretation	Rank
Good training environment	3.92	Extent	1
Project-based training programs	3.75	Extent	2
Electrical safety training	3.34	Somewhat Extent	3
Composite Mean	3.67	Extent	
Good training environment	3.92	Extent	1

Overall extent of human resource management practices to career progression of electrical professionals in the local construction industry. Table 11 presented the overall extent of human resource management practices in contributing to the career progression of electrical professionals in the local construction industry, based on the composite mean, interpretation, and rank of each HRM dimension.

Table 11
Overall Extent of HRM Practices to Career Progression of Electrical Professionals in the Local Construction Industry

HRM Dimension	Composite Mean	Interpretation	Rank
Training and Development	3.67	Extent	1
Recruitment and Selection	3.45	Somewhat Extent	2
Performance Appraisal	3.24	Somewhat Extent	3
Compensation and Benefits	3.16	Somewhat Extent	4

Table 11 showed that Training and Development had the strongest contribution to the career progression of electrical professionals (CM = 3.67), particularly through structured training environments and project-based programs. Recruitment and Selection followed (CM = 3.45) and contributed somewhat, particularly through the hiring of licensed and experienced personnel, although its integration with career planning remained limited. Performance Appraisal (CM = 3.24) and Compensation and Benefits (CM = 3.16) also contributed somewhat, indicating limited linkage between appraisal results, financial progression, and career mobility mechanisms.

Comparison between the level of implementation of human resource management to electrical contractors when grouped according to their profile. Table 12 presents the results of the tests of difference in the level of implementation of human resource management (HRM) practices when respondents were grouped according to age, gender, position, number of employees, and years of company operation. The findings indicate that not all profile variables significantly influenced respondents' assessments of HRM implementation.

With respect to age, the analysis revealed no statistically significant difference in the level of HRM implementation among the age groups, as

indicated by a p-value of 0.096, which exceeds the 0.05 level of significance. This finding suggests that respondents, regardless of age category, generally shared comparable perceptions regarding the implementation of HRM practices. The result implies that HRM policies and programs are experienced in a relatively consistent manner across different age groups within electrical contracting firms.

Table 12

ANOVA Results for Difference in HRM Implementation According to Age, Gender, Position, Number of Employees and Years of Company Operation

Source of Variation	SS	df	MS	F	p-value	Decision
Between Groups	0.842	3	0.281	2.184	0.096	Not Significant
Within Groups	8.884	69	0.129			
Total	9.726	72				

Gender	Mean	SD	t-value	p-value	Decision
Male	3.55	0.41			
Female	3.48	0.45	0.812	0.419	Not Significant

Source of Variation	SS	df	MS	F	p-value	Decision
Between Groups	1.436	2	0.718	5.874	0.004	Significant
Within Groups	8.290	70	0.118			
Total	9.726	72				

Source of Variation	SS	df	MS	F	p-value	Decision
Between Groups	0.653	4	0.163	1.224	0.308	Not Significant
Within Groups	9.073	68	0.133			
Total	9.726	72				

Source of Variation	SS	df	MS	F	p-value	Decision
Between Groups	1.012	2	0.506	4.031	0.022	Significant
Within Groups	8.714	70	0.124			
Total	9.726	72				

Decision Rule: Reject H_0 if $p \leq 0.05$

Similarly, gender did not produce a statistically significant difference in perceptions of HRM implementation (p = 0.419). Both male and female respondents reported comparable assessments of HRM practices, indicating that the implementation of HRM initiatives is perceived similarly regardless of gender. This finding reflects a relatively uniform application of HRM practices across male and female employees and suggests that gender does not substantially influence employees' evaluation of HR-related functions within the organization.

In contrast, a statistically significant difference was observed when respondents were grouped according to position (F = 5.874, p = 0.004). This result indicates that managerial, supervisory, and rank-and-file personnel differed in their assessment of HRM implementation. The variation in perceptions may be attributed to differences in organizational responsibilities and levels of involvement in HR processes. Individuals occupying managerial and supervisory positions may have greater exposure to policy formulation, planning, and implementation activities, whereas rank-and-file employees primarily experience HRM practices through their day-to-day application. Consequently, distinct organizational perspectives may contribute to differing evaluations of HRM implementation.

The findings further showed no statistically significant difference in HRM implementation when respondents were grouped according to the number of employees in the company (p = 0.308). This suggests that regardless of workforce size, electrical contracting firms exhibit relatively similar levels of HRM implementation. The result implies that organizational size, as measured by employee count, does not necessarily determine how HRM practices are implemented or perceived within the sampled firms.

However, a statistically significant difference emerged when respondents were grouped according to years of company operation (F = 4.031, p = 0.022). This finding indicates that perceptions of HRM implementation vary across firms with different lengths of operational experience. The result suggests that organizational tenure may influence the development and implementation of HRM practices. Firms with longer operational histories may possess more established systems, procedures, and administrative

structures that support HRM implementation, while relatively newer firms may still be developing or refining their HR-related policies and practices. Nonetheless, the statistical result only confirms the existence of differences among groups and does not, by itself, indicate which specific category demonstrates the highest level of implementation.

Overall, the findings demonstrate that position and years of company operation are significant factors associated with differences in perceived HRM implementation, whereas age, gender, and number of employees are not. These results suggest that organizational role and organizational maturity are more influential in shaping perceptions of HRM practices than individual demographic characteristics or workforce size.

Proposed performance appraisal and compensation and benefit framework. To strengthen the weaker dimensions of human resource management identified in the study, particularly performance appraisal and compensation, an Integrated Performance Appraisal and Compensation and Benefits Framework was developed.

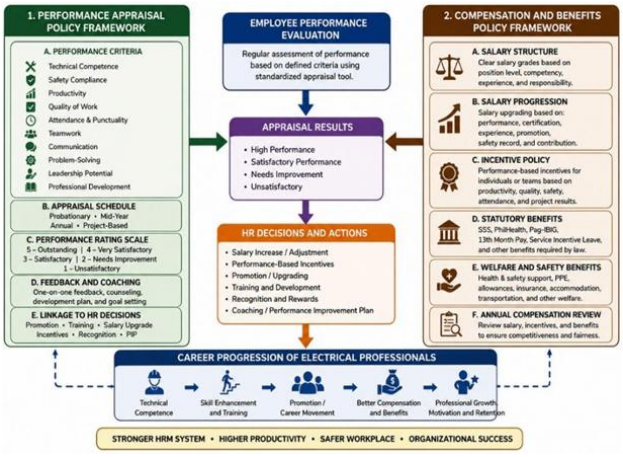

Figure 2
Integrated HRM Framework: Performance Appraisal and Compensation for Career Development of Electrical Professionals

This framework is designed to align technical competencies with standardized performance criteria, competency-based appraisal, and structured compensation systems, ensuring that career progression is systematically supported within electrical contracting firms.

Figure 2 illustrates the "Performance Appraisal Policy Framework" and the "Compensation and Benefits Policy Framework" as interconnected systems that support the career progression of electrical professionals. On the left, the "Performance Appraisal Policy Framework" highlights Performance Criteria (technical competence, safety compliance, productivity, quality of work, attendance and punctuality, teamwork, communication, problem-solving, leadership potential, and professional development), an Appraisal Schedule (probationary, mid-year, annual), and a Performance Rating Scale ranging from "Outstanding" (5) to "Unsatisfactory" (1). These are reinforced by Feedback and Coaching mechanisms such as one-on-one feedback, goal setting, and development planning, with direct Linkage to HR Decisions including promotion, training, salary upgrade, incentives, recognition, and performance improvement plans.

At the center, the Employee Performance Evaluation process consolidates appraisal results into HR decisions and actions, such as salary adjustments, performance-based incentives, promotion, training, recognition, and coaching. On the right, the Compensation and Benefits Policy Framework details the Salary Structure, Salary Progression, Incentive Policy, Statutory Benefits (SSS, PhilHealth, Pag-IBIG, 13th Month Pay, Service Incentive Leave), Welfare and Safety Benefits, and an Annual Compensation Review to ensure fairness and competitiveness. At the bottom, the Career Progression Pathway for Electrical Professionals shows how technical competence, skill enhancement, and training lead to promotion, better compensation, and ultimately professional growth, motivation, and retention.

Together, these elements reflect the five interconnected aspects emphasized in the study, namely Competency-Based Appraisal,

Feedback and Coaching, Performance-Linked Compensation, Certification and Career Pathways, and Monitoring and Evaluation, demonstrating how appraisal and compensation systems can be integrated into a unified HRM framework.

The figure visually reinforces the study's conclusion that embedding these mechanisms into HRM practices strengthens workforce development, enhances motivation, and supports the sustainability of electrical professionals in the construction industry.

DISCUSSION

The findings of this study confirm that human resource management (HRM) practices are generally implemented among electrical contractors, with training and development emerging as the strongest dimension. This result aligns with Gurmu et al. (2019), who found that HRM adoption significantly improves construction productivity, and with Manoharan et al. (2021), who emphasized the importance of workers' knowledge and skills in enhancing project performance. The prioritization of licensed and experienced personnel further supports Armstrong and Taylor's (2023) assertion that competency-based recruitment is essential in risk-sensitive industries, where technical expertise and regulatory compliance are critical.

However, performance appraisal and compensation systems were only somewhat implemented, reflecting concerns raised by Makhubela et al. (2016b) regarding the fairness and effectiveness of appraisal mechanisms in construction. This gap is significant because appraisal and compensation are central to employee motivation and retention. Ndudi et al. (2023) demonstrated that competitive pay and promotion opportunities strongly influence worker motivation, while Chalambo (2023) highlighted the role of recognition and fair appraisal in career advancement. The moderate influence of these dimensions in the present study suggests that electrical contractors may not be fully leveraging HRM practices to support long-term professional mobility.

The absence of significant differences in HRM implementation by age, gender, or company size indicates that practices are broadly consistent across demographic categories. However, differences by position and years of operation suggest that organizational maturity and hierarchical roles shape HRM effectiveness. This finding resonates with Loosemore et al. (2020), who argued that HRM practices must adapt to organizational structures and operational challenges in construction.

Overall, the results emphasize that while training and recruitment are strengths, appraisal and compensation require stronger integration into structured career progression frameworks. Without these mechanisms, electrical professionals may face limited opportunities for advancement, reducing motivation and potentially contributing to workforce attrition.

Conclusion. The study found that most respondents were male supervisory employees working in large, established electrical contracting firms, which suggests that the results reflect the perspectives of practitioners in manpower-intensive organizations with stable operations. Human resource management practices were generally implemented, but training and development together with recruitment and selection were stronger compared to performance appraisal and compensation systems. This indicates that firms placed greater emphasis on hiring and training workers than on systematically evaluating performance or linking compensation to career progression. While appraisal data were sometimes used in decision-making, feedback, recognition, counseling, and promotion linkage were not yet fully institutionalized. Similarly, compensation practices were limited to statutory benefits, with salary increases, incentives, and structured salary grade systems only moderately applied.

The findings further revealed that perceptions of HRM practices varied depending on organizational position and years of company operation, highlighting the influence of role and business maturity on workforce management. Overall, HRM practices contributed to the career progression of electrical professionals, but the strongest impact was observed in training rather than in appraisal or compensation. To address these gaps, the study underscores the need for a structured policy framework that integrates performance evaluation, career development, salary progression, incentives, promotion, and training. Such an integrated framework for compensation and performance appraisal would strengthen weaker HRM dimensions and ensure that career progression is systematically supported within electrical contracting firms, thereby enhancing workforce motivation, retention, and long-term professional mobility.

Limitations. This study was limited to electrical contracting firms holding PCAB Category A licenses under the SP-EE (Specialty Electrical Works) classification. The scope was restricted to electrical installations and excluded broader HR processes such as ISO 9001 standards and legal policy frameworks. As such, the findings primarily reflect HRM practices within large-scale, manpower-intensive electrical contracting firms and may not fully capture variations across smaller firms or other construction specialties.

Future Directions. Future research should broaden the scope beyond electrical contracting firms to include other construction-related professionals such as mechanical, civil, plumbing, and construction management personnel. This would help determine whether similar human resource management (HRM) issues exist across the wider construction industry. A longitudinal approach is also recommended to examine the long-term effects of compensation and appraisal policies on employee retention, motivation, productivity, and career advancement, thereby providing deeper insights into the sustainability of HRM practices over time.

Further studies may also focus on developing and validating performance appraisal instruments specifically tailored for electrical contracting firms, ensuring that evaluation systems are both fair and effective. Researchers could explore the relationship between compensation satisfaction, appraisal fairness, employee retention, and professional progression among technical workers, as well as investigate psychological factors that shape employees' perceptions of risk and safety culture on construction sites. In addition, examining HRM practices in ISO 9001–accredited companies would expand knowledge of standardized HR processes. Finally, future studies should consider the experiences of female professionals in the construction industry, recognizing their contributions in emotional intelligence, attention to detail, and collaborative problem-solving, which can significantly enhance project performance and organizational profitability.

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REFERENCES

Futuregen Consulting. (2026). *The role of electrical engineers in commercial construction projects.* Futuregen. https://futuregenconsulting.ca/the-role-of-electrical-engineers-in-commercial-construction-projects/

Aldhuhoori, R., Almazrouei, K., Sakhrieh, A., Hazza, M. A., & Alnahhal, M. (2022). The effects of recruitment, selection, and training practices on employee performance in the construction and related industries. *Civil Engineering Journal, 8*(12), 3831–3841. https://doi.org/10.28991/cej-2022-08-12-012

Aljumah, A. (2023). The impact of job training on recruitment and employability skills among graduates. *International Journal of Professional Business Review, 8*(10), e02806. https://doi.org/10.26668/businessreview/2023.v8i10.2806

Alsakarneh, A. A., & Hong, S. C. (2015). Talent management in twenty-first century: Theory and practically. *International Journal of Applied Research, 1*(11), 1036–1043.

Armstrong, M., & Taylor, S. (2023). *Armstrong's handbook of human resource management practice: A guide to the theory and practice of people management* (16th ed.). Kogan Page.

Association for Talent Development. (2022). *How to build a personalized employee development plan.* https://www.td.org/content/atd-blog/how-to-build-a-personalized-employee-development-plan

Cataraja, G., & Cataraja, R. (2022). Evaluation of the performance of the Technical Education and Skills Development Authority (TESDA) training institutions in Region VIII. *East Asian Journal of Multidisciplinary Research, 1*(6), 947–960. https://doi.org/10.55927/eajmr.v1i6.695

Chalambo, D. (2023). *Factors influencing employees retention in the construction sector of Tanzania: A case of ESTIM Construction Company Ltd.* [Master's thesis, The Open University of Tanzania]. The Open University of Tanzania Institutional Repository.

Department of Labor and Employment. (1993). *Department Order No. 19, s. 1993: Guidelines governing the employment of workers in the construction industry.* https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/10/39583

Department of Labor and Employment. (1998). *Department Order No. 13, s. 1998: Guidelines governing occupational safety and health in the construction industry.* https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/10/43886

Doranga, N., Subedi, M., & Katwal, K. (2024). Labor management practices of selected construction contractors in Nepal. *International Journal on Engineering Technology, 1*(2), 164–174. https://doi.org/10.3126/injet.v1i2.66728

Gabriel, D., Ismail, I. J., & Jaffu, R. (2024). Linking human resource recruitment and cost performance of force account construction projects: The mediating effect of quality performance. *Cogent Engineering, 11*(1). https://doi.org/10.1080/23311916.2024.24

22445

Galve, M. A. (2025). *Statutory benefits in the Philippines: A complete guide*. Sprout. https://sprout.ph/articles/statutory-benefits-in-the-philippines/

Gurmu, A. T., & Ongkowijoyo, C. S. (2019). Predicting construction labor productivity based on implementation levels of human resource management practices. *Journal of Construction Engineering and Management, 146*(3). https://doi.org/10.1061/(ASCE)CO.1943-7862.0001775

Raul S. Imperial v. Heirs of Neil Bayaban & Mary Lou Bayaban, G.R. No. 197626, 841 Phil. 53 (Phil. Oct. 3, 2018).

John Clements Consultants. (2025). *HR's guide to DOLE inspections compliance*. https://johnclements.com/the-looking-glass/featured/dole-inspections-compliance-guide

Karakhan, A. A., Gambatese, J., Simmons, D. R., Albert, A., & Breesam, H. K. (2022). Leading indicators of the health and well-being of the construction workforce: Perception of industry professionals. *Practice Periodical on Structural Design and Construction, 28*(1). https://doi.org/10.1061/(ASCE)SC.1943-5576.0000747

Kazaz, A., Manisali, E., & Ulubeyli, S. (2008). Effect of basic motivational factors on construction workforce productivity in Turkey. *Journal of Civil Engineering and Management, 14*(2), 95–106. https://doi.org/10.3846/1392-3730.2008.14.4

Lacsina, B. (2025). Performance appraisal and performance productivity of contract-of-service employees. *Journal of Interdisciplinary Perspectives, 3*(7), 398–411.

Lee, T. Y., Ahmad, F., & Sarijari, M. A. (2023). Current status and future research trends of construction labor productivity monitoring: A bibliometric review. *Buildings, 13*(6), 1479. https://doi.org/10.3390/buildings13061479

Loosemore, M., Dainty, A., & Lingard, H. (2020). *Human resource management in construction projects*. Routledge. https://doi.org/10.4324/9780203417881

MacDuffie, J. P. (1995). Human resource bundles and manufacturing performance: Flexible production systems in the world auto industry. *Industrial Relations and Labor Review, 48*, 197–221.

Makhubela, M., Botha, P. A., & Swanepoel, S. (2016). Employees' perceptions of the effectiveness and fairness of performance management in a South African public sector institution. *SA Journal of Human Resource Management, 14*(1). https://doi.org/10.4102/sajhrm.v14i1.728

Manoharan, K., Dissanayake, P. B. G., Pathirana, C. K., Deegahawature, M. M. D. R., & Silva, K. D. R. (2021). Perspectives of construction supervisory workers on the project-level causes affecting the efficiency of labour operations in Sri Lankan building projects. *Journal of Technology and Value Addition, 3*(2), 63–84. Uva Wellassa University. https://doi.org/10.4038/jtva.v3i2.54

Mansor, F. A., Jusoh, Y. H. M., Hashim, M. Z., Muhammad, N., & Omar, S. N. Z. (2023). Employee engagement and organizational performance. *International Journal of Accounting, 8*(50), 69–80.

McLean, G. N. (2014). *Human capital theories and practices: Gaining a competitive advantage through national HRD* [Presentation]. Faculty of Social

Sciences and Humanities, Mahidol University.

Mustafa, B., & Lleshi, S. (2024). The impact of lifelong learning and investments in employee development on employee productivity and performance. *Multidisciplinary Reviews, 7*(8), 2024175. https://doi.org/10.31893/multirev.2024175

Ndudi, F. O., Okoro, C. S., & Eze, U. C. (2023). Human resource management practices and productivity in construction firms. *International Journal of Construction Management, 23*(4), 689–702. https://doi.org/10.1080/15623599.2021.1882745

Nkuba, G. M., & Mtebe, N. (2023). The influence of health and safety practices on employee performance: A case study of TBL Mwanza. *Direct Research Journal of Management and Strategic Studies, 4*(1), 1–7. https://doi.org/10.26765/DRJMSS2716389052

Okafor, C. M., Wedraogo, L., Essandoh, S., Sakyi, J. K., Ibrahim, A. K., Babalola, A. S., & Adenuga, M. A. (2025). Analysis of human resource development initiatives and employee career progression. *International Journal of Multidisciplinary Futuristic Development, 6*(1), 55–64. https://doi.org/10.54660/IJMFD.2025.6.1.55-64

Oluwatosin, E. A. (2024). Human resource management in construction. *International Journal of Research Publication and Reviews, 5*(7), 450–457. https://doi.org/10.55248/gengpi.5.0724.1613

Republic Act No. 7796. (1994). *Technical Education and Skills Development Act of 1994*. https://ldr.senate.gov.ph/legislative%2Bissuances/Republic%20Act%20No.%207796

Rhumbix. (2024). *7 strategies for construction labor optimization*. https://www.rhumbix.com/blog/7-strategies-for-construction-labor-optimization

Richer, M. (2024). *8 top challenges and issues in the construction industry*. Bridgit. https://gobridgit.com/blog/8-top-challenges-in-construction-industry

Siman, B. P. (2023). A critical analysis of the Philippine construction industry: Current trends, forecast, and business focus for engineering design firms. *International Journal of Multidisciplinary Applied Business and Education Research, 4*(8), 2691–2699. https://doi.org/10.11594/ijmaber.04.08.01

Singh, A. R., Singh, S., & Prajapat, D. (2025). Optimizing construction project scheduling and resource allocation using machine learning techniques. *International Journal for Research in Applied Science and Engineering Technology, 13*(8), 1034–1040. https://doi.org/10.22214/ijraset.2025.73529

Statista. (2025). *Construction sector in the Philippines*. https://www.statista.com/topics/6011/construction-sector-in-the-philippines/

Thomas, H., Smith, R. R., & Diez, F. (2013). *Human capital and global business strategy*. Cambridge University Press. https://doi.org/10.1017/CBO9781139519380

Verma, R., Mathur, R., Pahuja, S., Kumar, P., & Dadwal, S. (2026). The evolution of human resource management: From traditional practices to digital twin-driven approaches. In C. Sachdeva, V. Grover, V. P. Gangwar, & P. Kumar (Eds.),

HR 5.0 integration: Unleashing the potential of the digital twin revolution (pp. 25–44). Emerald Publishing Limited. https://doi.org/10.1108/978-1-83708-112-720261002

Wuttaphan, N. (2017). *Human capital theory: The theory of human resource development, implications, and future*. Faculty of Management Sciences, Pibulsongkram Rajabhat University. https://www.researchgate.net/profile/Naphat-Wuttaphan/publication/344166132