Utilizing the Enterprise Architecture Model to Develop the Structure of Public Sector Entities in Saudi Arabia

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Abstract: The current research is to profit from the science of enterprise architecture (Enterprise Architecture) and its application in building the structure of government sector institutions in the Kingdom of Saudi Arabia, in accordance with the Kingdom of Saudi Arabia 2030 vision. while emphasizing the value of enterprise architecture (EA) and the need for knowledge to apply its models and procedures while creating its structures. The research study's scope is determined by how well the descriptive and analytical approaches function together, and this is achieved by choosing a few government sector organizations to focus on. Throughout exploring the possibility of applying the Enterprise Architecture model, as an application case based on the extent of knowledge of the cadres of those entities with the organizations' enterprise architecture, and the presence of supervisory expertise. By relying on the quantitative method of studying and analyzing the situation by conducting a questionnaire on some workers in those bodies under consideration (Research Sample), studying the possibility and feasibility of applying enterprise architecture for organizations and generalizing this in the restructuring of government sector's institutions in general.

Keywords: Enterprise architecture; Governance; Saudi Vision 2030

1 Introduction

Most institutions in the public sector are currently organized on a comprehensive design basis and on a set of qualitative criteria as a tool to infer the work and technology used within that organization, or in the form of separate units and a set of processes, programs and systems that are inconsistent with each other. If the organization decides to develop and maintain a documented structure at all levels to be a basic reference for planning and decision-making and to make the most of business, technology and human resources, it is assumed that the organization will think of comprehensive solutions instead of individual systems and programs. Accordingly, the administrative leadership should provide appropriate resources to the Enterprise Architecture Implementation Unit and ensure that it is integrated into all the qualitative aspects of managing the organization, in order to ensure commitment to following the targeted approach to quality assurance so that it is consistently applied in all fields and at all administrative levels of the organization [1].

In compliance with the Kingdom's 2030 vision, the government and leaderships in the Kingdom of Saudi Arabia are taking promising steps and decisions towards the growth of the economy through the implementation of transformative programs, which aim to enhance performance and restructure some government agencies, in order to build effective, transparent and accountable government institutions with high performance and competitiveness. The process of improving the general environment for the business sector, and attracting the best talent. and investments worldwide, requires the application of standards of efficiency and governance at all levels of service provided within the public sector, and thus this method is suitable for seeking to improve community participation in the process of progress and development.

The theories of enterprise architecture and the application of its methodologies have been adopted by numerous institutions operating in the public and private sectors across the globe; however, Saudi government sector institutions are not as fortunate to have as many of these theories as tools to implement governance. In order to evaluate the

level of familiarity governmental sector institutions have with the concept of enterprise architecture and ascertain the significance of possessing expertise to apply their methodologies and frameworks in these institutions for their development and restructuring, this study serves as a preliminary step.

The current study is important because, if theoretically possible, it can be applied to all sectors, their departments, and government sector institutions. By grouping all of the sub- and main-objectives to support the joint work strategy, it clarifies what the institution should look like in the future. Regarding the study paper's practical significance, all government sector entities have the potential to implement enterprise architecture in their local organizations. especially considering that the primary objective of the enterprise architecture model, which is to connect the organization's strategy to the existing work processes, is being achieved by the present study in an effort to successfully enhance the departmental structures. Considering that departments are using the IT infrastructure to work together harmoniously and conserve resources and time. Regarding the study paper's practical advantages, they are found in the government sector's adoption of enterprise architectural concepts as a long-term approach to organizing and planning.

The primary goal of this study is to clarify the degree to which Saudi Arabian government institutions may use the enterprise architecture model to construct their organizational structure. These primary aims include some of the following sub-objectives: evaluating the viability and possibilities of reorganizing the government sector institutions under investigation using the enterprise architecture paradigm; becoming aware of the viability of using the suggested model and spreading its use in the reorganization of government sector institutions generally; assisting in the successful completion of the enterprise architectural model's overarching goal in order to improve the administrations of government sector entities; Examine the potential for attaining concord across government sector institution administrations in order to economize time and resources; utilizing the infrastructure of information technology to accomplish the organization's objective in compliance with the work processes adhered to.

2 Literature Review

This section presents general information about EA history, definition, strategies and stages. Before we commence by defining the term Enterprise Architecture, we need to refer to the development of that science, whose history is distributed into three main time periods. Starting from the pre-EA phase that was known as the "Business System Planning stage", which lasted around 20 years from the beginning of the sixties till the beginning of the eighties. Then the stage of Enterprise Architecture comes afterwards, which lasted during the early years of the 1980's till that early 1990's, and finally the stage of enterprise architecture of modern organizations, which began from the end of the nineties until our present day [2].

We need to know what does the word "enterprise" mean, which means a high-level strategic vision for the whole organization, while the word "architecture" refers to an organized structure for analyzing, planning and resource developing of within that organization or entity, before commencing with the term definition of "Enterprise Architecture" [3].

A researcher called Connor O-Brian defines the term "enterprise architecture", as a holistic perspective of overseeing entities, while utilizing some technologies and management procedures to develop the performance of those organizations within their strategies, business models, information stream and technological assets. And in another definition, the enterprise architecture is the ability to comprehend, design, plot, manage and monitor establishments, systems or procedures in all its forms (current, transitional and future), while studying and documenting the relationships between them [4]. Also other researchers have defined EA as "Enterprise architectures define the style and method of design and construction that comprise the elements of a system and define the purposes and interrelationships of those elements" [5].

And because the structure of the organization is related to the mission and organizational objectives of the operations and the technical architecture or information technology necessary to implement them. The enterprise architecture is viewed as an approach and business-oriented task, which assist management in their planning process and their supervisory roles by providing synchronized approaches for the whole entity [6]. In addition, it permits an adequate foundation for the organization from day one, to ensure the success of its process, management, documentation and hierarchical flow. While allowing an effective way the system within the enterprise from failure or being obsolete before it is built, through the simplicity of corresponding to maintenance and technological advancement [7].

The enterprise architecture is guided by strategic objectives and business requirements, as it provides a scheme and professional basis approach to procedures, planning, policy-making, and resource improvement that is beneficial to decision makers, and supporting personnel [6]. EA could be closely tied to utilizing its results and conclusions in a Multi-Criteria Decision-Making process to forecast the behavior of any decision making process, such as the PROMETHEE model [8].

Enterprise Architecture empowers traditional organizations to recognize their current structure, and other value generation sources [7]. It has an essential role in formulating strategies, so that enterprise architects could work

smoothly with other divisions such as the employees of planning and project management departments. They usually take a part in reforming the organization's futuristic goals and objectives, overlapping with the structural design of the organization and developing series of plans and projects to backing that achievement [4].

In addition to what has been mentioned above, the application of Enterprise Architecture works to decrease system complexity by referring to technical standards and operating principles to guide the design of solutions and technological options, as well as the reuse and sharing of functional components, and the identification of tasks and procedures, through the standardization of technologies and infrastructure. Adopting an organizational architecture application enhances the consistency and integration across processes, information, applications and the infrastructure of the enterprise to do business optimally [4].

It works on defining the structure of the institution with the constructivism that defines the relationships, dependency and requirements, as well as planning and organizing the strategy, which in turn is linked to the vision and goals of the organization with departmental initiatives, which in most cases think individually.

In addition to guiding the organization's employees to think in a general and comprehensive manner for the organization and not only through their departments.

Organizational architecture improves the quality and performance of business processes and improves productivity across the enterprise by standardizing and integrating data links. It also assists executives in visualizing issues, challenges and problems, and contributes to establishing consensus among them on those issues that need to be addressed and moving to the root causes of those challenges, and it engages stakeholders and beneficiaries, in order to define a guided roadmap. Towards solutions in the short term, by making quick and immediate decisions or in the long term by modifying the main strategies and objectives of the institution [4].

Therefore, the overall architecture of the organization should be a trusted reference, a source of process resource standards, and designed for future operating situations within the organization. In order to avoid many of the dilemmas facing organizations in the public and private sectors, the most important of which is the duplication of tasks and practices, so that the overall structure of the institution is the only reference source within the organization in order to avoid wasting time and resources and avoid duplication and destructive competition between sub-departments in large and complex organizations. When the enterprise architecture is constructivist, organized in all dimensions, it becomes a comprehensive system of higher standards and more reference of standards and practices [6].

The implementation of an enterprise architecture program includes organizations with some basic elements and requirements to determine the scope of general constructivism, its sub-layers, and the method of documentation thereof. Among the most important of these elements is defining the institution's enterprise architecture framework, which is considered a tool used by enterprise architecture designers to define and describe the methodology for implementing enterprise architecture methods and a method used to capture, organize and present the information required for implementation in a wider range [9].

The building engineering framework of an organization is defined by the Office of the Australian Chief Information Officer as a template that outlines how to create an architecture for the organization by offering blueprints, structures, common terminology, methods, tools, and templates with the goal of accomplishing business objectives in accordance with the organization's overall strategy [8].

There are many organizations building engineering frameworks (EAF) that have been created more broadly during the late last century; some of them have been developed to include very specific regions. AlSoufi [10] have divided enterprise architecture frameworks organizations into five main divisions, including: Enterprise developed frameworks, Commercial frameworks, Defense industry frameworks and Government frameworks. And some other frameworks, as shown in the Table 1. Among the most popular frameworks currently in use is the Zackman Enterprise Architecture Framework, which contains six dimensions or views: planner, owner, designer, outlet, subcontractor, and user and six basic questions: What, how, where, who, when and why. This framework consists of rows and columns that operate largely like a database with interconnected and intertwined relationships, so that the base is considered as a chart made up of cells in which the elements are linked together in a way that does not allow them to be duplicated or merged. This framework ensures that all perspectives are anchored, and it ensures that they are in an integrated system regardless of the order in which they were previously [9].

The structuring of government sector institutions is one of the businesses that receive the attention of all governments, without exception. At each stage of renewal and modernization of work procedures in governments, one of the most important steps of that stage is to review the existing structure and work to amend it at the two levels: at the governmental level in general, and at the level of government institutions separately in particular. Accordingly, we find that scientific research circles include some experiences in a group of countries that have previously restructured their governments and governmental institutions. For example, the Jordanian government issued a guide to unify work on structuring its government sector institutions [11, 12].

Additionally, by initiating a three-year eGovernment plan aimed at enhancing citizen service delivery through seamless integration and connected governance, the Bahraini eGovernment Authority (eGA) has made a substantial contribution in that area. It was decided to develop a National Enterprise Architecture Framework (NEAF) as a

result. The National Enterprise Architecture Framework (NEAF) is a set of governance, compliance procedures, technical standards, models and meta-models, and guidelines that are intended to direct the creation and application of Enterprise Architecture by different government agencies in the Kingdom [13].

Table 1. The main breakdown of the five enterprise architecture frameworks

Enterprise Developed Frameworks	Commercial Frameworks	Defense Industry Frameworks	Government Frameworks
The open group architecture framework TOGAFTM	Integrated architecture framework IAF	Command, control, communications, computers, intelligence, surveillance and reconnaissance C4ISR	Federal enterprise architecture framework FEAF
Generalized enterprise reference architecture and methodology GERAM	Zachman framework	Department of defense architecture framework DODAF and technical reference model TRM	Government enterprise architecture GEA
Reference model of open distributed processing RM - ODP	Architecture of integrated information systems ARIS	NATO architecture framework NATO	Treasury enterprise architecture framework TEAF
Guide to the enterprise architecture body of knowledge EABOK	OBASH I business and IT methodology and framework OBASHI	Technical architecture framework for information management TAFIM	European inter-operability framework EIF
		Joint technical architecture JTA	NIST enterprise architecture NIST
		UK Ministry of Defense architecture framework MODAF	Treasury information system architecture framework TISAF
		Department of national defense and the Canadian forces architecture framework DNDAF	Standards and architectures for e−government applications SAGA
		France DGA architecture framework AGATE	Extended enterprise architecture framework E2AF
		International defense enterprise architecture specification IDEAS	SPEWAK's enterprise architecture planning EAP

In addition, the government of Oman started the Governmental Architectural Framework (GAF), which was used as a case study and includes interviews with architects and other stakeholders as well as a review of GAF documentation. The results showed that the formation of architectural knowledge, the examination of IT standards and EA frameworks, the formation of working groups, and the production of architecture documentation marked the beginning of the GAF development process. The stakeholders played three roles throughout the establishment of GAF, whereas the enterprise architects played six. By increasing knowledge of the EA development process, the findings are meant to aid in the creation of a standardized EA framework for the public sector [14].

Through research in the corridors of information sources concerned with publishing scientific works, a group of research works and methodological reports were obtained that deal with this topic and show the extent of the intended benefit of applying the organizations' enterprise architecture model in the government sector. The document [15] conducted a questionnaire on the role of enterprise architecture in achieving the concept of interconnected government in a group of Asian and Pacific countries. Those countries are: The United Arab Emirates, Australia, the Hashemite Kingdom of Jordan, Columbia, Oman, New Zealand, the Kingdom of Saudi Arabia, and South Korea. The dimensions surveyed were the seven dimensions of interconnected government, according to the e-government survey issued by the United Nations [16].

The results of the questionnaire presented by the researcher resulted in the Kingdom of Saudi Arabia having achieved four of those seven dimensions, while three of them were not achieved at that time. The scientific work ended with the proposal of a framework consisting of five steps with identifying the relationship of each step of the interconnected government dimensions [15].

3 Methodology

This research is restricted to the Kingdom of Saudi Arabia's public sector organizations. Many personnel in the government sector lack sufficient expertise about enterprise architecture. The lack of regional experiences and expert houses for the field of enterprise architecture contributes to the information scarcity, making benchmarking—the

act of sharing experiences—unfeasible. There are gaps in Saudi colleges' understanding of enterprise architecture principles. The study's geographic coverage was limited to Saudi government apparatus personnel in the western area; the remaining portion of the Kingdom was left out. This limited the study's comprehensiveness. The research study's brief duration is a result of the researchers' constrained time frame following the completion of the first approval stage and the phase in which they submit the final copy to the conference's scientific committee.

This research is regarded as an exploratory study that aims to determine how much government agencies have used enterprise architecture into the design of their administrative divisions. Because of this, the descriptive and analytical approach must be appropriate for the facts, observations, and information gathered from many sources and in a range of methods according to the nature of the study. These observations, facts, and data require a precise description in order to be used and analyzed appropriately. This helps to produce positive outcomes and valuable recommendations regarding the adoption of an enterprise architecture model by organizations for the purpose of structuring and organizing the administrative units of government sector institutions.

Public services at the governorate level																					
Number of agricultural, administrative, public and financial service centers 1- 2																					
The Principality or Governorate	Health directorates	Real estate development fund	Labour office branch	Branch of Environment, Water & Agriculture	Financial branch	Transport branch	Females education office	Males education office	Females Education administration	Males education administration	Municipality centre	municipality	Secretariat of municipality	Pensions	Social insurance	An ambulance center	Civil affairs	Passport department	Traffic centers	Police station	Police centre
Ar Riyad	1	1	8	2	1	1	10	11	1	1	0	15	1	1	1	49	14	18	12	0	32
Ad Diriyah	0	0	0	1	0	0	1	1	0	0	0	2	0	0	0	1	2	1	1	3	0
Al Kharj	0	1	2	1	1	0	0	1	1	1	2	3	0	1	1	1	2	4	1	6	1
Ad Duwadimi	0	1	1	1	1	0	5	5	1	1	7	8	0	1	1	7	3	4	3	10	6
Al Majmaah	0	1	2	1	1	0	1	1	1	1	7	6	0	1	0	7	2	4	4	3	6
Al Quwayiyah	0	1	1	1	1	0	2	2	1	1	7	5	0	1	0	6	2	3	2	11	2
Wadi Ad Dawasir	0	1	1	1	1	0	0	0	1	1	2	1	0	1	0	2	2	2	1	2	2
Al Aflaj	0	0	1	1	1	0	1	0	1	1	1	4	0	0	0	2	1	1	1	4	1
Az Zulfi	0	1	1	1	1	0	1	0	1	1	1	1	0	1	0	1	2	2	1	0	2
Shaqra	0	1	1	1	1	0	1	0	1	1	1	3	0	1	0	2	2	2	1	2	1
Hawtat Bani Tamim	0	0	1	1	1	0	0	0	1	1	1	3	0	1	0	3	2	1	1	2	1
Afif	0	1	1	1	1	0	1	0	1	1	2	2	0	1	0	3	2	2	1	1	1
As Sulayyil	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0	1	2	0	1	2	1
Duruma	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	1	1	2	1
Al Muzahimiyah	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	1	2	1	1	1	1
Rumah	0	0	0	0	0	0	1	1	0	0	1	1	0	1	0	4	2	1	1	3	2
Thadiq	0	0	0	1	0	0	1	1	0	0	3	1	0	0	0	1	1	1	1	1	1
Huraymila	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	2	1	1	1	1	1
Al Hariq	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	1	1	0	0	1	1
Al Ghat	0	0	1	1	0	0	1	1	1	1	0	1	0	0	0	1	2	1	1	0	0
Marat	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0
Ad Dilam	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	1
Ar Rayn	0	0	0	0	0	0	2	2	0	0	10	0	0	0	0	1	0	0	0	7	1
Total	1	9	22	22	11	1	34	28	12	12	48	62	1	11	3	99	48	50	38	64	65

Figure 1. The number of public establishments in the Jeddah Region

The study population consists of government sector institutions, including ministries, agencies, public institutions, offices, as all of these institutions have organizational structures that contain engineering divisions to manage the projects assigned to them or either maintain facilities under their supervision. According to the annual report of the Department of Statistics and Information for the year 2019 and related to services statistics and the census of economic establishments in the central region [17], the operating establishments by type of sector and economic activity, especially the number of establishments in the governmental and public service sector, is considered to be 107 establishments in Jeddah City. Those institutions were represented by their employees who have direct contact with the technical departments within those institutions in general. The number of employees of those institutions concerned with the application of Energy Efficiency procedures and methodologies within the facilities of those institutions, as shown in Figure 1. Those institutes are: the Jeddah Municipality, health directorates, municipality center, and secretariat of municipality, some universities, civil affairs, passport department, traffic centers, police station, social insurance and education administration. The research sample consisted of 84 workers from government and public agencies under study. The following tables are used for the information required for Cochrane equations, which represents a sample scaling theory, which is explained according to the equations. The sample size was determined according to the basic Cochrane equations and Eq. (1) and Eq. (2) and according to Table 2 and Table 3 [18, 19].

Table 2. Critical (z) values used in the calculation of confidence intervals

Confidence Level	Critical (z) Value to be Used in Confidence Interval Calculation
50 %	0.67449
75 %	1.15035
90 %	1.64485
95 %	1.95996
97 %	2.17009
99 %	2.57583
99.9 %	3.29053

Table 3. Sample size required for surveys

Estimated Population Size	Margin of Error Confidence Level 95%			
	10 %	5 %	2.5 %	1 %
100	50	80	94	99
500	81	217	377	475
1,000	88	278	606	906

$$n_0 = \frac{Z^2 pq}{e^2} \tag{1}$$

where, Z represents the level of confidence at (95%) and is equal to (1.96). p represents the value estimated by the researcher for the true proportion of the study population and equals (0.5). It represents the maximum that can be used in the Cochrane equation, and q represents the product of a subtraction of p from one (1) It is equal to (0.5), and finally e represents the permissible error limit and is equal to (0.05). Thus, the assumed study sample size n_0 is (384) individuals, but the assumed sample size is greater than 5% of the study population. Therefore, the Cochrane equation can be used for small communities, which states:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \tag{2}$$

where, N represents the size of the study population and is equal to 107, n_0 represents the assumed sample size and is equal to 384. By applying the equation, the approved size of the study sample n is 83.85 items, but 84 items were used in the search instead to increase the accuracy of the results presented.

The paper questionnaire was used as a tool for this study, and it consisted of two axes: the level of knowledge of the enterprise architecture and the importance of having expertise concerned with the application of the methodologies used in the organizations' architecture The first axis contained (10) paragraphs, while the second axis contained (4)

paragraphs. The five-point Likert scale was adopted to answer the paragraphs of the resolution according to the cell lengths that were determined by calculating the scale range by subtracting the smallest values of the scale from the largest (5-1 = 4), and after that the result was divided by the number of options (4/5 = 0.8) There are 5 options as follows: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. Noting that the paragraphs of the questionnaire were formulated in a positive pattern, as the choice strongly agrees is equal to (5), agree is equal to (4), neutral is equal to (3), disagree is equal to (2), and strongly disagrees equals (1). Accordingly, the length of the options that represent the cells is as shown in Table 4.

Table 4. Calculating the length of options Likert's five-point scale for the study

No.	Option	Period Length	Value Level
1	Strongly Disagree	From 1 to 1.79	Very low
2	Do not agree	From 1.8 to 2.59	Low
3	Neutral	From 2.6 to 3.39	Average
4	Agree	From 3.4 to 4.19	High
5	Strongly Agree	From 4.2 to 5	Very High

4 Data Analysis and Results

4.1 Tests the Validity and Reliability of the Study Tool

Everybody Among the fundamentals for guaranteeing the caliber and precision of the data that will be gathered are the validity and reliability tests of the research instrument. Its practicality is apparent [20]. Additionally, the quality that may be examined and explored to yield fruitful outcomes that support the creation of sensible suggestions that are both appropriate and helpful. As a result, the researcher used a few straightforward observations to judge the questionnaire, and the study instrument was modified and accepted in accordance with its significance and priority.

As for the reliability of the study tool and the self-validity of its parts, the tests of the reliability coefficient Cronbach's Alpha and the self-validity coefficient were reliable. As the square root of the reliability coefficient, taking into account the need for the coefficients to be equal to or greater than (0.60) according to the statistically recommended minimum [21]. All the results of the stability test conducted on a primary sample consisting of (84) individuals showed the strength and coherence of the parts of the questionnaire, where the values of the Cronbach Alpha coefficient ranged between (0.773) and (0.721), as shown in Table 5.

Table 5. Values of reliability coefficients

Section	Code	Questions	Cronbach Alpha
Familiarity with Enterprise Architecture	1	My company applies risk assessments and mitigation tools	0.748
	2	My company applies a documentation framework	0.751
	3	My company applies an effective documentation framework	0.735
	4	I'm familiar with the requirements developing techniques	0.727
	5	I'm familiar with the requirements overlapping	0.723
	6	My company's organizational structure suffers from requirements and roles overlapping	0.773
	7	I'm familiar with the Enterprise Architecture notion and its principles	0.721
	8	I have a previous experience with utilizing the Enterprise Architecture's frameworks and methodologies	0.722
	9	I always use Enterprise Architecture principles in my organization	0.726
	10	I'm willing to learn about Enterprise Architecture principles	0.768
Significance of having EA expertise to apply its methodologies	11	There are many Enterprise Architecture implementation methodologies applicable to my Organization.	0.741
	12	I can determine the best applicable Enterprise Architecture methodology for my organization	0.729
	13	Enterprise Architecture implementation methodology is supposed to be determined by a Chief Architect.	0.746
	14	Enterprise Architecture implementation methodology must be approved by the highest level of decision makers in my organization	0.737

After the arbitrator tested the validity and reliability of the study tool, the values of the Cronbach Alpha coefficients and self-validity were published on the target sample according to the scientific principles followed in publishing the questionnaires.

4.2 Statistical Analysis

According to the researchers 'background, there are no prior assumptions on the study population about the level of knowledge of government agencies in the organizations' enterprise architecture, nor the importance of having experiences that apply the methodologies used in this. Whereas the data collected from the study sample is characterized by being naturally distributed according to the normal distribution tests that were conducted on it despite the fact that they are ordinal data in their entirety, the calculation of frequency distribution, averages, standard deviation and percentage were used to analyze the paragraphs of the axes according to the responses of the respondents, in addition to performing correlation analysis between these paragraphs. The analysis was done by using the Social Statistical Packages Program (SPSS).

4.3 Using the Averages of the Answers on the Statements of the Axes

The process of calculating the averages of the answers on the statements of the axes is done by finding the average value of all the answers options on the statements of the axes and then finding the average value of the averages of the answers to the statements of each axis as a total average value for the axis, provided that the division of the categories of the five Likert scale in Table 4 is used to interpret the values 'The total mean of the axis'. With regard to the first axis, which is knowledge of the enterprise architecture, the analysis of the responses obtained according to the social statistical packages program (SPSS) as shown in Table 6 shows the mean values, the standard deviation, and the proportions of the paragraphs of the axis. The results of the evaluation showed that the total mean value of the axis is (3.3) as the mean of the arithmetic means of the paragraphs, (1.07) as the average of the standard deviations, and (65%) as the average of ratios.

The final result of the evaluation was 'Average'. This indicates that the general level of knowledge of enterprise architecture at government agencies represented by their cadres is at the middle level. The results showed that the respondents have no previous experience in using the frameworks and methodologies of Enterprise Architecture and they are ready to learn more if they are trained and to enrich their knowledge in this aspect.

Table 6. Evaluation of the terms of the knowledge base of enterprise architecture

Section	Phrase Code	Mean	Standard Deviation	Percentage	Evaluation
	1	3.55	1.01	71 %	High
	2	3.67	0.97	73 %	High
	3	3.39	1.01	68 %	Average
	4	3.43	1.08	69 %	High
Familiarity with Enterprise Architecture	5	3.33	1.01	67%	Average
	6	3.27	1.12	65%	Average
	7	2.74	1.24	55 %	Average
	8	2.33	1.10	47%	Low
	9	2.62	1.23	52%	Average
	10	4.20	0.94	84%	Very High
	Section Average	3.3	1.06	65%	Average

Table 7. Evaluation of the terms of the importance of having expertise in applying EA methodologies

Section	Phrase Code	Mean	Standard Deviation	Percentage	Evaluation
	11	3.63	0.9	73 %	High
Significance of having EA expertise to apply its methodologies	12	3.38	1	68 %	Average
	13	3.99	1	80 %	High
	14	4.15	0.9	83 %	High
	Section Average	3.78	0.96	70 %	High

By analyzing the averages of the answers on the paragraphs of the second axis, which is the importance of having experiences to apply the methodologies of enterprise architecture, the analysis of the responses as shown in Table 7 shows the mean values, the standard deviation, and the percentages of the paragraphs of the axis. The results of the evaluation showed that the total mean values of the axis are (3.8) as the mean of the arithmetic means of the paragraphs, (0.96) as the average of the standard deviations, and (70%) as the average of the ratios, and the final result

of the evaluation was "high". This indicates that the existence of expertise to apply the methodologies of Enterprise Architecture at government agencies, which is represented by their cadres of respondents, is considered relatively high and is of high importance. As they cannot determine the most appropriate methodology for these entities.

While the determination of the appropriate methodology should be made by a person with high experience, as the key person responsible for Enterprise Architecture implementation, with the necessity of the approval of stakeholders from the decision-makers on that choice, and this requires the presence of expertise in this area among the decision-makers, or at least some of them.

4.4 Correlation Coefficient Test (p)

By conducting the correlation coefficient test on the paragraphs of the first axis, it was found that there is a strong positive correlation between paragraphs (2 and 3, 4 and 5, 7 and 6,7 and 8, 7 and 9, and lastly 8 and 9) and this correlation appears in Table 8. These correlations can be summed up based on the analysis of the respondents' answers as follows:

-Often when government agencies implement documentation frameworks, these frameworks are effective.

-Knowledge of the methods of developing and writing requirements is often linked with awareness of the level of complexity that results from overlapping of those requirements. This is of critical importance when Enterprise Architecture in order to structure them.

-Know-how is often associated with the concept of Enterprise Architecture with previous experience in using enterprise architecture frameworks and methodologies.

-How an organization views the notion of enterprise architecture influences how it uses its principles.

-Employing enterprise architecture concepts is contingent upon an organization's prior usage of its frameworks and procedures.

Table 8. Pearson correlation coefficient table for the sections of the knowledge base of organizations

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q1	1.000	0.261	0.402	0.279	0.244	-0.049	0.106	0.105	0.179	-0.042	0.050	0.079	0.092	0.153
Q2	0.261	1.000	0.627	0.264	0.298	-0.048	0.056	-0.019	0.204	0.035	0.048	0.034	-0.169	-0.009
Q3	0.402	0.627	1.000	0.431	0.273	0.042	0.266	0.239	0.365	0.004	0.015	0.054	-0.167	0.012
Q4	0.279	0.264	0.431	1.000	0.619	0.280	0.417	0.385	0.342	-0.134	0.039	0.060	-0.052	-0.007
Q5	0.244	0.298	0.273	0.619	1.000	0.195	0.483	0.386	0.375	-0.110	0.156	0.187	0.041	0.021
Q6	-0.049	-0.048	0.042	0.280	0.195	1.000	0.043	0.159	0.007	-0.156	-0.108	-0.085	0.014	-0.053
Q7	0.106	0.056	0.266	0.417	0.483	0.043	1.000	0.663	0.454	-0.026	0.236	0.300	0.037	0.140
Q8	0.105	-0.019	0.239	0.385	0.386	0.159	0.663	1.000	0.584	-0.043	0.074	0.294	0.138	0.150
Q9	0.179	0.204	0.365	0.342	0.375	0.007	0.454	0.584	1.000	-0.193	0.189	0.192	0.086	0.137
Q10	-0.042	0.035	0.004	-0.134	-0.110	-0.156	-0.026	-0.043	-0.193	1.000	0.208	0.294	0.291	0.310
Q11	0.050	0.048	0.015	0.039	0.156	-0.108	0.236	0.074	0.189	0.208	1.000	0.520	0.454	0.509
Q12	0.079	0.034	0.054	0.060	0.187	-0.085	0.300	0.294	0.192	0.294	0.520	1.000	0.609	0.572
Q13	0.092	-0.169	-0.167	-0.052	0.041	0.014	0.037	0.138	0.086	0.291	0.454	0.609	1.000	0.737
Q14	0.153	-0.009	0.012	-0.007	0.021	-0.053	0.140	0.150	0.137	0.310	0.509	0.572	0.737	1.000

The green color expresses the strong positive relationship, the cyan color represents the positive relationship, the orange color represents the negative relationship, and the dark red color expresses the strong negative relationship

As for when conducting the correlation coefficient test on the paragraphs of the axis of importance of having experiences to apply the Enterprise Architecture methodologies. It was found that there is a strong positive correlation between paragraphs (11 and 12, 11 and 14, 12 and 13, 12 and 14, and finally 13 and 14) and this correlation appears in Table 8. These correlations can be summed up based on the analysis of the respondents' answers as follows:

-In the event that there are multiple methodologies for Enterprise Architecture commensurate with the entity, it is assumed that the chief engineer of the organization determines the most appropriate methodology.

-In the event that there are multiple methodologies for Enterprise Architecture that are commensurate with the entity, the decision-makers in the entity should adopt the most appropriate methodology.

-It should be the determination of the methodology for the implementation of constructive organizations by the chief engineer of building organizations, accompanied by the approval of decision makers in the organization.

5 Conclusion

The first research question focused on determining the extent to which the enterprise architecture can be applied in the restructuring of the government sector institutions under study. Based on the statistical analysis carried out in the previous section, the researchers were able to answer the study questions in pursuit of the research objectives.

Even though the respondents' overall organizational architecture knowledge is at the intermediate level, this indicates the difficulty of implementing enterprise architecture in the near future due to the cadres' insufficient knowledge, who should be actively involved in ensuring that the application succeeds and that the fundamental goals and anticipated benefits are met. Given the strong desire of cadres to get suitable development and contribute to the application based on outcomes, it would be feasible in a similar context to apply enterprise architecture to organizations at these institutions on a distant scale.

The purpose of the questionnaire's second component was to ascertain if the enterprise architecture and its guiding principles could be used to restructure government sector organizations more broadly. By gathering the necessary number of respondents in accordance with the Cochrane equations, the study sample was chosen to reflect the community in accordance with the standards and guidelines applicable in scientific research. The outcomes of this study may be applied to all government sector establishments that comprised the research community, which included ministries, agencies, public institutions, pharmacies, presidencies, and government funds. Because of this, it is currently challenging for most authorities to implement enterprise architecture due to the lack of knowledge among the cadres who should be actively involved in ensuring that the application is successful and that the fundamental goals and anticipated benefits are met. It is possible for the government sector to embrace the idea of organizational architecture engineering and offer the training and education required for medium- and long-term application of this concept.

It was also noticed that it is possible to effectively improve the structure of the administrations of government sector institutions by achieving the general goal of the enterprise architecture's model. This is done through the benefits of applying enterprise architecture frameworks that have been mentioned in the theoretical part and that are in line with many of the goals of the Kingdom of Saudi Arabia 2030 vision. This includes, for example, the optimal utilization of resources).

Additionally, the work brings the possibility of benchmarking experiences, related to what has been mentioned in previous studies about the adoption of many other governments in different countries to implement enterprise architecture. There are some successful stories in this aspect, such as the Bahraini government, which is considered to be one of the GCC council and one of the closest countries to the kingdom of Saudi Arabia through various political, social and economic aspects. Moreover, it could be also beneficial to utilize and take advantage of other international experiences such as the Australian government, the government of New Zealand, the government of North Korea, and the Jordanian government.

6 Recommendations

The researchers have put forth a set of recommendations in light of the previous findings in order to maximize the benefits of enterprise architecture in the structuring of government sector institutions. These include the need to adopt engineering practices for structuring organizations' at the government level and to gradually spread these practices throughout all government sector institutions in a way that is commensurate with the level of knowledge of this concept among sector employees and the availability of expertise that can oversee its application in government agencies.

Based on the preceding findings, the researchers have proposed a series of recommendations to optimize the use of enterprise architecture in the organization of government sector institutions. These include the adoption of organizational engineering at the government level and the gradual dissemination of these practices to all government sector institutions, taking into account the degree of familiarity with the concept among sector personnel and the availability of experts to oversee its implementation in government agencies.

It is crucial to incorporate the notion of enterprise architecture into the general prerequisites of colleges, universities, and other higher education establishments. the need to learn from global experiences and get familiar with effective approaches when it comes to implementing enterprise architecture. encouraging those in charge of planning and organizing to earn professional certifications in the area of developing the application of organizations.

It is difficult to achieve better business and IT alignment, economical resource utilization, and effectiveness without a certain level of EA maturity. Prior to continuing, it's imperative to comprehend the vital dependencies-dimension of incorporating EA into public sector organizations' organization, investment, executive backing, and leadership buy-in. Until EA is thoroughly connected with business functional units and business architecture is appropriately handled in tandem with business functional units, it cannot work.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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Nomenclature

e	Permissible error limit
N	Size of Study Population
n_0	Assumed Sample Size
p	Value of Proportion of Study Population
q	Product of a Subtraction
Z	Level of Confidence