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AHP-Based Framework for Optimizing, and Decision-Support in Enterprise Architecture Implementation

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Abstract. Enterprise architecture (EA) offers an integrated framework for strategic planning and organizational governance. Implementing EA effectively requires prioritizing a concise set of criteria within a complex system, leveraging mathematical modeling and optimization to inform decisions under uncertainty. This study introduces a hierarchical decision-making approach using Analytic Hierarchy Process (AHP) to extract and weight the most impactful criteria from an extensive literature base and expert opinions, with a focus on control-theoretic and optimization perspectives. Using insights from 18 experts from various fields and the proposed approach, key criteria of successful enterprise architecture deployment were identified and quantified: commitment (0.1143), governance (0.1082), infrastructure (0.0751), organizational management (0.0589), and senior management support (0.0484). The methodology integrates weights with objective-function considerations, sensitivity analyses, and optimization-oriented interpretations to ensure robust prioritization under uncertainty. The resulting framework supports decision-makers in (i) controlling and steering EA initiatives, (ii) optimizing resource allocation and process efficiencies, and (iii) designing data-driven, scenario-based decision models for dynamic organizational environments. These findings offer actionable guidance for managers aiming to enhance performance, reduce costs, and secure competitive advantage through disciplined governance, rigorous modeling, and evidence-based decision support.

Keywords. Enterprise architecture, Optimization, Analytic hierarchy process, Decision Support System, Strategic alignment.

MSC. 90C34; 90C40.

1 Introduction

The present era is characterized by rapid technological progress, increased speed, and intense competition across scientific and industrial domains. To remain viable, enhance performance, and achieve long-term sustainability, organizations must move toward technological transformation. This requires continuous updating, adaptation, and the ability to progress with appropriate speed and accuracy. In recent years, one significant and widely discussed topic has emerged in technology: enterprise architecture (EA). The concept of organizational architecture was first proposed by John Zachman, who in 1987 developed the first operational framework for EA. Enterprise architecture serves as a powerful tool that enables organizations to align business goals and strategies with information technology, ensuring that IT effectively supports strategic objectives [19]. It provides a roadmap for describing the current and future states of an organization's systems, digital environments, and activities [10].

Despite its value, many organizations continue to face challenges in implementing EA, and developing a comprehensive framework remains a complex undertaking [2]. Scholars have offered various definitions of EA, generally emphasizing its broad scope, which includes mapping organizational structures and business processes alongside information technology systems to improve alignment and support better decision making [3]. EA encompasses the design of data and information architectures, application systems, and technological infrastructures necessary to achieve organizational goals [9].

With ongoing advancements in information technology and the expanding role of information systems within organizations, effective EA implementation has become increasingly crucial. When executed successfully, EA mitigates issues stemming from redundancy and overlap among disparate information systems, fostering integration and enhancing operational efficiency. A 2023 study reported that organizations using updated EA practices are 2.5 times more likely to succeed compared to those that do not [14]. As technological innovation accelerates, organizations are increasingly motivated to adopt EA initiatives to strengthen business alignment and improve performance [9].

Nonetheless, implementing EA presents several challenges, including misalignment between business and technological priorities, limited resources, unclear project goals, and deficiencies in documentation and standardized processes [24].

As a result, there is now a strong emphasis on understanding the factors and criteria that influence the success of enterprise architecture (EA) implementation. Identifying these criteria can help reduce problems and prevent their occurrence by applying appropriate measures and solutions [8]. It can also help managers to support decisions in implementing successful enterprise architecture. One of the most important questions in EA is how useful and effective its implementation has been for the organization. A key aspect of effectiveness is customer satisfaction; thus, organizations strive to implement EA as effectively as possible [16].

Effective decision support for successful enterprise architecture (EA) implementation depends on several key factors identified across the literature. Among these, the support and commitment of senior management play a crucial role. Additional influential elements include alignment with organizational strategy, availability of sufficient human resources, an appropriate organizational culture, and the application of recognized standards and methodologies [23].

The aim of this study is to examine the criteria that contribute to the successful implementation of EA, thereby assisting managers in making informed decisions. Sound selection and decision-making processes help ensure that enterprise architecture aligns fully with organizational strategic objectives. To achieve this, the study employs the Analytic Hierarchy Process (AHP) as part of a multi-criteria decision analysis framework, integrating expert judgments to establish a reliable method for measuring and evaluating these factors. In the proposed approach, the most significant factors are identified and prioritized.

Earlier studies have mainly relied on factor analysis, which is fundamentally an exploratory statistical technique. In contrast, AHP is a multi-criteria decision-making (MCDM) method designed to rank alternatives based on multiple criteria. While factor analysis seeks to uncover latent structures among variables and reduce data dimensionality, typically using quantitative data such as questionnaire responses or Likert-scale ratings, AHP relies on subjective expert judgments obtained through pairwise comparisons of criteria and alternatives.

Because the objective of this study is to select and rank the most important criteria rather than to identify underlying latent constructs, AHP is more suitable than factor-analytic approaches. Moreover, the decision-making problem examined in this research follows a clear hierarchical structure with independence between criteria and alternatives. For this reason, AHP is preferred over methods such as ANP, which are more appropriate for systems with complex interdependencies and feedback relationships. AHP offers a well-defined and organized hierarchy of goals, criteria, and sub-criteria, unlike ANP, which lacks a strict hierarchical structure.

Other methods, such as DEMATEL, were also not considered appropriate for this study. DEMATEL is specifically employed to analyze and visualize causal relationships within a network of factors, focusing on the strength and direction of influence among elements. Since the current research does not involve examining causal relationships or constructing a network of interdependent factors, DEMATEL does not align with the study's goals.

Therefore, given the independence of criteria and the hierarchical nature of the decision structure, the Analytic Hierarchy Process represents the most suitable method for comparing and prioritizing the criteria and alternatives under consideration.

2 Related Works

With the growth of large organizations and the increasing necessity to design and develop complex information systems, alongside the need to modernize outdated systems, organizations have increasingly turned their attention toward specialized information systems. The importance of flexibility, agility, and rapid responsiveness to external pressures, such as changes in business conditions, evolving missions and organizational structures, and accelerated technological progress, has driven companies to study enterprise architecture (EA) more comprehensively [5]. Today, EA has become a central organizational strategy.

Despite its strategic significance, many large EA projects across both the private and public sectors fail for various reasons. Researchers have therefore focused extensively on identifying the key factors that contribute to successful EA implementation at different organizational levels. For example, a 2008 model emphasized that information technology must be regarded as a core business requirement, and that EA, serving as the alignment of IT with business processes, plays a critical role in organizational success

[7]. This study highlighted IT monitoring, architectural knowledge, and architecture management as influential criteria.

According to Van der Raadt et al., factors such as architectural processes, architectural communication, architectural governance, the organizational scope of architecture, and human resources significantly affect EA implementation success [21]. Schmidt's model showed that the increasing complexity of information technology can generate numerous challenges, one of which is elevated operational costs. The study identified several key criteria, including enterprise architecture planning, EA support and communication, EA monitoring, and stakeholder participation, as vital for successful implementation [18].

Ylimäki's findings further suggest that managers prioritize innovation and adaptability to business environment changes, identifying maturity model assessment, project monitoring and evaluation, and business environment analysis as important criteria for effective EA implementation [25]. Similarly, Lee et al. identified guidelines, senior management support, organizational architecture structure, and regulatory frameworks as critical success factors [11].

Kamogawa and Okada [7] noted that many organizations confront shifts in their business environment, such as the introduction of new products and services, which necessitate changes in business processes for survival. They identified technology governance and EA-related knowledge as among the most essential factors for successful EA implementation.

Aier and Schelp viewed EA as a mechanism for enhancing agility, stability, adaptability, and efficiency in business processes and IT systems. They classified influential factors into four groups: background elements, structural factors, process-related factors, and EA evolution over time, with each category comprising a set of associated criteria [1].

In a study by Nikpay et al. [13], participants, including experienced enterprise architects and university faculty, were asked to select five key success factors from a predefined list. The results identified five major criteria: supervision, support and communication, management, stakeholder participation, and organizational culture and planning.

Ranjbarfard and Salari examined academic literature addressing the benefits of EA adoption and the factors influencing its implementation. Their findings indicated that a clear understanding of organizational business, enhanced responsiveness to change, effective change management, integration of information systems, IT investment, business–IT alignment, organizational agility, and governance are central components of enterprise architecture success [17].

Finally, Rouhani et al. used a quantitative approach and questionnaire-based evaluation to analyze critical EA implementation factors. Their regression-based model, consisting of five independent variables and one dependent variable, revealed that governance is the most influential factor contributing to successful EA implementation [15].

A review of the research literature reveals that, given the significance of successfully implementing enterprise architecture across multiple levels and departments, many researchers and experts have investigated the factors and criteria that influence its successful deployment. Each study draws on a distinct theoretical perspective and model. Because the topic is important, leading research has sought to identify the key factors that drive the most successful EA implementations. To this end, a literature review of activities in this field was conducted, and the results of these studies were analyzed. Subsequently, a questionnaire was designed and completed with input from experts; the identified items were examined and evaluated. Finally, the items derived from the AHP, which is introduced here as a novel approach in this field, were weighted and paired for comparison to yield optimal results. The research process is summarized in Figure 1. The findings offer valuable insights for scholars and practitioners interested in organizational architecture and EA.

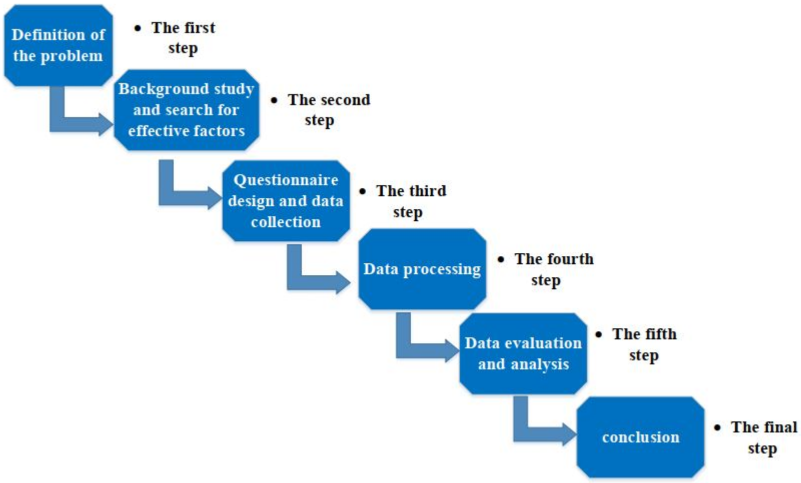

Figure 1: Research steps

3 Analytic Hierarchy Process-AHP

Drawing on the research background and the criteria required for the successful implementation of enterprise architecture, this study employed the AHP to determine the critical evaluation factors and the corresponding actions. The AHP is a structured framework for organizing and analyzing multi-criteria decision-making problems, grounded in mathematical and psychological principles [6]. It integrates the assignment of weights to criteria with the optimization of an objective function; thus, the checks and balances embedded in the weighting procedure ensure that the resulting priorities are logically consistent. This characteristic has contributed to AHP's status as one of the most widely applied multi-criteria analysis methods.

Originally introduced by Thomas Saaty, AHP assists decision makers in modeling complex problems and selecting optimal alternatives based on multiple criteria [20]. By relying on pairwise comparisons, the method enables managers and researchers to evaluate different scenarios systematically. Moreover, AHP serves as an effective tool for enhancing stakeholder participation in the decision-making process [22].

The initial phase of the method involves identifying the relevant criteria and sub-criteria associated with enterprise architecture success factors. These elements are subsequently organized into a hierarchical structure in which the overall goal appears at the top, followed by criteria and sub-criteria at successive levels. The set of criteria and sub-criteria used in this study was derived from prior research and expert consultations.

Following the construction of the hierarchy, pairwise comparisons were conducted to determine the relative importance of the criteria and sub-criteria. Data for these comparisons were collected through questionnaires distributed to domain experts. The scale used for pairwise judgements and the corresponding numerical values are presented in Table 1.

Table 1: Paired comparison scale and corresponding importance values

Definition of Importance Scale	Importance Value
Equally important preference	1
Moderately important preference	3
Strongly important preference	5
Very strongly important preference	7
Extremely important preference	9
Intermediate values	2, 4, 6, 8

In the data analysis stage, a pairwise comparison matrix A was first constructed from the expert responses. To verify the quality of the judgements, the consistency ratio (CR) was then computed using

$$CR = \frac{CI}{RI}, \tag{1}$$

where CI denotes the consistency index. The value of CI is obtained from

$$CI = \frac{\lambda_{\text{max}} - n}{n-1}, \tag{2}$$

with λ_{max} representing the maximum eigenvalue of matrix A and n the order of the matrix. The maximum eigenvalue can be determined by

$$\lambda_{\text{max}} = \frac{\sum a_j w_j - n}{w_1}, \tag{3}$$

$$A = [a_{ij}], \quad \text{with} \quad a_{ij} = 1/a_{ji}.$$

As mentioned, based on the literature review, he key factors influencing the successful implementation of organizational architecture were identified. This process yielded 27 indicators categorized into five dimensions. To contextualize and validate these factors, a questionnaire using a 1–5 Likert scale (1 = very low importance, 2 = low importance, 3 = moderate importance, 4 = high importance, 5 = very high importance) was administered to 18 experts, who were asked to rate each indicator. The mean score for each indicator was then calculated; indicators with an average score below 3 were excluded from further analysis. The results showed that all indicators were endorsed by the experts, with each achieving a mean score above 3. The detailed findings are summarized in Table 2.

It is noteworthy that sample size is typically determined using the Cochran formula, a well-defined and precise methodology. However, in methods such as the AHP, which depend on expert opinions, the approach differs from that of questionnaires employed in tools like SPSS. It should be emphasized that the sample size utilized in this study is deemed highly suitable and robust, as validated by experts in the field [4, 12].

According to Table 2, all research indicators have an average higher than 3, so they obtained the necessary points and were approved. The approved factors are listed in Table 2 in the form of coding. The hierarchical model of the research is also shown in Figure 2.

Table 2: Introduction of research factors

Factor	Sub-factor	Average Score
Leadership and Support	Senior management	3.44
	Governance	4.22
	Commitment	4.50
	Senior management support	3.22
	Enterprise architecture structure	3.17
Planning and Execution	Knowledge of architecture	3.28
	Architectural processes	3.94
	Planning and methodology	3.78
	Programming	3.33
	Reduction of complexities due to circulation processes	3.17
	Enterprise architecture guidelines	3.33
Participation and Satisfaction	Participation of architectural stakeholders	3.50
	Shareholders' satisfaction	3.22
	Satisfaction of top managers	3.50
	Stakeholder involvement in the project	3.50
Management and Supervision	Project monitoring and evaluation	3.39
	Identification of maturity model	3.44
	Identifying the business environment	3.56
	Organizational management	3.78
	Rules and regulations	3.50
	Documentation	3.89
	Planning	3.83
Resources and Infrastructure	Human resources and other resources	3.78
	Information technology	3.56
	Infrastructure	4.06
	Support	3.50
	Scope of the organization	3.44

Table 3: Research factors and sub-factors

Factor	Factor Code	Sub-factor	Sub-factor Code
Leadership and Support	A	Senior management	A1
		Governance	A2
		Commitment	A3
		Senior management support	A4
		Enterprise architecture structure	A5
Planning and Execution	B	Knowledge of architecture	B1
		Architectural processes	B2
		Planning and methodology	B3
		Programming	B4
		Reduction of complexities due to circulation processes	B5
		Enterprise architecture guidelines	B6
Participation and Satisfaction	C	Participation of architectural stakeholders	C1
		Shareholders' satisfaction	C2
		Satisfaction of top managers	C3
		Stakeholder involvement in the project	C4
Management and Supervision	D	Project monitoring and evaluation	D1
		Identification of maturity model	D2
		Identifying the business environment	D3
		Organizational management	D4
		Rules and regulations	D5
		Documentation	D6
		Planning	D7
Resources and Infrastructure	E	Human resources and other resources	E1
		Information technology	E2
		Infrastructure	E3
		Support	E4
		Scope of the organization	E5

The hierarchical model of the research based on the determined factor is shown in Figure 2. As can be seen, the hierarchical research model has 5 main factor and 27 sub- factors.

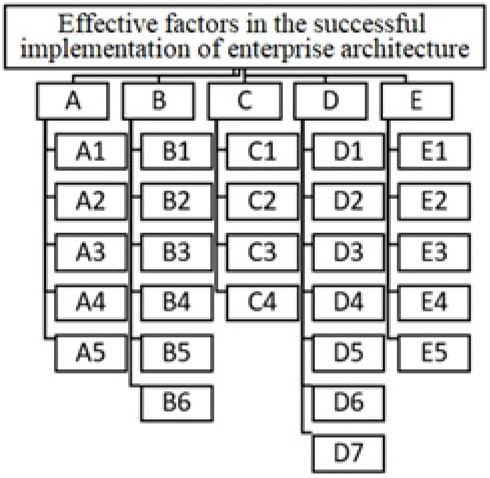

Figure 2: Hierarchical model of research

4 Analysis of the Results

Figure 3 shows the frequency distribution of respondents by gender, age, work experience, and education based on the paired questionnaire. The results indicate that 83% of respondents were male and 17% were female. Age distribution was 30–40 years (39%), 40–50 years (50%), and above 50 years (11%). Most respondents had more than 15 years of work experience, while the 5–10 years group had the lowest frequency at 6%. The 10–15 years group accounted for 22% of respondents. In terms of education, 39% held doctoral or master's degrees, while 22% held bachelor's degrees.

4.1 Pairwise Comparison of Main Factors

In this section , pairwise comparisons of seven main factors are given in Table 4. The inconsistency rate of this pairwise comparison is equal to 0.05, and since it is less than 0.1, it indicates acceptable compatibility.

The pairwise comparisons of Table 4 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 4. In this study, the only version of the software employed was the cracked edition, namely version 11.

According to Figure 4, leadership and support with a weight of 0.356 has won the first rank. Management and supervision with a weight of 0.208 has won secondplace and resources and infrastructure with a weight of 0.195 has won the third place. The general results are given in Table 5.

Gender frequency distribution

Gender	Frequency	Frequency %
Men	15	83
Women	3	17

Age frequency distribution

Age	Frequency	Frequency %
30-40	7	39
40-50	9	50
Above 50	2	11

Frequency distribution of work experience

work experience	Frequency	Frequency %
5-10	1	6
10-15	4	22
Above 15	13	72

Frequency distribution of education

Education	Frequency	Frequency %
Bachelor	4	22
Master's degree	7	39
Ph.D.	7	39

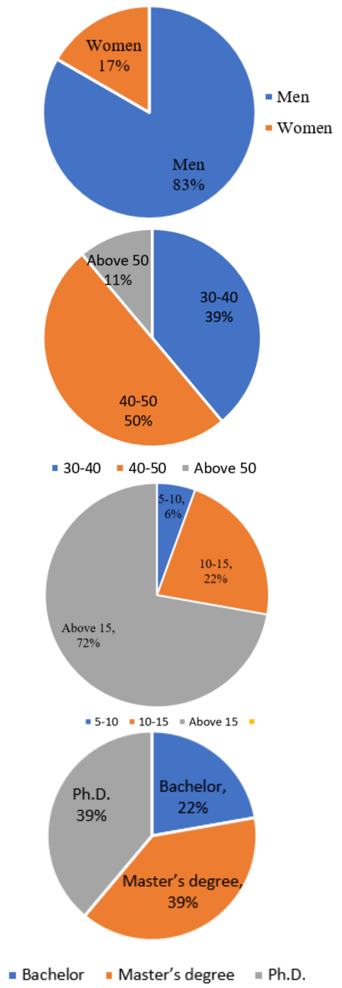

Figure 3: Demographic characteristics of the respondents

Table 4: Pairwise Comparisons of Main Factors

Factor	A	B	C	D	E
A	–	1.947	3.000	2.829	1.864
B		–	3.499	0.570	0.549
C			–	0.432	0.406
D				–	1.467
E					–

Figure 4: Weights of main factors

Table 5: Weight and rank of main factors

Rank	Weight	Code	Factor
1	0.356	A	Leadership and support
2	0.208	D	Management and supervision
3	0.195	E	Resources and infrastructure
4	0.162	B	Planning and execution
5	0.079	C	Participation and satisfaction

4.2 Pairwise Comparison of Leadership and Support Sub-Factors

The Leadership and support factor has 5 sub-factors, whose pairwise comparison is given in Table 6. The inconsistency rate of this pairwise comparison is equal to 0.07.

Table 6: Pairwise comparisons of leadership and support subfactors

	A1	A2	A3	A4	A5
A1	–	0.252	0.287	0.801	2.074
A2		–	1.038	2.325	1.474
A3			–	3.102	2.029
A4				–	1.688
A5					–

The pairwise comparisons of Table 6 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 5.

Figure 5: Weights of leadership and support subfactors

As can be seen, among the sub-factors of leadership and support, commitment with a weight of 0.321 has won the first rank. Governance with a weight of 0.304 has won the second place and senior management support with a weight of 0.136 has won the third place. The results of all sub-factors are given in Table 7.

Table 7: Weight and rank of leadership and support subfactors

Rank	Weight	Code	Sub-factor
1	0.321	A3	Commitment
2	0.304	A2	Governance
3	0.136	A4	Senior management support
4	0.121	A1	Senior management
5	0.117	A5	Enterprise architecture structure

4.3 Pairwise Comparison of Planning and Execution Sub-Factors

The planning and implementation factor has 6 sub-factors and their paired comparison is given in Table 8. The inconsistency rate of this pairwise comparison was found to be 0.03.

Table 8: Pairwise comparisons of planning and implementation sub-factors

	B1	B2	B3	B4	B5	B6
B1	–	1.230	0.752	1.900	2.570	1.430
B2		–	1.180	1.510	3.180	1.200
B3			–	2.760	2.430	1.290
B4				–	0.472	0.356
B5					–	0.538
B6						–

The pairwise comparisons of Table 8 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 6.

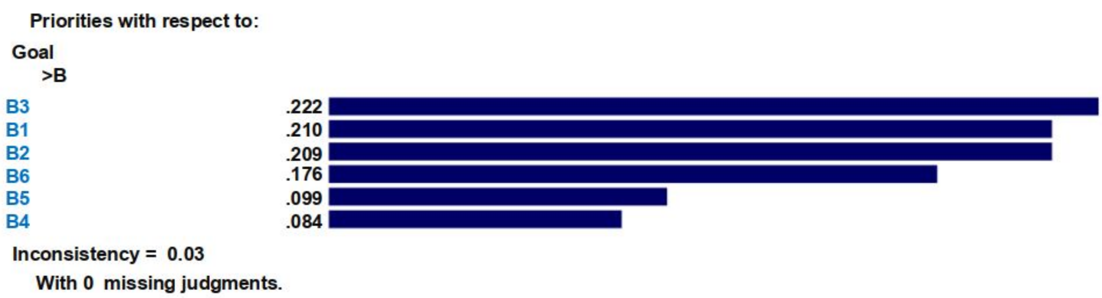

Figure 6: Weights of planning and implementation sub-factors

As can be seen, among the sub-factors of planning and implementation, planning and methodology has been ranked first with a weight of 0.222. Understanding architecture with a weight of 0.21 has won the second place and architectural processes with a weight of 0.209 has won the third place. The results for all sub-criteria are given in Table 9.

4.4 Pairwise Comparison of Participation and Satisfaction Sub-Factors

Participation and satisfaction factor has four sub-factors, whose pairwise comparison is given in Table 10. The inconsistency rate of this pairwise comparison is equal to 0.01.

The pairwise comparisons of Table 7 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 7.

Table 9: Weight and ranking of planning and implementation factors

Rank	Weight	Code	Factor
1	0.222	B3	Planning and methodology
2	0.210	B1	Knowledge of architecture
3	0.209	B2	Architectural processes
4	0.176	B6	EA guidelines
5	0.099	B5	Reduction of complexities due to circulation processes
6	0.084	B4	Programming

Table 10: Pairwise Comparisons of Participation and Satisfaction Subfactors

Subfactors	C1	C2	C3	C4
C1	–	1.859	1.598	2.188
C2		–	1.434	0.960
C3			–	0.855
C4				–

Figure 7: Participation and satisfaction subfactor weights

As shown, among the sub-factors of participation and satisfaction, stakeholder participation received the highest weight (0.384), followed by shareholder satisfaction (0.222) in second place, and stakeholder involvement in the project (0.206) in third place. The results for all sub-criteria are presented in Table 11.

Table 11: Weight and Ranking of Participation and Satisfaction Factors

Rank	Weight	Code	Factor
1	0.384	C1	Participation of architectural stakeholders
2	0.222	C2	Shareholders' satisfaction
3	0.206	C4	Stakeholder involvement in the project
4	0.188	C3	Satisfaction of top managers

4.5 Pairwise Comparison of Management and Supervision Sub-Factors

The management and supervision factor has 7 sub-factors, whose pairwise comparison is given in Table 12. The inconsistency rate of this pairwise comparison was found to be 0.04.

Table 12: Pairwise Comparisons of Management and Supervision Subfactors

Subfactors	D1	D2	D3	D4	D5	D6	D7
D1	–	0.806	0.633	0.265	0.585	0.820	0.566
D2		–	0.562	0.236	0.685	0.413	0.383
D3			–	0.641	0.417	1.020	0.943
D4				–	1.670	3.180	2.380
D5					–	1.920	1.870
D6						–	0.268
D7							–

The pairwise comparisons of Table 12 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 8.

As can be seen, among the sub-factors of management and supervision, organizational management has won the first place with a weight of 0.283. Laws and regulations have won the second place with a weight of 0.187 and planning has won the third place with a weight of 0.163. The results for all sub-factors are given in Table 13.

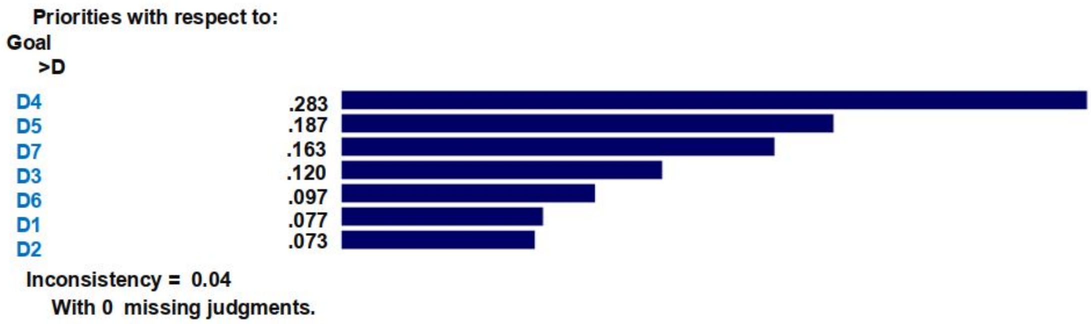

Figure 8: Weights of management and supervision sub-factors

Table 13: Weight and Rank of Management and Supervision Subfactors

Rank	Weight	Code	Factor
1	0.283	D4	Organizational management
2	0.187	D5	Rules and regulations
3	0.163	D7	Planning
4	0.120	D3	Identifying the business environment
5	0.097	D6	Documentation
6	0.077	D1	Project monitoring and evaluation
7	0.073	D2	Identification of maturity model

4.6 Pairwise Comparison of Resources and Infrastructure Sub-Factors

The criteria of resources and infrastructure had 5 sub-criteria, whose pairwise comparison is given in Table 14. The inconsistency rate of this pairwise comparison was found to be 0.03.

The pairwise comparisons of Table 14 were entered in the Expert choice software to calculate the weights of the factors, and the result is shown in Figure 9.

As can be seen, among the sub-factors of resources and infrastructure, infrastructure has won the first place with a weight of 0.385. Human resources and other resources with a weight of 0.234 have won the second place and information technology with a weight of 0.167 have won the third place. The scores for all 5 sub-criteria are given in Table 15.

4.7 Computed Weights and Final Ranking of the Sub-Factors

The final weight of the sub-factors is obtained by multiplying the weight of each factor by the weight of its sub-factors calculated in the previous steps, which is given in Table 16. Therefore, the commitment with a weight of 0.1143 has won the first rank. Governance ranks second with a weight of 0.1082 and infrastructure ranks third with a weight of 0.0751.

Table 14: Pairwise Comparisons of Resources and Infrastructure Subfactors

Subfactors	E1	E2	E3	E4	E5
E1	–	1.139	0.760	1.852	2.675
E2		–	0.434	2.103	0.840
E3			–	3.984	4.438
E4				–	1.268
E5					–

Figure 9: Weights of resources and infrastructure sub-factors

Table 15: Weights and rankings of the resources and infrastructure sub-factors

Rank	Weight	Code	Factor
1	0.385	E3	Infrastructure
2	0.234	E1	Human resources and other resources
3	0.167	E2	Information technology
4	0.108	E5	The scope of the organization
5	0.106	E4	Support

Table 16: Weight and final rank of sub-factors

Factor	Factor weight	Sub-factor	The relative weight of the Sub-factor	The final weight of the Sub-factor	The final Rank of the Sub-factor
Leadership and support	0.356	senior management	0.121	0.0431	7
		governance	0.304	0.1082	2
		commitment	0.321	0.1143	1
		Senior management support	0.136	0.0484	5
		Enterprise architecture structure	0.117	0.0417	8
Planning and execution	0.162	Knowledge of architecture	0.21	0.0340	11
		Architectural processes	0.209	0.0339	13
		Planning and methodology	0.222	0.0360	10
		programming	0.084	0.0136	27
		Reduction of complexities due to circulation processes	0.099	0.0160	23
		Enterprise architecture guidelines	0.176	0.0285	16
Participation and satisfaction	0.079	Participation of architectural stakeholders	0.384	0.0303	15
		Shareholders' satisfaction	0.222	0.0175	21
		Satisfaction of top managers	0.188	0.0149	26
		Stakeholder involvement in the project	0.206	0.0163	22
Management and supervision	0.208	Project monitoring and evaluation	0.077	0.0160	24
		Identification of maturity model	0.073	0.0152	25
		Identifying the business environment	0.12	0.0250	17
		Organizational management	0.283	0.0589	4
		Rules and regulations	0.187	0.0389	9
		Documentation	0.097	0.0202	20
		planning	0.163	0.0339	12
Resources and infrastructure	0.195	Human resources and other resources	0.234	0.0456	6
		Information technology	0.167	0.0326	14
		Infrastructure	0.385	0.0751	3
		Support	0.106	0.0207	19
		The scope of the organization	0.108	0.0211	18

5 Conclusion

In this study, the factors contributing to the successful implementation of enterprise architecture (EA) were identified and prioritized using the Analytic Hierarchy Process (AHP). By integrating the resulting weights with objective-function considerations and optimization-oriented interpretations, the analysis enabled a more robust prioritization of criteria under uncertainty.

Relevant factors and sub-factors were first extracted from prior research and expert opinion. Among these, leadership, support, and management emerged as the most influential criteria, followed by documentation practices and architectural expertise. A total of 27 frequently cited criteria were gathered from the literature and incorporated into the questionnaire. Experts evaluated each indicator using a 1–5 Likert scale, and indicators with an average score below 3 were removed from further analysis. The remaining factors were examined using ExpertChoice software.

The results showed that the *leadership and support* factor ranked highest with a weight of 0.3566, followed by *management and supervision* (0.208), and *resources and infrastructure* (0.195). Pairwise comparisons identified the highest-weight sub-factors within each category as follows:

- Leadership and support: *commitment* (0.321)
- Planning and implementation: *planning and methodology* (0.222)
- Participation and satisfaction: *stakeholder participation* (0.384)
- Management: *organizational management supervision* (0.283)
- Resources and infrastructure: *infrastructure* (0.385)

Overall, governance, support, and management were consistently identified as the most critical factors for successful EA implementation, with documentation and architect skills also proving significant. The obtained results align closely with findings reported in previous studies [15, 21, 25]. It should be noted that humanities-related concepts such as "governance" and "commitment" require careful interpretation in future research. These concepts should be examined by humanities scholars to clarify their meaning and determine how their importance should be operationalized to improve organizational outcomes and efficiency.

Future Works

For future research, it is suggested to use other methods such as interpretive structural modeling or other multi-criteria decision-making methods such as Analytical Network to obtain effective criteria for the successful implementation of enterprise architecture. And the results obtained should be compared with the results of this study and in this way the pattern of scientific and complex relationships between a set of factors and criteria should be identified. Entropy optimization methods can also be used to determine alignment and greater confidence in weights.

Declarations

Availability of Supporting Data

All data generated or analyzed during this study are included in this published paper.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Author Contributions

Mohamed Kouadria: Hadi Sharifi: Methodology, Software, Data Collection and Analysis, Investigation, Writing – Original Draft. Mostafa Akhavan-Safar: Conceptualization, Supervision, Validation, Writing – Review and Editing. Mohammad Mohsen Sadr: Supervision, Writing – Review and Editing. All authors have read and approved the final version of the manuscript.

Artificial Intelligence Statement

The authors used AI-based tools solely as part of their writing and editing workflow. Specifically, AI-assisted capabilities were employed to improve language quality, clarity, grammar, and stylistic consistency. The authors did not rely on AI to generate original scientific content, data, analyses, or interpretations.

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