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# Enterprise Architecture and Organizational Benefits: A Case Study

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**Abstract:** Enterprise architecture (EA) is a framework that consists of multiple processes to align business strategies with information technology (IT) architecture. It helps the organization standardize business operations and incorporate systems in different layers to achieve business goals and organizational benefits. This study focuses on identifying organizational benefits that can be achieved through EA implementation. The study comprises three main phases: (i) benefits realization (from literature review), (ii) benefits reconfirmation (from EA experts), and (iii) benefits validation (through a case study). Specifically, the benefits considered in this study are related to EA products, services, and strategies are known as: (i) business agility, (ii) creating competitive advantage, and (iii) increasing value. The study covers a vast literature review to define the current status of EA and organizational benefits. In addition, the study incorporates a number of measuring factors for each EA benefits with the help of a literature review. The initial findings reconfirmed and modified based on the experts' opinions collected through interview sessions. The research applied the grounded theory and qualitative approach to analyze the interview sessions. Accordingly, using the experts' advice, we proposed a model to show the steps and guidelines for assessing EA organizational benefits using corresponding measuring factors and sub-criteria. Finally, the proposed model validated through an in-depth case study to get final confirmation and see the model fits reality. Overall, this research highlight the potential benefits an organization can achieve from EA framework implementation. The proposed framework can assist EA decision-makers to understand and realize the EA benefits and its assessment process.

**Keywords:** enterprise architecture; organizational benefits; business agility; creating competitive advantage; increasing value; qualitative study

## 1. Introduction

Enterprise architecture is a framework that helps the organization to design, implement, and manage a business plan and to incorporate it with the technology domain efficiently. It is used to assist the enterprise in running its business processes, operations, and perform changes such as meeting business goals effectively and improve decision making process. Therefore, it is commonly known for integrating and aligning business strategies with information technology (IT) resources [1]. The concept of EA came into high demand due to the dynamic business environment and its dependency on technological resources. Furthermore, the current use of technology in business and its intimacy in running of business operations has created a new perspective of doing business [2]. Technology has drastically changed the enterprise's working environment. For example, the development of business processes, implementation of strategies, integration of different systems, and all other business activities are incomplete if there is no technology involved.

The use of technology is inevitable for the organizational development and business growth. Therefore, the concept is changing from traditional business to digitization, where cloud servers, big data, internet of things, and mobile technologies are producing positive impacts on digital business [3]. Whereas this transformation is a complex process for the enterprises due to the strong binding and bridging between the business models and the large number of IT resources and information systems (IS) [4]. The business models applied in traditional IS can be overlooked during the transformation phase if did not plan it well. Furthermore, as described by [5], the transformation is supposed to be deal with processes, business models as well as stakeholder's perspectives. The enterprise often mismanaged the transformation phase that might be due to lack of time, budgeting issues, or implementing the project as a whole rather than implementation in phases [6].

EA is evolving as an integrated approach to support this scenario that is known for a complete package starting from analyzing, building, managing, and implementing the digital transformation phase [7,8]. It provides continuous support to organize business models and integrate it using technology infrastructure. EA enables organizations to standardize IT infrastructure and to align it with business strategies and other needs [9]. During this phase, the overall requirements are not only to implement the new infrastructure but also to develop a number of frameworks and deliver it with proper governance rules. For this, the EA stands as a central part in defining the structure, mapping business rules, introducing new strategies, and, last but not least, is to govern at each step [10].

The progressive intervention of EA framework in business organizations has already presented numerous benefits to the industries, known as organizational benefits, as discussed in previous research [11]. The list of common EA processes are defined as digital transformation, IT infrastructure enhancement, utilization of IT resources, and modernization [12]. Furthermore, EA can support the re-design and re-development process initiated through major changes identified in an organization. EA has adequately vast implications on organizations where its functioning capabilities are largely identified and applicable for business processes, information security, network performance, systems' and data integration, and dealing with multiple personnel [13].

Multiple researchers presented a profound understanding of EA implementation and its benefits in an organization [14–18]. Previous studies addressed different processes and frameworks for the realization of EA benefits but some of them either discussed this issue with limited factors [19] or did not provide empirical evidence [20]. Despite the importance of the EA framework, it still lacks support in the realization of the potential benefits EA can create in organizations [20,21]. As a result, there is still a need to deal with the challenge of EA implementation and to realize its major benefits for an organization.

The main research question of this study is, "*how to discover and recognize the organizational benefits of EA*"? Therefore, the main focus in this research revolves around the understanding of EA benefits from different perspectives, such as products, services, strategies, and utilization of resources. The main contributions of the paper are: (i) proposed model of EA and organizational benefits, (ii) verification from experts, and (iii) validation through the in-depth case study. The rest of the paper is organized as follows. The next section develops the theoretical background of EA progression and realization of its benefits. Section 3 describes the stepwise approach of the methodology undertaken in this study. In addition, Sections 4 and 5 discuss the findings from interview sessions and model validation using the case study, respectively. Finally, the paper concludes with a discussion of major findings and future work.

## 2. Theoretical Background

### 2.1. Progression of EA

The use and implementation of EA have been described in different research. Initially, EA's main purpose is to create a positive relationship between business strategies and IT infrastructure. It has vast implications on overall business structure, starting from planning to designing, implementation to

maintenance, governing the processes, and providing services to employees and customers. Therefore, one researcher described the EA provision in three different interconnected processes, such as decision making, architecture, and implementation [22]. It highlights its importance and viability in running a business in a more flexible, relaxed, and trusted environment. Overall, the main focus of EA is to improve the services and IT infrastructure of the organization that may involve integration of information systems and reinforcement of online services that ultimately transform the organization towards digitization [3].

Initial EA research was more focused on proposing conceptual models, identifying the main factors of EA, the phases, and interconnectivity between the processes. It was essentially done to create and foster the emergence of the contextual and conceptual background of EA [23–25]. For example, a model was proposed in research for defining enterprise architecture as a supporting tool, which only discussed its conceptual view. In that model, the research provided four different perspectives of EA, such as (i) unified view, (ii) creating the architecture vision, (iii) architecture repository, and (iv) stakeholder management [2]. The framework did not provide a way towards implementation and empirical study. In addition, [26] proposed a framework of EA for its implementation on small and medium-size organizations. Likewise, that research presented the framework using different scenarios but it missed a case study to analyze the implementation of the framework. Therefore, we can extract the main finding from literature review here: that there is a lot of research that proposed a framework for EA that requires a validation process to check its applicability.

Currently, research puts more emphasis on its broader perspective and multi-ways inferences over organizational needs. There are several researchers who presented and proved the concept of EA and its benefits for organizations using an empirical approach. These researchers proposed the extensive features of EA—from services, business structure, governances, and IT infrastructure perspectives. The formalized concepts were further investigated and validated through different approaches, such as questionnaires, interviews with experts, and case studies. Similarly, a study was proposed and it validated the model for measuring the impact of IT on business agility. It highlighted the fact that an investment on IT projects can bring different capabilities to the organization, such as business process agility, organizational performance, IT–business alignment, and others. Research validated the model using empirical research and proved the responses using exploratory and confirmatory factor analysis [27]. Besides that, the benefits measurement of EA were presented by [4] to review EA implementation and post-evaluation environment. The paper presented interesting facts gathered by using interviews. The research first elaborated the major factors related to EA benefits and then validated them via interviews conducted on a single case study. The research used qualitative data analysis approach to gather and analyze the data. The list of benefits validated in the article were EA process quality, improved alignment, enhanced governance, common vision, and others.

This section highlights the different methodologies used in order to review, analyze, and measure the benefits of EA. Previous studies showed the progression of EA from a conceptual model to empirical studies. In addition, some of the articles evaluated the measuring factors using qualitative analyses, whereas few empirically tested them using a quantitative approach. EA benefits realization is mostly supported by qualitative analysis, as most of the measuring criteria are multi-dimensional and non-quantitative, as mentioned in Table 1. The idea of the interview instrument is used by different researchers who elaborate the analysis by providing important quotes given by the stakeholders who participated in the investigation [4,28,29]. In summary, the EA implications can be categorized in multiple directions, such as it can help to improve process management [22]; EA creates a proper documentation for services, modeling, and other items [30]; EA supports IT resource allocation and management to handle all business processes [15]. Based on this, the attempt to measure EA benefits can be applied in different ways according to the main objective of the research. This research is focused on measuring these benefits using the interview instrument, which was widely supported in previous research, as discussed in this section. Before moving to the next section, the summary of some previous work is presented in Table 1 that highlights the progression of EA proposed by different researchers.

**Table 1.** The progression of enterprise architecture (EA).

| Main Topic | Research Approach | Used Factor | Author and Year | Reference |
|---|---|---|---|---|
| EA for digital transformation | Conceptual framework | • Competitive Advantage<br>• Customer value<br>• Cost effectiveness<br>• System integration | Goerzig, 2018 | [26] |
| EA produces organizational benefits | Survey, quantitative | • Alignment<br>• Agility<br>• Quality<br>• Functionality | Foorthuis, 2016 | [20] |
| EA and organizational benefits | Survey, quantitative | • Governance<br>• Change in process<br>• Focus on business<br>• Organizational benefits | Shanks, 2018 | [31] |
| EA and business models | Interviews | • Business motivation<br>• Business models<br>• Business execution | Simon, 2014 | [29] |
| Organizational performance | Survey, quantitative | • IT capability<br>• Business-IT alignment<br>• Business agility<br>• Organizational performance | Chen, 2014 | [27] |
| Value generation through EA | Case studies | • EA modeling<br>• EA governance<br>• EA planning | Ahlemann, 2020 | [30] |
| EA capability | Interviews | • Pre-acquisition preparation<br>• Acquisition selection<br>• Acquisition integration<br>•<br>Post-integration management | Toppenberg, 2015 | [26] |
| EA and IT resource alignment | Survey, quantitative | • Business–IT alignment<br>• Business value<br>• Employee skills | Alaeddini, 2017 | [15] |
| EA generates business values | Theoretical framework | • IT assets<br>• Competitive process<br>• Organizational performance<br>• Conversion process | Alwadain, 2019 | [31] |
| EA benefits realization | Case study | • EA processes<br>• EA services<br>• Organizational environment | Niemi, 2016 | [32] |
| EA improve IT decisions | Survey, quantitative | • Monitoring<br>• IT alignment<br>• Values<br>• Business strategies | Van den Berg, 2019 | [33] |
| Improving agility through EA | Conceptual model, survey | • Organizational agility<br>• Strategic IT alignment | Pattij, 2020 | [25] |

The above table highlighted the progressive trends and development in the field of EA. The researchers have shown notable interest to present the concept and context of EA and its importance towards digital transformation. Previous research highlighted different aspects of EA commonly known as architecture, governance, services, and its impact on business organizations. Despite the different examples extracted from previous work, which highlight the importance of EA,

significant investments in EA implementation are still required for it to be validated and utilized properly. As discussed by [34], for some organizations EA benefits realization is still not clear; large investments in EA are underutilized or not managed properly.

### 2.2. EA and Organizational Benefits

Strategically, with multi-dimensional benefits to the organizations, the EA may deliver a powerful and effective association between business processes and IT infrastructure. Due to the nature of EA framework and variety of branches, the identification of these benefits is still complex for the organization and decision makers [4]. Previous studies have proposed different views on identifying and measuring EA benefits. A similar approach can be used to realize the impact of EA as presented by [35] that proposed the idea of measuring the IT investment benefits in two ways—financial and non-financial. The benefit detection concept was gradually enhanced during the evolution of the EA framework. There are multiple researchers who elaborated on the impact of EA and organizational benefits [21].

EA provides support to different services, products, systems, and business goals. The understanding of EA benefits comprises all aspects of its implementation. As per the reference of previous work, EA can deliver multiple IT benefits, such as flexibility [36], better IT alignment and conversion [37], and an enhanced IT platform [38]. Some researchers associate EA benefits to its products that can provide a complete package for particular tasks [20], whereas some relate it to the services provided by EA in the form of software to improve business process regularization [39], increase operational capacity [40], and improve automatic processing [41]. It highlights the numerous EA benefits identified in previous work.

After reviewing previous work it is evident that researchers found difficulties to properly categorize them in order. It further requires a deeper understanding and empirical testing to collect proof for categorization of EA benefits [32]. Some also categorize the benefits as tangible and financial benefits from EA, defined as corporate acquisition [28], IT cost reduction [41], and business' financial growth [42]. Others consider the non-financial benefits, also known as intangible benefits, that can be achieved through EA. From this perspective, there are numerous benefits identified, such as resource utilization, customer satisfaction, service improvement, and others [42]. The indirect impact of EA is ongoing in research, where more case studies or empirical research can provide a better understanding of EA and organizational benefits.

As discussed earlier, somehow EA benefits are categorized in different dimensions, but still, due to its vast implementation, this research field is actively progressing. To be more specific, this study is only focused on the list of benefits known as organizational benefits. The organizational benefits are known as long-term achievements of the enterprise that can be accomplished through the successful implementation of EA. The organizational benefits are directly and indirectly associated with different EA components like projects, services, and products [4]. They proposed three major dimensions: business agility, competitive advantage, and increased value. The idea of integrating these three dimensions with other measuring factors was introduced and validated through empirical research [31]. In addition to these three benefits, we integrated multiple supporting measuring factors for each benefit extracted from the literature review, as shown in Table 2. As far as organizational benefits are concerned, another idea presented by [11] to measure the benefits of the enterprise systems, which is one of the products of EA, is selected in this research and placed under these three main dimensions, as illustrated in the following table.

**Table 2.** Taxonomy of EA organizational benefits.

| Organizational Benefits | Measuring Factors | Description | Author and Year | Reference |
|---|---|---|---|---|
| Business agility | Changes in the environment | The extent to which the EA creates positive changes in the organizational environment. | Foorthuis, 2016; Teece, 2016 | [20,43] |
| | Respond effectively | A better use of EA services to respond to the query effectively. | Foorthuis, 2016; Kappelman, 2008 | [20,44] |
| | Increasing the operational capacity | The EA can improve the operational and working capability. | Carugati, 2020 | [45] |
| | Adoption of new technologies | EA framework is scalable and can adopt new technologies. | Shanks, 2018; Radeke, 2010 | [31,46] |
| | Expansion into new markets | The extent to which the organization can increase its capital. | Hazen, 2017 | [17] |
| | Changing work pattern | EA offers new and flexible working patterns. | Lange, 2012 | [47] |
| Creating competitive advantage | Higher return on investment | The extent to which the organization can generate higher returns as compared to competitors. | Lange, 2016 | [21] |
| | Better strategic alignment | EA positively aligns business strategies with IT resources. | Tamm, 2015; Maçada, 2012 | [48,49] |
| | Focus on customer and market | EA products support customers and market. | Radeke, 2010 | [46] |
| | Focus on business process | The extent to which EA improves the performance of business processes. | Shang, 2000 | [50] |
| | Focus on overall performance | EA can improve the level of organizational performance. | Lux, 2010 | [38] |
| | Integrating strategy and execution | The valuable integration of business strategy and its execution. | Toppenberg, 2015; Shanks, 2018 | [28,31] |
| Increase value | Ability to deliver better customer service | Extent to which EA enables delivery of better services. | Ross, 2006; Shanks, 2018 | [10,31] |
| | Deeper knowledge of the customer | EA-gathered extra information about customers. | Ross, 2006; O'Cass, 2013 | [10,51] |
| | User empowerment | EA support for proactive autonomous work and performance. | O'Cass, 2013 | [51] |
| | Building a common vision | The extent to which EA builds company's common vision. | Shang, 2002 | [11] |
| | Increased employee morale and satisfaction | The degree to which employees supported efficient and intelligent working environment. | Niemi, 2019; O'Cass, 2013 | [4,51] |

Our primary data source is based on the extracted list of EA's organizational benefits shown in Table 2. The basic idea is constructed using the findings of [11,31]. In addition, this research has enhanced the primary data by covering other previous work that proposed other EA measuring factors. The main approach in this study is to identify and integrate EA organizational benefits, verify from experts, and validate through a case study.

## 3. Research Methodology

This section describes the stepwise approach undertaken in this study to answer the research question. This study's research method is a combination of case study, interviews, grounded theory, and qualitative analysis. The idea presented in this study provides insight into measuring the benefits of EA in an organization. The research methodology is applied in three major steps: (i) primary findings from the literature review, (ii) refined through experts' opinion, and (iii) validated through a case study.

Firstly, we refined the primary finding through EA experts. The main purpose of meeting with the experts was to take their opinion on extracted factors of EA benefits as shown in Table 2. In addition, we investigated accordingly to understand and identify the measuring criteria for each benefit. Ultimately, with the help of experts' opinions, the model was refined with multiple lists of criteria. The findings of the interview sessions are discussed in Section 4, whereas the list of experts and their characteristics are explained in Section 3.2.

Secondly, the refined construct was applied to a case study to measure the EA benefit. Thus, the main part of the model validation was the discussion with the case study—a large automobile manufacturing industry operating in Pakistan. The selected organization is a large-scale organization, dealing with a good number of customers and employees. A detailed summary of the organization and its EA products is presented in Section 5.1. The case study approach has been supported by [52] for the research idea that requires an in-depth analysis of different organizational and behavioral factors. Furthermore, the case study approach provides the space to explore multiple ideas: (i) for the researchers to observe interesting facts and practice applying them in an organization, (ii) and to develop a strong result to support the proposed research paradigm [53]. The case study approach has largely supported and applied in different studies related to ICT investments and evaluation [49,50,54,55].

Moreover, the research was inspired by the approach of grounded theory [56] to extract innovative ideas and associate the discussion of participants with research questions and variables. Grounded theory is an impressive approach for building association in collected data through interviews or observation, as well as for understanding any organizational insights [57]. Therefore, through the interview sessions we extracted the main attributes related to EA and organizational benefits to support the research idea. The research development was further enhanced with the help of interviews and experts' opinion.

The qualitative data analysis was applied in interview sessions to generate pieces of information to support each research factor. The qualitative approach is feasible where organizational context, behavior, environment, and deep analysis are required to justify the findings of the research [58]. Mostly, qualitative data analysis is feasible for an issue that requires the examination of multi-dimensional and dynamic variables using methods such as observation, interview, and personal experience [59]. The research performed several steps to extract the findings from the discussion with EA experts. The stepwise research approach is shown in Figure 1 and is further explained in the subsequent sections.

### 3.1. Primary Findings

Our literature review established the base for this research. Previous work discovered different studies that proposed conceptual and theoretical models and methodology of EA [23,60]. The following are the highlights of primary findings of this study:

- Researchers described the EA implementation in three different interconnected processes, like decision making, architecture, and implementation [22].
- Previously, most of the research was more focused on presenting the conceptual models of EA [23,24]. For example, [26] proposed a conceptual model of EA and organizational benefits using different factors, such as competitive advantage, customer value, cost-effectiveness, and system integration.
- EA provides support to different services, products, systems, and business goals [36].
- EA generates multi-dimensional benefits for organizations [20].
- EA framework has a variety of products with their implications, the identification of these benefits is still complex [4].
- Apart from the previous work presented in this field, a deeper understanding and empirical testing are further required [32].
- The major categorization of EA and organizational benefits extracted from previous work are business agility, creating competitive advantage, and increase value [31].
- With the help of our vast literature review, there are several measuring factors identified for each of EA's organizational benefits, as shown in Table 2.
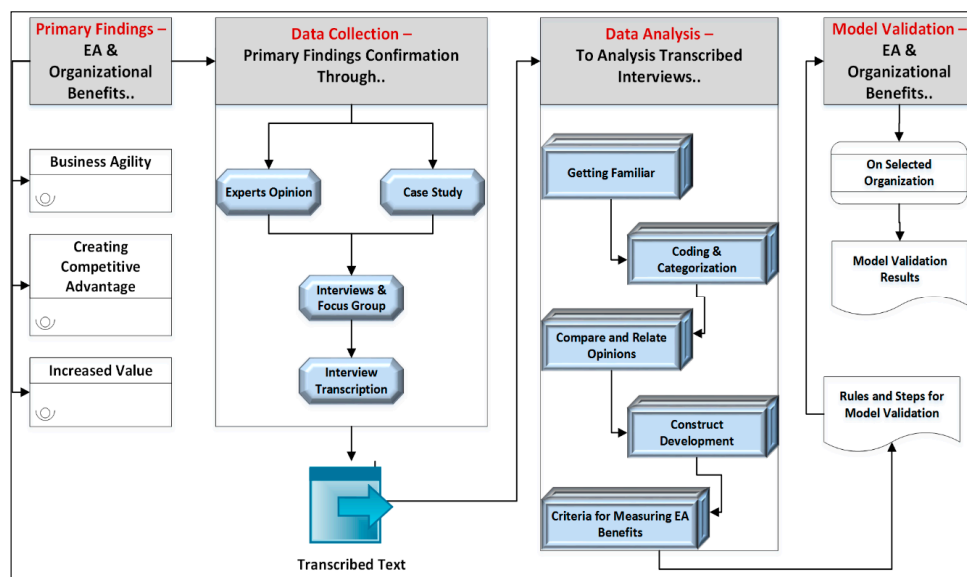
**Figure 1.** Stepwise research approach.

*3.2. Data Collection Process*

In this study, we have taken the primary findings from the literature review in front of experts to refine the collected data. The refinement process was applied with the help of EA experts. For this, seven experts were selected in this study and all of them were practicing and working in different Pakistani industries. Their complete information was kept anonymous because of privacy issues, but some of the characteristics are mentioned in Table 3.

**Table 3.** List of EA experts.

| Participants | Abbreviation (as Used in Section 4) | Experience (Years) | Organization |
|---|---|---|---|
| Enterprise Architect | EA | 10 | Automobile manufacturing |
| Business Architect | BA | 8 | Public educational institution |
| Project Manager | PM | 9 | Automobile manufacturing |
| Application Architect | AA | 6 | Automobile manufacturing |
| Organizational Architect | OA | 10 | Public educational institution |
| Chief Information Officer | CIO | 8 | Health organization |
| Technological Architect | TA | 7 | Health organization |

Several sessions were conducted to take their opinion. Based on their availability and time constraints, some of the interviews were collected electronically; some live sessions were also part of this study. Therefore, we can say that the interviews were semi-structured. During the live session, cross-questions were asked for further understanding. All of the experts had more than five years of experience in this field and had been working in the middle and upper hierarchy. They had vast experience in EA use, implementation, and pre/post evaluation of EA products.

In the beginning, different questions were asked in warm-up sessions to match the level of the researchers' understanding and EA experts'. The warm-up questions were also asked to create the pace for the discussion. Furthermore, the extracted EA benefits were presented to them in order to take their suggestions on measurement of those factors. As a whole, the summary of interviews is presented in Section 4, which is categorized according to each benefit. Finally, the sub-criteria

suggested by interviewees are presented in Table 4, which will be considered as a basic guideline in model validation. To check the validity and reliability of the findings generated from the interview sessions [61], the transcription of each interview was cross-checked and presented to the interviewees to obtain their consent. Also, some findings were validated through documents and reports collected from the interviewees provided to the researcher as supporting materials.

**Table 4.** Guidelines to measure the benefits of EA (Extracted from Interview Sessions).

| Organizational Benefits | Measuring Factors | Measuring Sub-Criteria |
|---|---|---|
| Business agility | Changes in the environment | • Changes in business domain<br>• Changes in IT infrastructure<br>• System integration |
| | Respond effectively | • Fast query response<br>• Time duration between query and response |
| | Increasing the operational capacity | • Overall cost efficiency<br>• Improved productivity<br>• New operational plans |
| | Adoption of new technologies | • IT conversion process<br>• IT–Business alignment<br>• Performance measurement |
| | Expansion into new markets | • Product development<br>• New marketing campaign<br>• Number of customers |
| | Changing work pattern | • Generating online templates<br>• Automate business processes<br>• New services performance |
| Creating competitive advantage | Higher return on investment | • Net benefits calculation<br>• Benchmarks |
| | Better strategic alignment | • Project success rate<br>• Project alignment with strategies |
| | Focus on customer and market | • Set customer's priority<br>• Customer–product ratio |
| | Focus on business process | • Process analysis<br>• Process re-structuring<br>• Process–resources utilization |
| | Focus on overall performance | • Review and analyze processes<br>• Review performance metrics |
| | Integrating strategy and execution | • Identify objectives and output<br>• Develop proper planning<br>• Step-wise execution |
| Increase value | Ability to deliver better customer service | • Interactive customer service<br>• Work on customer's feedback<br>• Response time |
| | Deeper knowledge of the customer | • Knowledge management<br>• Association with customers |
| | User empowerment | • Work delegations<br>• Greater employee involvement |
| | Building a common vision | • Team work performance<br>• Conflict measurement |
| | Increased employee morale and satisfaction | • Performance of decision making tools<br>• Problem solving<br>• Better business performance |

### 3.3. Data Analysis

In this phase, several steps were taken to analyze the data collected during the interview sessions. First of all, interview sessions were transcribed and presented back to the interviewees to obtain their approval on the written content. Some alteration was performed based on the suggestions given by the interviewees. Later on, the final transcriptions were loaded and analyzed through Atlas.ti [62], a tool used in qualitative research and for interview analysis. The memos, coding, and categorization steps were applied in the Atlas tool, to create relationships among the opinions given in different interview sessions. The screenshot of coding step is shown in Figure 2. The detailed findings of the interview analysis are presented in Section 4 and Table 4.
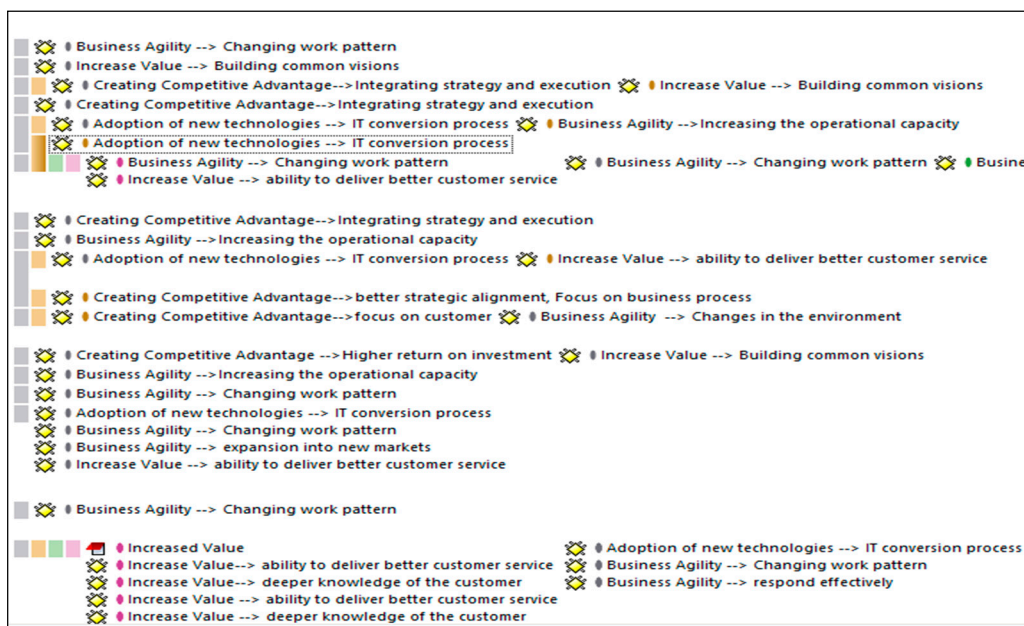


**Figure 2.** Coding steps.

### 3.4. Model Validation

Finally, after multiple steps were applied to refine the primary findings, the proposed model for measuring organizational benefits of EA is shown in Figure 3. The proposed model is a visualized form of the extensive literature review presented in Table 2. The purpose of this validation step was to verify the proposed model through a real case study to measure the benefits of EA. As a first step, the proposed framework was refined by EA experts, as discussed in Section 4. In addition, the guidelines for model validation were also identified during the interview sessions (Table 4). The details of the case study, used products of EA in the case study, and the validation process are explained in Section 5.
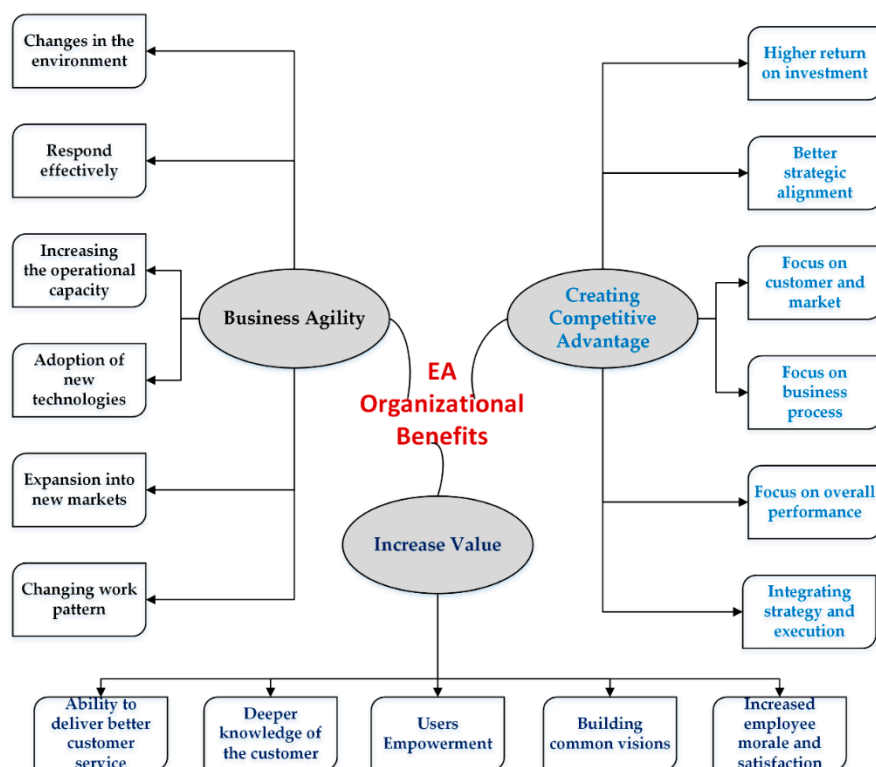
**Figure 3.** The proposed model for EA and organizational benefits.

## 4. Findings from Interview Sessions

There were a total of seven interview sessions conducted at different times and locations. The interview sessions were semi-structured, where the common concepts, objectives, products, and benefits of EA were part of the discussions. To stay on track, the questions were related to EA benefits and to finding out the measuring sub-criteria for each measure. The discussion during each interview session was at least one hour or more. This section summarized the highlights of all interviews. For a clearer understanding, the interview highlights are presented under the category of each organizational benefit, like "business agility", creating competitive advantage", and "increasing value". Finally, at the end of this section, we provide the major findings of the interviews in the form of "guidelines to measure the benefits of EA" (Table 4).

Business agility is one of the organizational benefits that can be achieved through EA implementation, as mentioned in the proposed model. During the interview sessions, we asked their opinion on EA and business agility and its corresponding factors and how to measure these factors. The summary of interview sessions about EA and business agility discussed are as follows:

*EA and organizational benefit—"business agility"—interview highlights.* "Normally, as a *BA*, the strategy we built is fully consulted through other architects working in the company. The business strategy is always developed based on the availability of resources and products", the participant *BA* added his opinion. The list of the benefits was shown to all participants in different sessions. Regarding the EA impacts on business agility, the participants showed their interest towards its acceptance.

Most of the participants fully agreed with the instrument and the list of the benefits initially proposed by [31]. The participant *OA* from educational institute further added here, "having EA as the main enterprise framework, it eased the approach to do required changes in any process, as well as the implementation of new rules and policies is a part of execution".

Overall, all interviewees showed their support and confidence towards the statement that "Business agility is one of the major organizational benefits that can be achieved after successful

implementation of EA". According to the *PM* who belongs to the automobile manufacturing industry, "it is not about to plan and manage organizational internal processes, but EA work as a complete package, the future prospects, competitors information, deep knowledge about customers, and it may change overall vision of the employees".

In response to the question about integration and adoption of new technologies with the existing business scenario, the *TA* (health organization) explained, "indeed it is not an easy task, where a single mistake can create a massive mess and can disturb the overall working capabilities ... although, proper and step-wise implementation with testing strategies may avoid these issues".

In addition, the *CIO* added the important point here regarding the adding of the new service, product, or new technology, he said, "the real achievement is not about implementing the new services, products or technology, the essential thing is to get the results out of it by improving the operational capacity" ... that was a really important point he made, especially as he is working in a health organization. Actually, operational capacity is one of the elements of business agility that can be achieved through IT investment and also discussed by [40] in their published article.

Regarding the question about major difficulties with EA implementation, the enterprise architect explained, "the real problem occurs when the *planning team* develop a strategy that does not match with the application requirements or supported by existing architecture", in addition, the statement given by enterprise architect, also supported by other interviewees. The *CIO* further added here, "by implementing EA is not about getting the corporate benefits only but it also provide different values to the company's employees and customers".

Finally, as a part of this research to validate the proposed model, we asked the participants to provide feedback and their input on measuring business agility factors that were presented to them. Table 4 illustrates the summary of the discussion in the form of additional sub-criteria extracted during the discussion.

The next EA benefit discussed during the interview sessions is known as "creating competitive advantage". According to the proposed framework, there are six measuring factors extracted from the literature review. During the discussion we asked their confirmation about the list of benefits, where all the participants supported the construct. In addition, for each measuring factor, we asked for suggestions on providing the measuring criteria. The measuring sub-criteria are shown in Table 4, whereas the summary of the interview sessions is explained below:

***EA and organizational benefit—"creating competitive advantage"—interview highlights.*** "When it comes to creating a competitive advantage, this is an important organizational benefit can be achieved through EA implementation", says an enterprise architect from automobile company. "From an organizational point of view, integration of strategy and execution ... is quite challenging, as it requires support from other architect and EA products", the statement supported by all interviewees.

It is always the main motto of the organization to put special focus on customers, business processes, and market situation. "Did you find it complex to manage"? "We have a number of EA components, such as business modeler, knowledge management, and solution providers, with positive support and possible alteration in a specific system we can achieve the target successfully ... Although, regarding the market situation, we need to keep our eyes on the list of competitors, and also to provide extra support to the customers to keep them loyal and connected with our services", explained by *TA* and *CIO* from health organization.

The company creates a competitive advantage in many ways, but it critically depends on the time of strategy development and used approach says *BA*. He continued, "For example, if a management strategy is feasible from all aspects but the delay or early in implementation ... it cannot generate potential benefits". "Overall, the organizational culture plays a significant role in generating a higher return on investment and create a competitive advantage", an interviewee elaborated more in this regard.

The findings of the interview illustrate that the parameter added in the instrument to measure the competitive advantage was fully supported by interviewees. In particular, attributes such as focus on

the customer, market, and business processes were voted as more important than others. The enterprise architect also put extra importance on the attribute "integrating the strategy development and its execution", which requires proper planning and utilization of resources.

During the conversation with different participants, it was noted that a powerful strategy should involve a complete business model, that is the main functionalities of enterprise architecture framework, such as a business modeler. "The design of the business model is based on the organizational policies and other criteria as well", *BA* (from educational institute) added this point.

From the company's point of view, they always struggle to be noticeable and profitable among the list of competitors. At this stage, to get a more clear understanding form the EA experts and practitioners, the question asked from the interviewees, "Is it quantifiable to know about the performance and market standing in front of other competitors?" The *BA* made a notable remark on this question, "Indeed, there is no clear cut formula or equation to know the market standing, since it requires regular monitoring, benchmark, and list of criteria to be measured thoroughly". The interviewee further added that "Somehow, from tangible like financial perspective, it is measureable by looking at the company's capital and net profit . . . . but non-tangible benefits such as customer satisfaction with your product, their trust on the company, or employee efficiency . . . . these types of measurement factor requires multiple dimensions to be covered".

The discussion led to the point where the researcher asked their opinion on defining the measuring criteria for each measuring factor that could help the researcher to measure the performance of organizational benefit i.e., "creating competitive advantage". Table 4 summarizes the findings of this question, as mentioned in measuring sub-criteria column.

The next and last category of EA benefits investigated in this study was "increase value". The concept of creating values is defined as a number of non-financial benefits, EA implementation can provide to the organization. The concept of value is commonly known as a non-financial benefit an organization can achieve from any project [11]. In this regard, the researcher extracted the number of values proposed in previous work related to EA use and implementation. During the discussion with the experts, the idea was positively supported by all of the interviewees and the level of acceptance was high. Specifically, a deeper knowledge of the customer, employee satisfaction, and improving business efficiency were explained as the main motives of EA products. The following are some opinions received from the interviewees that supported the research idea that "EA products can increase potential values to the organization".

*EA and organizational benefit—"increase value"—interview highlights.* In addition to the financial benefits, EA generates a major positive impact on the organization by increasing its value. For sure, "EA framework supports the organization in digital transformation that initiated many values to the organization, not only to the customers but employees as well", the *PM* from automobile company provided a healthy argument. The *TA* further added to it, "However, the transition and implementation of EA follows the structured list of processes, where the performance of the technological resources is much important than others".

Similarly, the *AA* explained, "obviously, it's a joint effort, EA framework supports internal and external processes and business models that generate enormous values". Meanwhile, "we need to the know the difference before and after implementation, the things that are clear enough to us are better engagement and fast response to the customers, improved employees working capability, and overall moving towards digitization", a clear point made by the enterprise architect.

Consequently, "Is there any resistance recorded from the employees for these radical changes?" The researcher continued the discussion by asking the question. "Integrating system and transition process always bring changes, naturally . . . the employees feel uncomfortable in the beginning, . . . and for sure we don't blame them. Ultimately, the overall scenario is for the sake of organizational benefits and values, they have to compromise and start feeling the positive change", the *OA* from educational institution answered. The PM further added to this point, "In this way, the major step is to empower

the users to work in a relax environment, where there will be some space for the mistakes, indeed . . . . user empowerment is the main value that EA can bring to the organization".

As a reference to the previous work, the researcher put a statement that "Enterprise architecture supports knowledge management and business intelligence [63], what is your opinion about it. The point made by *BA* from educational institute, "the enterprise architect provides a platform and support for different projects, knowledge management is one of them. It creates deeper knowledge of the customers, directly and indirectly, that can be extracted from multiple applications. The use of that knowledge can improve better delivery to the customers and can improve employee's morale and satisfaction as well". Finally, we asked their opinion to measure each measuring factor, the findings are shown in Table 4.

Finally, the same theory was applied here as well to get some list of parameters that could be used to measure each factor. Based on their vast experience and a significant role they played in EA implementation and measuring its impact, participants highlighted different parameters. As a major finding, we used the following guidelines during model validation in a case study. Table 4 illustrates the measuring sub-criteria for each measuring factor corresponding to three major benefits of EA, which were further validated through a case study in the next section.

## 5. Model Validation Using Case Study

The final phase of this research is to validate the model as depicted in Figure 1, the research methodology steps. Basically, the validation in this study is based on the overall findings gathered in the previous steps. It took lots of time and effort to perform the investigation through interviews. Further, the transcription of the interviews, coding, categorization text, and associating the keywords with the research parameters helped us to refine the proposed model (Figure 3) and generate the number of guidelines (Table 4) to validate the model.

To validate the model, we selected a large automobile manufacturing industry operating in Pakistan. The main purpose of this step was to check the credibility of the model and to know its execution in a real-world case study. The validation step can also explain whether the model and its parameter fit into the real scenario. The selected case study had implemented the EA architecture for more than seven years and gradually improved and installed the EA product according to the company's budget and business requirements. Before moving to the discussion, the following sub-section describes the background of the company, EA product and status of implementation, and major processes of EA.

### 5.1. Case Study–Summary

As discussed earlier, the selected case study is a large automobile manufacturing industry (the real name kept confidential due to privacy and the company's policy) dealing with different internal and external stakeholders. Mainly, the organization is providing services to the different small industries and workshops dealing with automobile parts. The company is operating and playing a big part in the country as an importer and distributor. As an importer, the company has a contract to bring parts and products to the country and work as a distributor to provide the services to the collaborators working inside the country.

The basic introduction in the above paragraph clearly defined the size and working scenarios of the organization selected for model validation. It also identified that the company possesses multiple lines of business dealing with different stakeholders, partners, and collaborators. "Fortunately, the EA framework is there and implemented on time providing support in all of our business processes. The multitude of development is consistently progressing and EA is there to integrate new products based on the business requirement", the business architect explained in the answer to the question asked by the researcher regarding EA support to the organization. One of the members of the EA council added further that, "Overall, the EA implementation carried out in multiple scenarios and layers. It has integrated several existing applications and business management systems, where the

EA umbrella keeps connecting all operational, organizational, business, and management activities. Mainly, it allows us to align business processes with IT infrastructure, but there are other products as well working independently in streamlined dedicated channels".

During the initial investigation, the researcher got the working architecture of EA in a case study. The EA team divided into different layers as per the EA architecture or product. Each working architecture and product of EA had its own director, coordinator, and other team members. Apart from that, there was a central team consisting of decision-makers, program director, functional leader, business manager, chief information officer, technical director, and others. For any amendment, the concerned product team director would submit the project proposal to the EA council. The EA council would look at the project proposal and decide according to the requirements and available investment funds, but it is a very common procedure in the company. Based on the discussion, the researcher designed a conceptual map of the EA framework already implemented in the organization and working properly, illustrated in Figure 4.
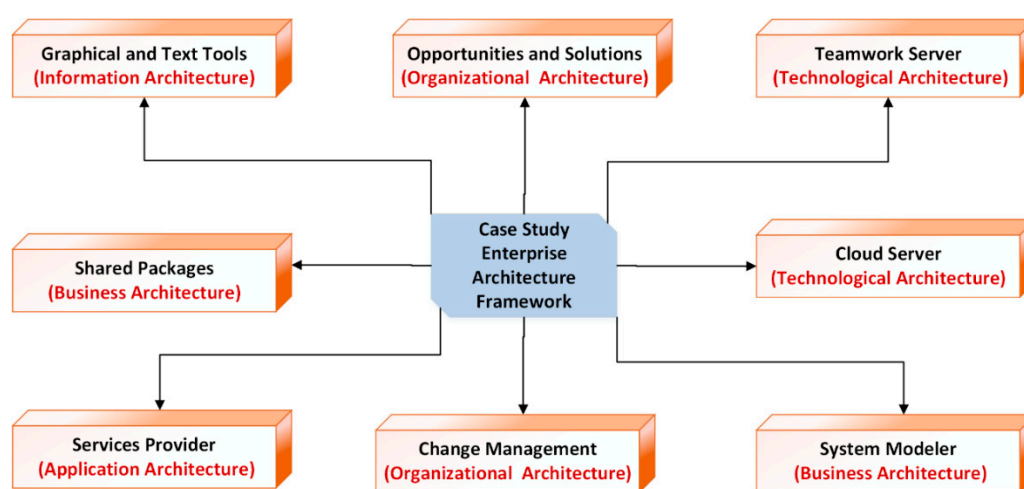


**Figure 4.** Case study—EA framework.

*5.2. Discussion on EA and Organizational Benefits in a Case Study*

This section presents the discussion with the case study in which different stakeholders participated, such as enterprise architect, decision-maker, project director, technological architect, and others. Model validation was based on the guidelines provided in Table 4 that were created based on the discussion with the experts in the previous phase. Basically, the study was based on qualitative analysis, where the list of benefits was associated with measuring factors. The major finding of the study was to identify sub-criteria or parameters to measure EA benefits. In addition, we validated the model with the help of another case study to understand how the model fits reality.

Altogether, there were 17 measuring factors connected with 3 major impacts of EA on the organization. The list of criteria was of descriptive nature, therefore it was quite challenging and complex to assess those criteria. Due to the framework's nature, the list of evidence and answers from the stakeholders was collected and presented using an informative approach. The framework was applied to discuss and take their opinion on each measuring factor. The findings from the case study are presented in the following three tables. For some attributes, the case study participants provided answers with descriptions, while for some attributes they explained the wokrings of the measurement procedures. The highlights of the findings were summarized by the researcher in a descriptive manner as shown in Tables 5–7. The tables (column: "Response from case study") explained their responses in reply to the question written in Table 4 (column: Measuring sub-criteria). Moreover, for greater understanding, we further asked to rank each sub-criteria (out of seven) based on their experience.

Figures 5–7 show the score given by enterprise architecture, decision maker, and project director of the case study, which highlights the importance of each measuring factor.

**Table 5.** The impact of EA on business agility in a case study.

| Organizational Benefits | Measuring Factors | Response from Case Study |
|---|---|---|
| Business agility | Changes in the environment | • The major impact of EA is to improve working capability and business performance.<br>• It actually helped us to deal with several changes in the business and technological domains.<br>• This attribute can further be measured through:<br>　○ # of positive changes.<br>　○ # of integrated system in past years.<br>　○ # of IT alignment with business changes. |
| | Respond effectively | • As far as query response is concerned, the EA architecture provides the platform for analyzing and responding to the received requests.<br>　○ # of queries dealing per day.<br>　○ # of decision makers meetings. |
| | Increasing the operational capacity | • The EA allows us to increase our operational capacity.<br>• The architecture is useful to connect with different channels associated with partners, warehouses, and collaborators. |
| | Adoption of new technologies | • It assists us in smooth IT conversion process.<br>• EA works in different layers and architectures, it facilitates the integration of new technologies, such as cloud, big data strategies, and others.<br>• The EA technological architecture provides flexible steps for aligning business and IT resources. |
| | Expansion into new markets | • The architecture provides fast and efficient process in dealing with partners and other stakeholders.<br>• EA has longterm influence on marketing campaigns and helps to enter new markets.<br>• The technology architecture assists to get more experienced customer data, which helps to develop complex marketing strategies in an efficient way. |
| | Changing work pattern | • The EA can generate a number of patterns based on the business requirements and objectives.<br>• Those reusable patterns and online templates support business automation and application integration. |

**Table 6.** The impact of EA on creating competitive advantage in a case study.

| Organizational Benefits | Measuring Factors | Response from Case Study |
|---|---|---|
| Creating competitive advantage | Higher return on investment | • Efficient decision-making process, building new business strategies, and full utilization of technology increases the return on overall assets. |
| | Better strategic alignment | • EA has the capability to support a scalable business environment.<br>• Project development is based on business strategies.<br>• The support from technical and business applications creates the best strategic alignment. |
| | Focus on customer and market | • The EA framework's customer-oriented capability creates a positive relationship with the customers and market personnel.<br>• The data architecture generates policies, strategies, and models based on customer and market data. |
| | Focus on business process | • Business process design is one of the main functions of EA.<br>• It has a prominent impact on business performance improvement. |
| | Focus on overall performance | • The main concern of EA implementation is to improve the overall performance of the organization.<br>• Process alignment, net profit, productivity, and other metrics can be used to measure the performance after EA implementation. |
| | Integrating strategy and execution | • The EA does not only support in building strategy, but also it continuously provides assistance until its execution.<br>• EA assists in a step-by-step approach in building and executing business strategies.<br>• The data and business architecture help to create automatic business models and strategies. |

Table 5 presents the impact of EA on business agility collected from the case study. The discussion with the participants was rich, but we provided only the highlights as most of the measuring factors were subjective and could not be directly measured in a quantitative manner. According to the table, all of the measuring factors were clearly supported by all the participants. There were some responses, for example the factors "changes in the environment" and "respond effectively"; the participants also provided some variables that could be used to quantify these measuring factors. For other factors, they responded by sharing their experience and explained the EA role to achieve these factors.

Figure 5 illustrates the ranking of each factor that was investigated by major stakeholders in the case study. The main purpose of getting these numbers was to identify the importance of the measuring factors proposed in this research. Based on the case study, the table highlights that "changing work pattern" and "adoption of new technologies" were the major impacts of EA, which got a high rank from each stakeholder. It can be further elaborated here that EA generates a multi-dimensional impact for business agility, but these two factors can be at the top of the list. The figure illustrates marginal difference in opinion of all major stakeholders, which highlights the high level of agreement with the factors presented under this category.

The next result presented in Table 6 is about how EA generates benefits in creating competitive advantage. Better strategic alignment and focus on the market were some of the main factors investigated through the case study. The table highlights that the efficient decision-making process, scalable business environment, process alignment, and proper coordination between technical resources and business application are the kind of variables that could be used to measure these benefits. The EA supports business growth by placing a special focus on market, customer, and business process. Its capability to generate higher return on investment is another point that can help to enhance the financial benefits.

**Table 7.** The impact of EA on increased value in a case study.

| Organizational Benefits | Measuring Factors | Response from Case Study |
|---|---|---|
| Increase value | Ability to deliver better customer service | • Its ability to deliver better customer services with the help of business and IT architecture. The data architecture models improve the dealing with the customers. |
| | Deeper knowledge of the customer | • Association and clustering of customers based on their feedback and purchasing history. <br> • The data and business architectures work based on knowledge management. <br> • EA helps to create strong and positive relationships with the customers. |
| | User empowerment | • Designated and relaxed environment for employees is the fundamental approach of EA. <br> • Its working environment supports teamwork and authenticated workgroups facilities. |
| | Building a common vision | • EA framework's boundaries ensure the employees think, work, and progress in the same direction. <br> • Interconnectivity, trust, and dependency between the architectures help to avoid any conflict. <br> • The EA vision complies with the company's vision; ultimately, it develops a common vision for all employees as well. |
| | Increased employee morale and satisfaction | • The secure, safe, and scalable environment automatically increases the employees' satisfaction to work independently. <br> • The decision-making process helps to take decisions quickly and reliably. |

In addition to the above table, we asked from the selected participants to provide their opinion on each measuring factor using a 1 to 7 ranking system. For this, enterprise architecture, decision maker, and project director selected from the case study. The result is shown in Figure 6 and it can be evident that the minimum rank we got was 5 out of 7, that is low level of acceptance. Although, most of the items got ranked high, which can be explained as highly accepted. The purpose was to bring some information to the readers to understand the importance of each measuring factor, and, further, these factors can be implemented in a case study to review the EA benefits.
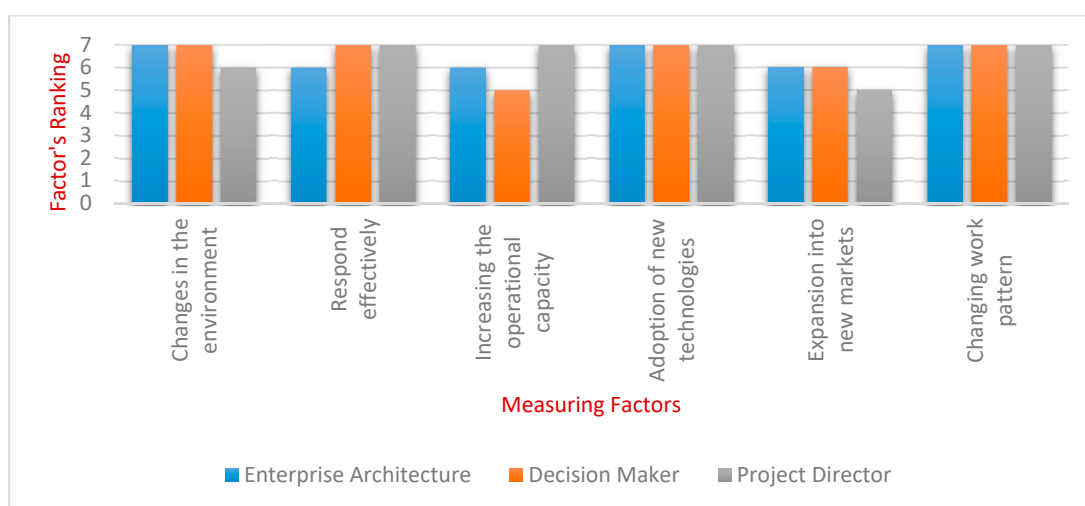


**Figure 5.** Scores on measuring factors of business agility.
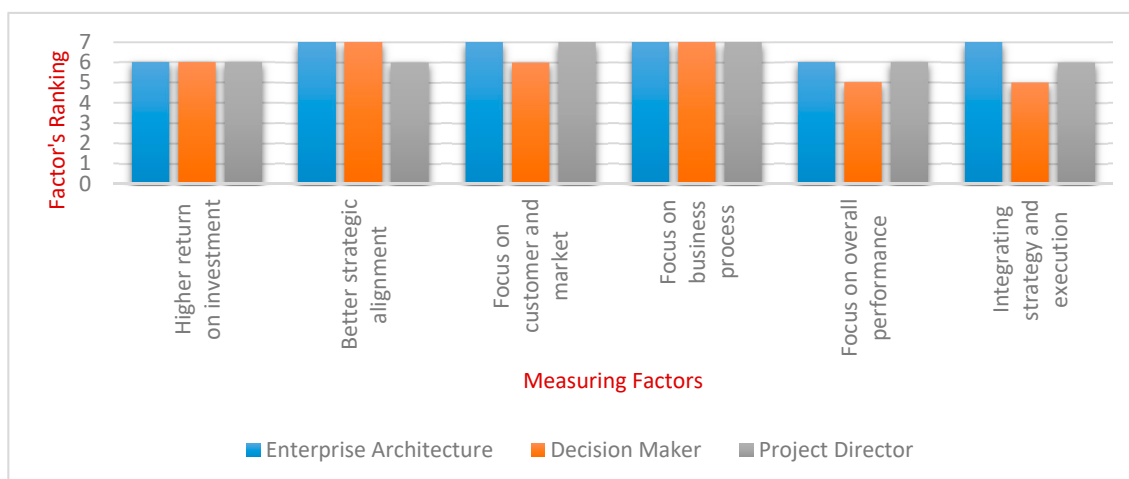
**Figure 6.** Scores on measuring factors of creating competitive advantage.

Finally, the last category of EA and organizational benefits investigated in this research is known as "impact of EA on increase value". Apart from the previous two dimensions, this dimension consisted of qualitative measuring factors completely, based on its name, "increase value", which is the concept of talking about non-financial benefits known as "values". There are five different measuring factors examined for this category, as mentioned they can only be measured in descriptive manner. Therefore, Table 7 displays the responses from participants that showed some proof that can be useful to understand the benefits they have already achieved after implementing the EA in their organization.

In the same way as applied to other dimensions, at this point we asked the three major stakeholders to rank each measuring factors, shown in Figure 7. The figure illustrates important findings of this research to understand and prioritize the measuring factors under this category while evaluating the impact of EA.

The above discussion highlights the importance of the proposed model and its validation steps. It is evident that the EA framework creates a large impact on businesses known as organizational benefits. The researcher came up with the three major benefits and its corresponding measuring factors. The research investigated a number of benefits that can be achieved through EA, in addition, the sub-criteria are collected that are associated with each organizational benefit. The research performed a detailed analysis to find out the association between different measuring factors and sub-criteria. The main findings of this research is the integrated model, which is based on the comprehensive literature review. Furthermore, the proposed model verified through experts opinion and validated using a case study. During the validation process, the researcher tried to answer each sub-criteria with the case study's participants' help. The validation process illustrates the possible implementation of the model for evaluating the EA benefits. As the research focused on the qualitative approach, therefore, the output was presented in a descriptive manner. For greater understanding, the scores given by different participants in a case study for each factor explained more about EA and its importance for the organizations.
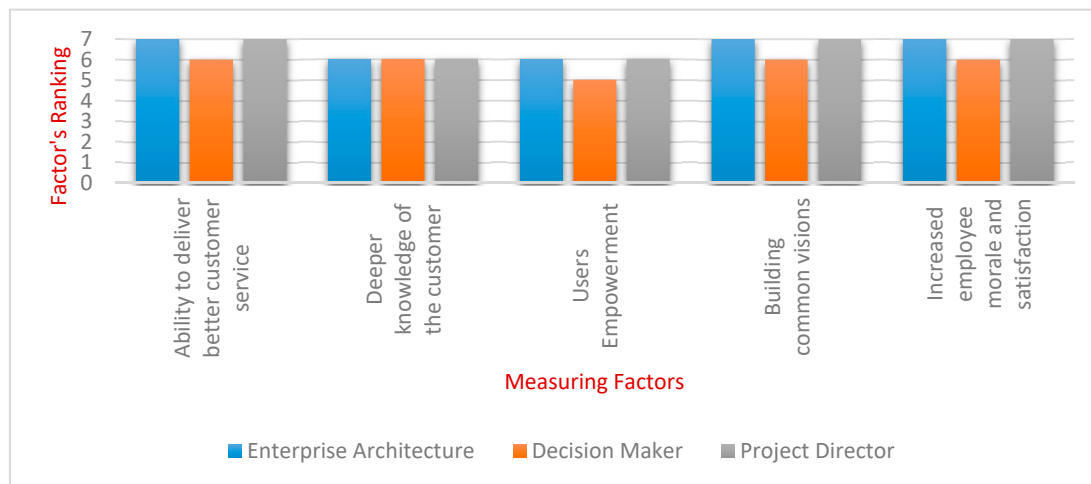
**Figure 7.** Scores on measuring aactors of increase value.

## 6. Conclusions

The EA framework generates a large impact on organizations from the business, technical, and management perspectives. In this study, we focused on the realization of EA benefits using an extensive approach. The overall research approach consists of several steps starting from the literature review, confirmation from experts, and validated through an in-depth case study. As per the discussion with different experts, it is evident that the EA measurement process is not an easy task and cannot be accomplished in a single run. It requires several steps to measure the direct and indirect benefits of EA from different perspectives. The research focused on extraction and validation of a number of EA benefits in multiple ways. We provided the enhanced version of EA benefits' framework by collecting the number of evidence in regard to EA and its impact. The research extracted three major benefits (business agility, creating competitive advantage, and increase value) related to EA products, services, and strategies. In addition, we enhanced the initial model by adding number of measuring factors and sub-criteria, to make the measurement process easy to implement.

The findings of this study are important in a way that they provide a methodology and guidelines to decision makers and researchers to measure the impact of EA. The study also supports the framework by validating it using a case study, while the validation tables provide the discussion with different stakeholders in a case study. It further explains the number of steps to measure the benefits of EA implementation. The main limitations in this study are a limited number of experts and a single case study used during the investigation. In the future, the number of benefits can be increased by replicating the idea and by improving the number of experts and case studies. The idea of improving the number of benefits can be achieved by discussing it with different experts working in multiple organizations. The number of dimensions can be sub-categorized based on further analysis on its measuring items. As EA cannot work as an individual entity, EA is a complete package that provides a platform to join different internal and external applications. Therefore, its integration with other system, its role and support for digital transformation are some areas that can be discussed in the future. Finally, to conclude this study, EA is not a single application, it is a complete framework, associated with many applications, systems, and communication channels. Therefore, its impact is dynamic and can be measured through different aspects, from planning to execution and afterward.

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