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Enterprise Architecture: A Business Value Realization Model

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Received: 30 July 2020; Accepted: 7 October 2020; Published: 14 October 2020

Abstract: Today, as organizations face constant change, they must rapidly adapt their strategies and operations. This involves continuous business transformation. However, guiding and managing such transformation can be an intimidating task because of organizational complexity. Hence, organizations resort to Enterprise Architecture (EA) to address this complexity and achieve their transformation goals. Nonetheless, there is a lack of research on EA benefits realization and a dearth of conclusive evidence on how EA enables business transformation and delivers value to organizations. Therefore, this research uses a case study method to explore how EA investment is converted into organizational value. This research makes two contributions. The first of these is the development of an EA value realization model, which comprises three iterative and interrelated processes: the EA conversion process, the EA use process, and the EA competitive process. The second contribution is the identification of factors that may influence the value realization process.

Keywords: enterprise architecture (EA); EA business value; EA benefits; EA value realization process; case study

1. Introduction

Enterprise Architecture (EA) is defined as "a coherent whole of principles, methods, and models that are used in the design and realization of the enterprise's organizational structure, business processes, information systems, and infrastructure" [1]. It defines the baseline and target states of an organization's capabilities, processes, applications, data, and technology infrastructure. It also facilitates the development of a roadmap for achieving the defined target state [2,3].

Despite the growing interest in EA research, considerable gaps remain in the literature about EA. Two of the most notable gaps is the lack of theory-based studies of EA [4–6], and the dearth of conclusive evidence on how EA delivers value to organizations [4]. Many organizations doubt EA's potential and view it as an abstract mechanism that demands significant investment with elusive to obtain value [5]. EA benefits are difficult to attain and the EA benefit realization process itself is unclear [7].

Some empirical studies have addressed EA benefits [5,8–10]. Yet, studies of EA benefits often offer implicit viewpoints of the EA benefit realization process, e.g., [11,12]. Furthermore, studies of EA success have mostly examined the establishment and implementation stages of EA, rather than the post-implementation phases, such as EA use [5]. Despite its criticality for realizing EA benefits [6], EA use has not been extensively examined [13].

The EA value realization process has recently been explored [3,5,7,10]. However, these studies provided varying views on how to achieve EA benefits, which suggests the need for further research [5,6,14]. Despite these efforts, it is still unclear how EA business value is realized [7]. As a result, there are great challenges in implementing EA and understanding the EA value realization process [7]. Although research shows that EA can improve organizational performance, some issues

remain unexplored [8], and further research should focus on how organizational benefits are delivered by EA [10].

Considering the various benefits of EA without seeing the bigger picture cannot provide an appreciation of the benefits of EA or an understanding of the EA value realization process. A more profound exploration of the dimensions of EA benefit realizations is required [14].

The lack of an EA benefit realization process model leads to the following issues. First, such a lack means there is no common perspective on EA's capabilities development and how EA improves organizational performance. Second, it makes it difficult to communicate a strong value proposition for EA. Third, it restrains the development of a clear business case for an EA because of the ambiguous justifications of EA's business value [15].

Considering these issues, this research endeavors to provide theoretically grounded and empirically supported answers to the following questions.

1. How does EA investment lead to improved organizational performance?
2. What are the potential factors that influence EA value realization?

This study endeavors to unpack the process by which EA adds value to organizations. It aims to develop a theoretical EA benefit realization process to enrich the understanding of how EA leads to improved organizational performance. For this purpose, a process theory—"how IT creates business value" [16]—is used to connect the dimensions that support the description and analysis of the EA benefit realization process. This theory offers an analytical lens that provides insights on how EA investments lead to improved organizational performance and to identifies some of the factors that affect EA value realization.

This research uses a case study method to explore these issues, and makes two main contributions. First, this research provides an overarching model that describes and unpacks the EA value realization process. It does this by breaking the process into three interrelated processes: the EA conversion process, the EA use process, and the EA competitive process. Second, this research identifies some factors that influence EA value realization.

From a practical perspective, having answers to these research questions would enable organizations to recognize the complexity surrounding EA business value realization and better plan their EAs. These answers would also enable organizations to make informed decisions about EA investments, which most organizations are still struggling to make [6].

This section has explained the motivation for this research, and presented its objective and research questions. The following sections presents an overview of EA.

2. Enterprise Architecture

EA is a collection of models and principles that are used to design and realize organizational business processes, applications, and technology infrastructure [1]. EA encompasses current and target representations of an enterprise's business capabilities, processes, applications, and systems, as well as their interrelationships and the extent to which these assets are shared by different parts of the enterprise [3,6]. EA is both a process and products to be shared and used by different parts of the organization [7].

EA may be adopted for various reasons. It is used to manage complex business and Information Technology (IT) landscapes of an organization and to facilitate the alignment of strategy, operations, and resources [5,14]. It is also used to manage complexity and change and to enhance resources used to achieve organizational goals [6,14]. Organizations use EA for various purposes such as business transformation [4,7], strategy execution [17], business and IT alignment [18], IT standards management [12], complexity management, better communication [10], Information Technology (IT) management [19] and project compliance [10].

Enterprise Architecture Management (EAM) is concerned with the establishment and continuous development of EA [20]. It goes beyond EA modelling and focuses on EA management tasks such

as establishment, planning, governance, and architectural change management [20]. It includes the managerial activities necessary to establish, develop, and maintain an organization's EA [5]. This research addresses an important aspect of EAM by exploring the EA benefits realization process.

This study builds on previous EA benefits research since the focus of this study is EA benefits realization process. Key studies that have addressed the issue were identified and reviewed [3,5–7,10,11,14,15,21,22]. In some of these, EA benefit realization is presented as a simple process whereby particular factors are associated with particular benefits (e.g., [11,21,23]), while others studies EA suggest that EA benefits are influenced by indirect intermediary factors [3,5,7,10,22]. This research adopts a similar view to that presented in [7] whereby EA benefits realization is seen as a complex process comprising interrelated processes and relationships.

3. Theoretical Foundations

This study adopted a process theory that describes IT business value realization. This theory is based on three interrelated process models that constitute a chain of value creation as shown in Figure 1. The first model, "IT Conversion Process", describes how an IT investment is converted into IT assets. The second model, "IT Use Process", describes how IT assets produce IT impacts. The third model, "Competitive Process", connects IT impacts to organizational performance [16].

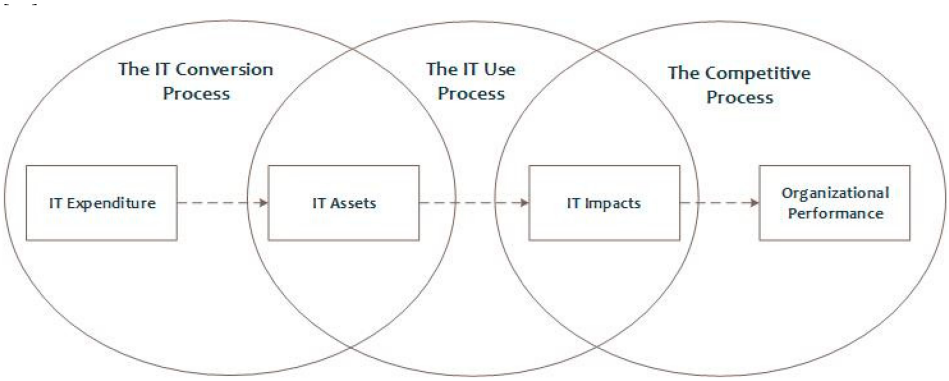

Figure 1. How information technology creates business value: A process theory [16].

The theory is developed to apprehend the process by which IT investment is converted into a preferred organizational performance. It stipulates the fundamentals conditions and a chain of events that are fundamental for achieving the preferred organizational performance. It also proposes that desired outcomes are not always achieved. It is anticipated that some important conditions or events may fail to occur at any point in the process, disrupting some or all of the preferred outcomes [16]. The theory is developed to describe how a preferred organizational performance could be achieved through IT investment, without necessarily explaining why the anticipated results are not realized [16].

In this research, that theory is used to understand the process of converting an EA investment into the desired organizational performance. It specifies a chain of events and conditions that are crucial for realizing organizational performance. It also considers that desired outcomes are not always realized. It is expected that some essential conditions or events might not happen, affecting some, or all, of the estimated outcomes [16].

3.1. The EA Conversion Process: From EA Investments to EA Assets

Based on the theory, an IT investment is an essential condition for the conversion process, resulting in IT assets. Nevertheless, converting investments into assets is not accomplished with the same efficiency by every organization, because it depends on the effectiveness of the conversion process. There are some factors that influence the conversion process such as IT strategy, organizational structure, and IT project management [16].

The same is proposed for EA. The EA conversion process examines the development of an EA investment into EA assets. An EA investment is a necessary but not adequate condition for obtaining good EA assets [16]. Converting an EA investment into EA assets is influenced by some conversion factors. For a certain level of EA funds, some organizations would successfully gain a great mix of EA assets while others would not. Investment in EA is not an adequate condition for achieving organizational benefits. Hence, it is vital for organizations to identify and build EA capabilities to enable business transformation and achieve organizational benefits [4]. Further, EA implementation should not be seen as a project that can provide immediate returns. EA requires constant and continuing development of its operations [6,24,25]. Funding EA using a project fixed-term mechanism is not suitable for EA development, and it significantly hinders the effective implementation of EA in organizations [24].

Further, established foundations such as strategically positioned EA, organizational support, EA promotion, a skilled team, and adequate funds are proposed to enable an effective EA implementation [5,8]. Similarly, established EA processes such as communication and governance facilitate the development of EA artifacts and services [14].

Therefore, this is the first process in the EA value realization model. It takes in an EA investment as a condition that is essential, yet is not adequate for generating quality assets, as the effectiveness of the conversion process is influenced by conversion factors.

3.2. The EA Use Process: From EA Assets to EA Impacts

The use process explores how IT assets are used to realize IT benefits. It proposes that for an organization to attain the value of IT impacts it must have quality IT assets [16]. In addition, IT assets must be accompanied by appropriate use if the IT impacts are to be realized [16].

In the literature on EA, activities produce various types of EA artifacts, such as architectural models, principles, standards, and roadmaps. These artifacts mostly describe some aspects of an organization such as its current state, its future state, and its transition roadmap [6,13].

These artifacts are supposed to be used. Yet, a substantial issue facing EA is the ambiguity of using EA artifacts in organizations [26]. Furthermore, having attractive EA artifacts and guidelines is not enough if they are not used appropriately [13]. Organizations often become trapped by developing EA artifacts without identifying the intended stakeholders and planning their purposeful use [13]. Large numbers of EA artifacts are often used poorly or are even found to be useless or outdated [27]. Thus, to enable the effective use of EA artifacts, it is recommended that artifacts be linked to their associated organizational activities and expected benefits [9].

The literature on EA has a strong focus on EA artifacts and their management and use, but artifacts by themselves will not bring value to an organization [3,5]. Thus, recent studies have paid attention to other dimensions of EA use such as processes, and services [3,13]. This research adopts an expanded view of EA use not only by focusing on EA artifacts but also by including other EA assets, such as EA capabilities, processes, and services.

Thus, based on the adopted theory and the material from EA literature, it is proposed that the EA use process must have quality EA assets and appropriate use of those assets to realize EA benefits.

3.3. The EA Competitive Process: From EA Impacts to Organizational Performance

Improved organizational performance is the ultimate intended outcome. Achieving enhanced organizational performance because of an IT investment requires achieving the first essential condition, "IT impacts". The "IT impacts" are considered an intermediate state that must be attained before improved organizational outcomes can be achieved [16]. Further, IT impacts cannot be sufficient. This is primarily because of factors outside an organization's control. In other words, only if business conditions are favorable can there be enhanced organizational performance because of IT impacts [16].

Previous research on EA has recognized the importance of identifying intermediate EA outcomes that should ultimately result in the achievement of end organizational goals [8,10,23]. Reported EA

benefits include business/IT alignment, improved insights, reduced complexity [10], increased IT reuse, business process improvements [19], and improved project planning, quality, and compliance [15].

EA direct benefits, although valuable in themselves, have a substantial role in attaining organizational goals [10]. In the literature on EA, organizational performance is represented as the degree to which the EA-related end goals are achieved at the organization level [10]. Previous studies noted that EA benefits can lead to organizational efficiency, organizational alignment [14], costs reduction, and improved organizational agility [10].

Thus, in light of the adopted theory, it is proposed that organizations that can realize the intermediate benefits of EA are expected to achieve a positive, subsequent, and often indirect impact on organizational performance [8], assuming that business conditions are favorable [16].

In light of the presented theoretical foundations, Figure 2 shows the proposed EA value realization process model. The model is analytical, as, in reality, the three processes are interconnected and iterative.

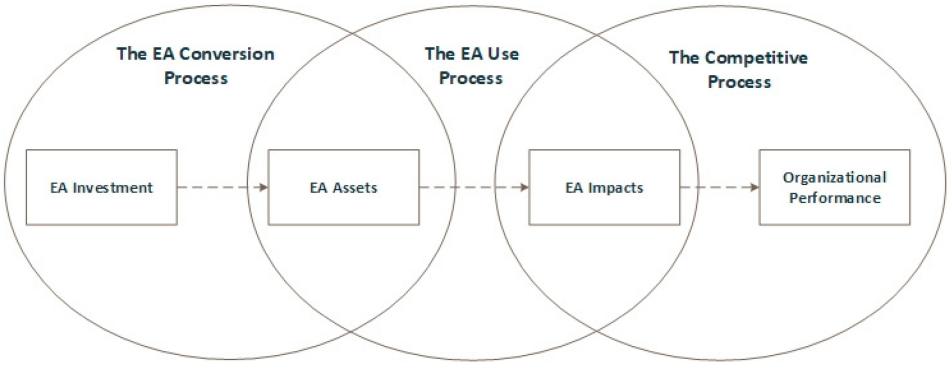

Figure 2. The Enterprise Architecture (EA) value realization process.

4. Research Methodology

As indicated in Section 3, this study endeavors to explore and describe the process of EA value realization. In particular, it examines the main processes and practices that should be in place to realize the intended organizational benefits from an EA investment.

Considering the purpose and nature of this study, case study is an appropriate research method [28]. The issue to be examined is contemporary and must be explored in its context. The case study method is a well-suited approach, as it allows the researcher to explore research issues with various dimensions of interest and it uses various sources of evidence [28,29]. A multiple-case study design was adopted, and the unit of analysis was the EA program. Four cases were explored, and they have been selected to maximize what can be learned [30]. The selected cases are government agencies with EA practices that have been established for at least two years. An overview of the cases is presented in Table 1.

The data were collected using multiple data collection techniques to triangulate sources of evidence [28]. In this study, an exploratory open-ended qualitative survey and group interviews were used. First, as suggested in [30], an exploratory open-ended qualitative survey was used, see Appendix A. A qualitative survey was sent to the head of EA at each of the selected government agencies. The survey was designed to gather information about the organization and its core business, in addition to its EA initiative and its drivers, implementation, use, benefits, issues, and challenges. Each agency returned one completed survey.

Following this, structured group interviews were conducted with participants from each agency. They were used to obtain any information that might not have featured in the survey, develop a richer understanding of their EA program, increase the depth of the data gathered, expand the number of sources of information, and obtain documentation to support each case evidence. Group interviews were chosen, as suggested by [31], to further understand the issue under investigation.

Table 1. Descriptions of the cases.

Name of Organization	Case 1	Case 2	Case 3	Case 4
Government/private	Government agency	Government agency	Government agency	Government agency
Size of organization	Very large	Very large	Very large	Medium
Size of EA	Small	Small	Small	Small
EA budget	Yearly—continuous, with some funding issues in the last year	Yearly—with issues of inadequate funding	Yearly—continuous	Yearly—part of business transformation
Length of EA adoption	5 years	2 years	9 years	2 years

The collected data for each case (the survey, the interviews and the collected documentations) were combined. Table 2 shows the interview participants and collected documents. Notes were taken during the interviews and combined with the survey data. Then, the obtained documents were reviewed to extract useful data that might support the analysis and ultimately answer the research questions.

Table 2. Interview participants and collected documents.

Case 1	One group interview—90 min, two participants: chairman of EA, and enterprise architect. Obtained documents provide information about the organization, EA, EA tool, EA maturity assessment, e-services, and organizational performance dashboard.
Case 2	One group interview—90 min, four participants: chief enterprise architect, enterprise architect and two EA consultants. Obtained documents provide information about the organization and its EA program.
Case 3	One group interview—120 min, three participants: chief enterprise architect, and two enterprise architects. Obtained documents provide information about the organization, EA charter, EA governance and strategic planning, and EA processes.
Case 4	One group interview—90 min, two participants: EA project manager and EA consultant. Document obtained provide information about EA maturity assessment, baseline EA, target EA, EA roadmap (initiatives), and provided e-services.

The data were analyzed using thematic analysis including both a deductive analysis (derived from the adopted theoretical model) and inductive analysis (themes emerging from collected data) [32].

For the deductive analysis, the three processes of the adopted theory (EA conversion, EA use, and EA competitive processes) were used as broad themes to guide and scope the analysis of the data. In addition, an inductive analysis was undertaken to enrich the understanding of each process and identify potential factors that might affect EA benefits realization. Text from that data was coded to form generic themes (factors), and they are reported in the following section.

5. Findings

This section presents the results of the analysis of the case studies in accordance with the three process models of the adopted theory: the conversion process, the use process, and the competitive process.

The focus of the analysis was to explore each process and identify factors that help to produce the outcomes of each process specifically and the whole value-generation process in general.

5.1. The Conversion Process

The EA conversion process examines the development of an EA investment into EA assets. An initial EA investment is an essential condition for the conversion process. To convert that investment into valuable EA assets, effective conversion management is needed.

The data showed that EA investments varied in terms of size and importance among the four cases. Some cases had a dedicated yearly EA budget, while others reported that funds were not enough after the initial investment, and one case reported that the EA budget was part of a business transformation program. Besides the investment of funds, the data showed that there were some factors that affected the conversion process and its outcomes. The analysis yielded six main factors that were found to influence the effectiveness of the conversion process. They were management support, communication and collaboration, EA team capability, EA framework and tools, EA vision, and EA governance. The following subsections present each factor.

5.1.1. Management Support

The findings showed that an effective conversion process requires effective management support. "Top management support" was considered *"vital to the successful adoption of EA practices within any organization"—Case 3*. Without such support "*EA will not have power and visibility to involve and guide strategic initiatives"—Case 3*. Further, senior management involvement was essential for developing a valuable organizational EA practice, and *"without the [agency's] senior management support, some of EA's potentials would not be achieved"—Case 1*. Management support and involvement were required to produce deliverables that *"meet their requirements"* and their approval. EA deliverables had to be *"approved by senior management or [other] stakeholders before further actions"—Case 1.*

Management support should be maintained by showing EA value and quick wins. EA teams should present *"EA value as well as quick wins to both business and IT stakeholders in order to maintain their support and keep them interested in EA practices"—Case 1*.

5.1.2. Communication and Collaboration

The findings showed that effective communication and collaboration was important for an effective conversion process. EA programs require the involvement and participation of many stakeholders and business units in the organization. *"Enterprise Architecture practices require significant cultural changes. For e.g., instead of silo and stove-piped style, EA demands transparency and information sharing"—Case 3*. A communication plan and stakeholders' management plan were valuable enablers to facilitate EA communication and coordination activities. *"It was very essential to have a formal communication plan and stakeholder management plan to be able to succeed in the EA initiative"—Case 4.* Effective communication and collaboration are important for an EA program and its products. It was stated that "*Enterprise Architecture products are only as good as the information collected . . . . If quality information is not shared, then EA artifacts will not depict the true picture"—Case 3*.

5.1.3. EA Team Capability

The data showed that forming a capable and skillful EA team was crucial for establishing an effective EA program. *"Without proper skills, knowledge, and required experience it would be difficult to establish an effective EA practice"—Case 1.* A skillful EA team contributes to increased awareness and acceptance of EA and the delivery of quality EA assets. *"Management has acknowledged continuous training as an important part for enhancing the quality of EA artifacts"—Case 3*.

Further, experienced architects *"would be able to understand and realize the complexities that arise when various building blocks across EA domains are connected"—Case 1.* Engaging external consultants and experienced architects was reported as an enabling mechanism for EA programs and their deliverables. That was because *"their previous engagement in several other similar programs served a lot in utilizing the most effective techniques, overcoming the challenges and [improving] the overall quality of delivery"—Case 4*.

A skillful and capable team adopts an incremental value delivery approach. As EA programs often require a long time before realizing the ultimate desired value, an incremental value delivery approach was recommended. *"It's important to plan EA actions in increments in order to deliver value as fast as possible. Without doing so, EA risks becoming a theoretical practice that produces unusable artifacts"—Case 2.*

5.1.4. EA Framework and Tools

This factor includes the EA framework, methodology, reference models, templates, and tools, which were used to support the EA conversion process. *"The deliverables are produced after careful research of the existing trends and standards as well as the requirements of the stakeholders"—Case 1.* The findings showed that framework and tools were needed, and their lack may limit the progress of EA. *"We lack EA tools, but we have requested this from top management as an important aspect going forward"—Case 2.*

It was also reported that the EA framework and tools may need to be tailored to suit organizational needs. During the establishment phase, an EA framework was tailored, and formats of deliverables were specified to meet organizational requirements. It was recommended to *"tailor [the EA framework] if needed to cater for any special requirements . . . [and] specify all file formats for deliverables and notations of diagraming"—Case 4.* Further, *"selection or development of the right meta-model that fulfills the requirements of the [organization] was an essential for the success of EA practice"—Case 1.* A rich meta-model provides a proper mechanism *"for modeling various building blocks of [the agency] while preserving relationships among them. . . . EA has to be based on a rich meta-model to enable thorough data collection"—Case 1.*

5.1.5. EA Vision: Business-Driven EA

The data showed that a well-defined business-driven EA vision was important for the EA programs. This meant that the EA program was linked to the business strategy and based on business needs. *"EA must be driven by business. It must be viewed as a tool that translates business strategy and the business model into an executable operating model"—Case 2.* If not, *"EA risks being IT-driven which yields projects and investments that do not provide business value"—Case 2.* EA vision should be *"aligned with the business vision of the organization and it should be value-driven"—Case 1. "Indulging in some contemporary activities just for the sake of doing those without any benefit to the organization should be avoided"—Case 1.* A business-driven EA facilitates EA's integration with existing organizational practices, and it increases the effectiveness of EA. *"EA process has been established, and interactions with other frameworks are also incorporated. Touch-points with PMO, ITIL, strategy management, and SDLC were defined as part of [the EA] framework"—Case 3.*

5.1.6. EA Governance

The data analysis showed the importance of EA governance, e.g., governance structure, standards, and processes. It was stated that *"governance is [an] important aspect of any EA program"—Case 3.* For effective EA implementation and use, organizations need a well-defined EA governance practice. *"EA governance is very crucial to the success of EA implementation and use. Thus, it is recommended to ensure that EA governance practices are well-defined and established"—Case 1.*

Defining EA principles and standards should be based on best practices and organizational requirements. It was reported in Case 4, *"EA principles were derived from both the industry best practices and [the agency's] internal environment"—Case 4.* It was also important to align EA governance with existing organizational and project governance practices.

EA activities and deliverables must be governed by an EA governance committee. *"EA committee has to govern EA activities, procedures, and plans. It also has to make sure that EA practices and processes are frequently revised and updated. A frequent update of EA content and practices is essential to keep EA relevant"—Case 1.* EA governance processes must be established to ensure the quality of deliverables. It was also reported in Case 4, that *"a review process of all deliverables consisted of multiple stages"* involving *"the consultation company internal quality assurance"* and *"formal review from business stakeholders on business documents and technical stakeholders on technical documents"—Case 4.*

5.2. The EA Use Process

This section reports the findings about the EA use process. It should be noted that the factors reported in the previous sections are still relevant during this process. They must be maintained during this process to enable a better EA use process.

As the theory suggests, a first condition for realizing EA benefits was the availability of quality EA assets. The quality of EA assets depends on the effectiveness of the previous process, the conversion process. EA assets must be of good quality to be useful. *"Needless to say, the EA team must produce quality output"—Case 2*.

The quality of EA assets must be maintained by establishing proper mechanisms for their use and updating. *"Procedures also were defined to ensure proper updates of both the EA repository and the EA portal"* and *"the frequency of updates to the repository is very important because the [agency] cannot afford to make decisions based on outdated data"—Case 1*.

Further, quality EA assets by themselves do not guarantee that EA benefits will be realized. They must be used appropriately. That means using the right EA assets for the right purpose at the right time. The data analysis showed some enablers of appropriate EA use.

First, asset representation and communication could facilitate appropriate use. Different stakeholders have different requirements for EA. Hence, the EA team must properly assess stakeholders' requirements and provide them with assets that *"are relevant to them by creating various architectural views and reports"—Case 3*. EA tools also facilitate the centralization and representation of EA assets. Tools were reported to be useful in structuring EA assets, customizing them, and making them accessible for use. For example, a centralized repository based on an EA tool was used and customized where *"several reports were customized to meet stakeholder information needs"—Case 3*.

Second, integrating EA practices with the existing organizational practices such as project management, IT operations, and service delivery increased the appropriate use of EA assets. It helped to develop specific events that triggered the use of certain EA assets. For example, *"EA is involved in assessing architectural changes arising from various sources such as change initiatives/projects, IT operations, and service delivery"* and *"changes are assessed and managed"* according to EA's *"policies and principles"—Case 3*. In another instance, *"EA plays an integral role throughout the project lifecycle . . . all the key deliverables are also delivered to EA for assessment and making sure that the project deliverables are produced in alignment with the developed target architecture"—Case 1*.

5.3. The Competitive Process: From EA Impacts to Organizational Performance

The findings showed that organizations expected to realize EA benefits, which ultimately would lead to organizational benefits. Some reported a struggle in realizing both EA benefits and the ultimate organizational goals while others reported partial achievement of both. As the theory suggests, to realize their ultimate organizational performance, organizations must achieve the condition, the EA benefits (impacts). The competitive process was also sensitive to external factors such as business and environmental conditions that might influence the realization of desired organizational performance. For example, it was reported that a merger was affecting EA. *"Due to the merger, we are now still unaware of the new strategy. The new EA cycle depends on this"—Case 2*.

The data showed that achieving the ultimate organizational performance from investments in EA might take years. All the cases had been operating their EA programs for many years. Thus, some organizations chose a "cycles of EA" approach. In such an approach, the organization focuses on achieving some EA benefits in each cycle that leads to a certain organizational performance. For example, *"the first EA cycle was to redesign and automate our IT operation processes in order to achieve the goal of 'reducing costs and increasing customer satisfaction'"* while *"the second cycle is to respond to the goal of 'improving agility and reduce time to market'"—Case 2*.

6. Discussion

This section discusses the findings in light of the adopted theory and the literature about EA. It is organized into three subsections: the EA conversion process, the EA use process, and the EA competitive process.

6.1. The EA Conversion Process: From EA Investments to EA Assets

The conversion process proposes that organizations spend on an EA program and, subject to the effectiveness of their EA conversion process, obtain EA assets. The first dimension of the conversion process is EA investment. EA investment is an essential but not adequate condition for producing quality EA assets. As the findings showed, the organizations varied in terms of their EA funds. Some organizations had sufficient yearly EA funding while others did not. As an essential condition, EA investment affects the quality of the conversion process and its outcomes, EA assets. Thus, sufficient EA funding should become part of the organizational budgeting process to implement EA successfully [8]. When an EA team has access to adequate ongoing funding, it is likely to produce useful artifacts [6]. Based on the findings and the supporting literature, the first proposition is formulated.

P1: *Adequate ongoing funding is an essential condition for an effective EA conversion process.*

Having adequate funding is not enough. The findings also showed that the effectiveness of the conversion process was influenced by the conversion factors. Those factors affected the conversion process and its outcomes, "EA assets". Those factors were management support, communication and collaboration, EA team capability, EA framework and tools, EA vision (business-driven EA), and EA governance. Organizations vary in their EA configuration and implementations based on the factors that influence the effectiveness of the conversion. The way organizations form their EA program influences EA outcomes [33] and EA configurations affect EA processes and the quality of EA services and products [7]. This leads to the second proposition.

P2: *EA's conversion process effectiveness is influenced by conversion factors.*

The second dimension of the conversion process is its effectiveness. There are six factors that influence the effectiveness of the EA conversion process. The first one is management support. It has been found to be a key enabler of an effective conversion process. It provides the power and visibility needed for EA conversion. Other literature also emphasized the significance of management support for the success of EA establishment [5,8]. On the other hand, the lack of management support is one of EA's major issues [34,35]. The lack of support limits the productivity of the EA team and the effectiveness of EA activities [36]. Thus, to improve the EA conversion process, EA programs should be supported by senior management. This leads to the following proposition.

P3: *Management support increases the effectiveness of the EA conversion process.*

An effective conversion process requires solid communication and collaboration mechanisms. Having formal communication and collaboration plans increases the effectiveness of EA conversion. It is important to avoid miscommunication and fragile collaboration [37] because they lead to the collection of unsuitable data and the development of useless artifacts [35]. Without proper communication, business units cannot agree on shared goals and form a common understanding [35]. Thus, proper communication and collaboration mechanisms facilitate the EA conversion process by avoiding silo-thinking and isolation issues that negatively affect the conversion process. This leads to the following proposition.

P4: *Effective communication and collaboration mechanisms increase the effectiveness of the EA conversion process.*

The findings showed that a capable and skillful team was important for EA conversion. Such a team increases the awareness of EA activities, promotes the acceptance of EA, and delivers useful EA assets. The findings are in line with the literature on EA. A skillful and experienced team strives to establish a successful EA program [35,37]. It can engage business and IT stakeholders to think strategically and envision the future of EA [38]. This leads to the fourth proposition.

P5: *EA team capability influences the effectiveness of the EA conversion process.*

The findings suggested that the EA framework and tools play a role in converting EA investments into assets. Selecting and tailoring an appropriate EA framework, tools, reference models, meta-models, and guidelines to suit organizational needs enables and guides EA activities during the conversion process. This helps to structure and guide EA activities, such as EA documentation and planning. Previous studies presented similar views that EA frameworks and methodologies help architects. They provide architects with templates and guidelines that facilitate the development of EA [7,35,37]. The careful selection of methodologies and approaches improves EA activities and presentation of assets [6]. This leads to the following proposition.

P6: *An EA framework and tools influence the effectiveness of the EA conversion process.*

The data showed that an EA vision influences the conversion process. A business-driven EA vision links the EA initiative to the business strategy and shapes it based on business needs. On the other hand, an IT-driven EA minimizes EA's value and yields projects and assets that do not provide the ultimate business value. A business-driven EA helps to integrate EA within existing practices such as project management, IT operations, and service delivery. Further, the lack of a clear EA vision decreases the effectiveness of EA activities [25,37]. A vague or incomplete vision might result in EA assets of questionable value [37]. This leads to the following proposition.

P7: *EA vision influences the effectiveness of the EA conversion process.*

The data analysis showed that EA governance influenced the conversion process. EA governance includes establishing and operationalizing an EA governance structure, standards, and processes. EA governance is an important aspect of any EA program and vital for both the implementation and use of EA. EA activities, procedures, and plans must be governed to keep them aligned with the organization and to produce the right EA assets. EA governance was widely discussed in the literature on EA. An ambiguous structure for EA governance was recognized as a potential reason for ineffective EA implementation [36]. A proper governance mechanism would enable better integration of EA processes with organizational ones [34] and facilitate the development of architectural assets [24]. This leads to the following proposition.

P8: *EA governance influences the effectiveness of the EA conversion process.*

In light of the adopted theory and the findings of this study, it could be proposed that these conversion factors and their configurations and interactions influence the effectiveness of the EA conversion process and its outcomes, EA assets. Each EA program has its special characteristics, and some factors may have a greater influence than others. Thus, organizations must pay attention to the conversion factors in light of their own needs and maturity [39,40].

6.2. The EA Use Process: From EA Assets to EA Impacts

This section discusses the findings about the EA use process. The data analysis showed some potential factors that facilitated the EA use process to achieve EA benefits. The factors reported in the previous conversion process are still relevant and important for this process.

The EA use process proposes that the first condition for effective use is the availability of quality EA assets. Yet, quality EA assets were not enough for EA benefits to occur. It stresses that these assets must be used appropriately to obtain the desired EA benefits.

As discussed for the previous process, EA investment and the effectiveness of the conversion process determine the quality of EA assets. The findings showed that EA assets such as artifacts, tools, processes, and services must be of good quality to be useful. Previous studies emphasized the availability of high-quality EA information for EA use [6]. Quality EA assets are characterized by accuracy, relevance, timeliness, completeness, interpretability, and accessibility [6]. Low-quality EA assets undermine its usability. Developing low-quality EA assets is one of the major challenges that hinder EA usefulness [26,34,35]. This leads to the following proposition.

P9: *Quality EA assets are an essential condition for an effective EA use process.*

Further, having quality EA assets does not guarantee the realization of EA benefits. EA assets must be used appropriately to have the intended impacts. Though, how do organizations enable the appropriate use of EA assets? The data analysis showed some enablers of appropriate use. First, assets must be properly represented and communicated to enable their appropriate use. The requirements of EA stakeholders must be carefully assessed to provide each stakeholder group with the needed assets and guidelines to use them [33]. Appropriate EA frameworks and tools facilitate the classification, centralization, and representation of EA assets. Second, EA assets must be integrated and aligned with existing organizational practices such as project management, IT operations, and service delivery to facilitate their appropriate use. These findings regarding the appropriate use of EA assets comport with the perspectives of several earlier studies [3,7,9]. Thus, the following proposition is formulated.

P10: *Quality EA assets must be used appropriately to achieve EA benefits.*

6.3. The Competitive Process: From EA Impacts to Organizational Performance

As the theory suggests, to realize the ultimate organizational performance, organizations must achieve the essential condition, EA benefits (impacts). Besides that, external factors such as market and business conditions must be favorable to realize the desired organizational performance. The findings showed that external factors led to a disruption of EA activities and use, which ultimately affected the anticipated organizational performance. This echoed previous studies that found that realizing EA benefits can increase organizational performance [8,10,23]. The direct benefits of EA, although valuable in themselves, have a substantial role in helping an organization attain its goals [10] such as efficiency and organizational alignment [14].

The findings showed that some organizations used cycles of the EA value realization process. Each cycle was focused on certain EA benefits, which were expected to lead to certain improvements in organizational performance. For example, in one case, *"the first EA cycle was to redesign and automate our IT operation processes in order to achieve the goal of 'reducing costs and increasing customer satisfaction'"* while *"the second cycle is to respond to the goal of 'improving agility and reduce time to market'"*.

In summary, organizations that could realize the intermediate benefits of EA were expected to experience a positive but often indirect impact on organizational performance [8,14], providing that the business and market conditions were favorable [16]. Thus, the following could be proposed:

P11: *The realization of EA benefits is an essential condition for the ultimate organizational performance.*

and

P12: *Business and market conditions must be favorable to realize the ultimate organizational performance.*

7. Conclusions

This research has developed a theoretical process model to offer insights into how EA investment is converted into desired organizational performance. The process model links and unpacks the process into three iterative and interrelated processes: the EA conversion process, the EA use process, and the EA competitive process.

The first contribution made by this research is the development of the EA benefits realization model. This model comprises essential conditions and the three interrelated processes mentioned above. First, organizations invest in EA and, conditioned by the varying effectiveness of the EA conversion process, attain EA assets. Second, quality EA assets, if appropriately used, lead to desired EA impacts. Third, attained EA impacts, if not adversely affected by external factors, yield enhanced organizational performance.

Articulating a complete process model for the way that EA creates business value offers several benefits, as follows. First, this model provides an analytical lens to comprehend why EA funding does not always result in improved organizational performance. This might stimulate further research to look beyond the simple relationships between EA and organizational performance. Second, it offers a framework to explore the conditions and processes that are associated with EA business value realization.

The second contribution is the identification of the various factors that influence EA business value realization. The effectiveness of the conversion process is influenced by management support, communication and collaboration, EA team capability, EA framework and tools, EA vision, and EA governance. Organizations vary in their EA configuration and implementation based on the factors that influence the effectiveness of the conversion. Furthermore, within the EA use process, appropriate use of EA assets is influenced by the representation of EA assets and communication about them, as well as the integration and alignment of those assets with existing organizational practices.

This study has highlighted areas where further research is most needed. As it appears, the EA value creation process is complex, and needs to be broken down into manageable pieces. This research achieves this by categorizing the overall process into three interrelated processes whereby each process has its own enablers, issues, activities, and outcomes. This research has provided a beginning for understanding the EA process, but more research is needed. For example, further investigation should be conducted into many aspects of the conversion process, including EA funding, the details of the activities in the EA conversion process, conversion issues, and the interactions between conversion factors. The same is true for the second process, it is necessary to examine issues such as the variety of assets, what constitutes their appropriate use, how the use of assets differs across different contexts, and how to promote the appropriate use of EA assets.

Furthermore, the outcomes of such empirical research provide viable support to practitioners on important aspects of EAM such as understanding the complexity surrounding EA's business value realization, the key processes, primary enablers, and the types of EA assets, their quality, and appropriate use.

This research also has limitations. The first of these arises from the nature of the research method. A case study of only four public sector organizations was used, which limits the generalizability of the findings since it cannot be claimed that the processes and factors identified in these cases would be similar in other settings. Thus, future research is needed to further examine the developed model in different contexts.

The second limitation relates to the qualitative data obtained for this study; although the data describe what the participants considered to be important, other aspects might not have been covered. Therefore, the model and factors that have been developed are by no means a comprehensive or

ideal representation of EA value realization. Although this research endeavors to describe the EA value realization process, the overall scope of the study could be extended. For instance, longitudinal research is desirable to further recognize how EA value evolves over time, reflecting the influence of the three sub-processes; this would lead to a richer understanding of both the sub-processes and the overall EA value realization process.

Funding: This research was funded by the Deputyship for Research & Innovation, Ministry of Education in Saudi Arabia, project number IFKSURG-1442-122.

Acknowledgments: The author extends his appreciation to the Deputyship for Research & Innovation, Ministry of Education in Saudi Arabia for funding this research work through the project number IFKSURG-1442-122.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

About Your Organization

This part is about the general information about your organization, IT and EA. Please describe the major role of your organization, for example, your organization vision, mission and the most important services you provide.

Organization Structure (IT Organization should be included)

Organization Structure of IT Department

Organization Structure of EA

EA and IT Budget and Employees

Table A1. EA and IT budget and Employees.

Employees	Internal	External
IT		
EA		
Budget by year (last 3 years)		
IT		
EA		

About IT Department

This part is about information systems and plans in your IT department

Major Information Systems

Current Major IT projects

Future Plans for IT

About EA

This part is about EA activities. In this part, please provide information as much as possible in details

History of EA with major activities

Table A2. History of EA with major activities.

Year	Description of Activities	Major Objectives	Current Status

Please provide/describe your EA framework/methodology?

Future plans of EA, e.g., what are the planned projects related to EA?

Detailed Characteristics of EA

The following items are about major aspects of EA. Please complete the following table by describing the importance of each item to your organization and the actual practices in your organization. Suggested items are EA Objectives, EA principles, EA framework, EA methodology, EA team, EA governance, EA assets, EA resources, EA maturity, EA reference models, EA deliverables, EA scope, EA implementation, and EA use.

Table A3. Characteristics of EA.

Aspect	Description

Success Factors

Please describe any factor that is considered to be important for the successful implementation of EA in your organization

Table A4. Success Factors.

Factor	How?

Benefits of EA

Table A5. Benefits of EA.

Benefit	Description	Realized or not?

Difficulties and Obstacles.

If you have any difficulties or obstacles for the successful implementation of EA, please describe them

Table A6. Difficulties and Obstacles.

Difficulties	Description

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