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Assessing the Impact of Enterprise Architecture on Digital Transformation Success: A Global Perspective

Hassan Alghamdi

Systems and Networks Department, Faculty of Computing and Information, Al-Baha University, Al-Baha 65779, Saudi Arabia; haalghamdi@bu.edu.sa

Abstract: This research paper aims to analyze the significant contributions of enterprise architecture (EA) in leveraging digital transformation (DT) success at an international level. The paper adopts a meta-analytical approach, examining the patterns of EA's strategic alignment and operational impact. EA plays a crucial role in managing digital ecosystem complexity, which is a key factor in successful DT. The methodology also focuses on the systematic review and meta-analysis of the relationships between EA and other advanced technological systems such as AI, IoT, and Blockchain to reveal how these technologies improve EA's flexibility and strategic approaches. The paper emphasizes the importance of organizational culture, technological incorporation, and regional economic factors as critical determinants of EA practices in DT activities. It underscores the necessity for customized EA approaches to DT success within different cultural and economic contexts and their impact on sustainable management. This practical insight is a crucial contribution of the paper, providing a strategic roadmap for organizations aiming to optimize their digital transformation strategies through enhanced EA practices.

Keywords: enterprise architecture (EA); digital transformation (DT); global perspective; country-wise comparison; success metrics

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1. Introduction

1.1. Background

Enterprise architecture (EA) is one factor that enables today's businesses to be maneuverable and to manage technological resources. However, in the context of sustainable management, EA could offer the necessary structure to link DT goals with sustainable business models and support ecological, social, and economic sustainability [1]. In the wake of the pandemic (COVID-19), businesses are experiencing unprecedented changes and challenges. EA is pivotal in delivering dynamic capabilities that help enterprises have the necessary tools for thriving in adverse conditions [2]. These accommodations support firms and organizations in performing better digitally, allowing them to work with digital technologies at a version of the operational level, i.e., high digital ambidexterity, thereby giving a sense of amplified business value.

The strategic significance of enterprise architecture (EA) in driving organizational adaptability and managing technological complexity has increased in recent years. As noted by Yang et al. [3], the digital transformation of enterprises not only drives innovation but also crucially aligns government subsidies with corporate innovation strategies. Furthermore, integrating sustainable management practices within EA frameworks can ensure that these innovations contribute to long-term environmental sustainability, social responsibility, and economic resilience, thereby fostering responsible business practices that align with broader sustainability goals. This alignment is crucial in environments where technological change demands robust architectural frameworks to effectively harness the benefits [3]. EA, therefore, not only supports the strategic management of technology but

also facilitates the organization's ability to leverage financial and innovative resources more effectively.

Furthermore, the integration of industrial Internet platforms in traditional manufacturing remains on the rise, constituting a critical aspect of the digital economy where EA plays a vital role. As Liu et al. [4] point out, these platforms offer essential technical backstopping and thus help manufacturing enterprises make remarkable digital transformations through unity, resonance, and adaptation. Using such platforms is an excellent example of how EA can leverage technological enablers to improve business operations, thus allowing the organization to gain a competitive advantage in the digital business environment.

In addition, Aryal et al. [5] examine the competency center as the strategic approach to address often emerging issues related to digital transformation within EA. By incorporating emerging technologies such as AI, IoT, and Blockchain, EA frameworks can significantly enhance sustainable management practices. These technologies enable organizations to monitor and reduce their environmental footprint, optimize energy usage, and ensure responsible sourcing and production processes, thereby integrating sustainability into the core of their digital transformation efforts. These centers effectively establish settings for converging various technologies and organizational structures with appreciable potential for reconfiguration and innovation. The assemblage approach implied in these centers demonstrates EA's primary role in ensuring active and efficient digital transformation agendas, without which businesses cannot continuously adapt to new technologies and trends.

Digital transformations (DTs) are crucial in the academic world and business domains, yet their profound Environmental Footprint (EF) is frequently ignored, thus limiting opportunities for qualitative environmental sustainability (ES). This can be achieved by aligning ES with the conversation of DT by putting forward the Green Enterprise Architecture (GREAN) concept as a pathway to sustainability. Therefore, Vandevenne, Van Riel, and Poels [6], embracing the design science research approach, presented an artifact with a holistic strategy for integrating ES into DT across the layers of an organization. This tool offers specific action plans for how ES can be incorporated into the organization's strategy, business, data, application, and technology plans. By identifying an ES-aware business capability modeling approach, the artifact puts forward foundational ideas for environmentally sustainable DTs while indicating the need for further research and testing [6].

EA is not unique to corporate settings but also applies to public sector transformations. In the digital transformation of the German road infrastructure, for example, EA management (EAM) is required as an overarching methodology for strategically structuring information systems and technology [7]. This type of strategic structuring is critical to driving inter-organizational cooperation and maximizing data flows, underpinning effective digital service transformation in government.

While EAM, as a dynamic managerial capability, helps to manage the complexity of modern IT and IS landscapes, it can also support the organization in its digital transformation journey [1]. Organizations stay competitive this way when technological advancements are rapid and the continuous ecosystem is evolving. Strategic implementation of EAM paves the way for the evolution of technical IT competencies and guarantees strategic IT alignment; it is even more critical to larger organizations that intend to maintain consistency between business strategies and their supporting infrastructure from an IT perspective.

Therefore, the adoption and refinement of EA practices provide a robust framework for businesses and public entities alike to enhance their operational capabilities and strategic alignment, ensuring sustained success in a digitally driven world. The ability of EA to integrate and align strategic objectives with digital transformation initiatives highlights its indispensable role in modern business ecosystems, making it a key investment area for decision-makers aiming to navigate the complexities of today's business environment effectively.

1.2. Overview of Digital Transformation and Its Relevance in the Current Technological Landscape

Digital transformation is a significant change in the business world, where digital technology infiltrates enterprise operations and fundamentally changes how they operate and deliver value. This shift represents much more than new technologies, offering other structures of business processes, culture adjustments and customer experiences that are designed from the ground up or revised to align with changing internal business needs and markets [8]. As enterprises shift towards intelligent connected factories and cyber-physical systems, the internal IT landscape should align with enterprise architectures. This alignment facilitates the development of iterative, customer-involved, and business-oriented products [8].

Additionally, enterprise digitalization is a force at the ecosystem level, affecting audit efficiency and business-IT alignment dynamics [9]. Firms in China, for example, embrace digital transformation, which further complicates these processes due to different audit effects, thus demonstrating the transformative changes in enterprise risk and the information environment [9]. Furthermore, agility is a core concept for modern enterprises, and it requires the continuous adjustment of business strategies to IT capabilities facilitated by advanced enterprise architectures and ontologies [10].

1.3. Problem Statement

While every organization is being pushed toward digital transformation (DT), success rates vary significantly among regions. This difference is due to various factors based on these countries' economic conditions, technological infrastructure, and regulatory environments. Interestingly, one of the most critical ingredients for achieving this, which always seems to be taken for granted, is enterprise architecture (EA). EA can potentially impact the ability to compete and achieve strategic objectives in organizations digitally. Further, organizations in areas where EA is both inculcated and well-evolved, more often than not, declare that they have more incredible triumphs with their digital transformation programs compared to others. In contrast, companies in the regions where EA is not deeply explored would find it hard to achieve the realized benefits of the digital transformation. Now, the question is: Can enterprise architecture (EA) deliver steps to the digital transformation doorsteps along with a formal process of weaving technology and aligning strategically across diverse regional landscapes?

1.4. Variable Definitions

To deal with the complex dynamics of EA in the context of DT, this research addresses four key variables:

1. Impact of EA on DT Success: This variable is used to identify the direct effects of structured EA practices on the success rates of DT initiatives. This study contributes to the body of research by exploring the implications of various implementation strategies and, thus, how the role of EA in improving DT success can differ in multiple organizational contexts.
2. Patterns Across Countries and Industries: This dependent variable aims to determine how enterprise architectures are adopted and effective worldwide. The research also covers variations between different economic blocs and industries and identifies how geographical and sector-specific contexts affect the role of EA in DT.
3. Influence of Organizational Culture: This affects the implementation and effectiveness of EA. This cultural ideal examines the cultural traits that enhance or impede EA's alignment with DT goals to collectively drive transformation success.
4. Emerging Technologies within EA: This variable analyzes how emerging technologies are being incorporated into EA frameworks and to what extent they add to the dynamic nature of EA and the strategic element of DT. It also explains how emerging technologies, such as AI, IoT, and Blockchain, drive capabilities that change how EA is executed today.

1.5. Scope of the Research

This study aims to assess the impact of enterprise architecture (EA) on digital transformation (DT) success from a global perspective, focusing on a country-wise analysis. By examining different countries across various continents, this research will identify how EA facilitates DT across diverse national landscapes, encompassing developed and developing economies. The geographical scope includes the following:

- Developed economies: EA practices are well embedded within business strategies in the case of developed economies like the USA, Germany, and Japan, resulting in high achievement in DT success.
- Emerging economies: In emerging economies, EA practices are increasingly being recognized and implemented as critical tools for achieving sustainable development and technological advancement. However, they are at different stages of maturity compared to developed economies.
- Transition economies: This refers to transition economies (e.g., Poland and the Czech Republic), illustrating the use of EA to aid DT in times of great economic and technological transformation.

This breakdown by country will provide the opportunity for a more detailed exploration of how different dimensions of economic development, and cultural and technological infrastructure, enable or constrain EA in driving DT. By disaggregating country-specific effects, global trends are mapped to better explain national strategies to develop a more comprehensive view of international DT forces.

The industry analysis of the effect of EA on DT, which provides one more important dimension to study, will be addressed in a future investigation. Accordingly, this decision ensures that the research remains detailed and sharp. It delves deeper to analyze geographical variations without getting distracted by sector-specific dynamics.

This not only strengthens the insights provided by this study but also lays down a base for future research, e.g., sector-specific studies of EA and DT trends globally. Therefore, this study is an indispensable document for business leaders and policymakers in countries around coherent strategies for using EA in digital transformation that are well aligned with national realities.

1.6. Significance of the Study

This research is significant as it contributes to a growing academic understanding of how enterprise architecture (EA) influences global digital transformation (DT) success. By providing a country-wise analysis, the study fills a critical gap in the existing literature regarding the regional implications of EA on DT outcomes. Moreover, it explores how sustainable management practices can be integrated into DT initiatives through EA, promoting responsible business practices that align with environmental, social, and economic sustainability goals. Practically, the findings will aid business leaders and policymakers in tailoring EA strategies to their specific national contexts, enhancing the effectiveness of DT initiatives. These insights can be used to inform strategic decisions, drive toward more effective resource allocation, and potentially reshape national digital innovation and technology management policies. By emphasizing the role of EA in fostering sustainable management, this study provides a framework for organizations to achieve long-term sustainability alongside their digital transformation goals.

2. Literature Review

2.1. Theories

Several theories describe how DT and EA successes are influenced, showing how EA practices affect organizational enablers and strategic fit. Similarly, Kotusev and Kurnia [11] revealed that EA does not have any general theoretical framework, but some theories are vital to understanding how organizations engage with EA artifacts; these theories include actor-network theory, boundary objects theory, and cognitive fit theory. This perspective

asserts that EA is a central facilitator for managing the interactions between business IT and enhancing the IS planning and strategic decision-making processes.

According to Kotusev and Kurnia [11], EA frameworks have a prescriptive nature that can restrain innovation. Other researchers, like Tamm et al. [12], see EA as a means of integrating new technology while maintaining organizational agility. This paper argues for a balanced view that EA's success in DT is predicated on how adaptable the framework is to the organization's cultural and technological environment.

A key criticism in the literature concerns whether EA frameworks, traditionally designed for stable environments, can effectively adapt to rapidly changing digital ecosystems. Some academic critics point out that EA can negatively impact innovation because there is no room for growth in a prescriptive organization; others claim that, without an EA framework, digital ventures are chaotic and cannot be sustained in the long run [11,12]. These criticisms must be taken into consideration to understand EA and its new changes when technologies like AI, IoT, or Blockchain are included in it.

Also, theories of sustainable management, such as the triple bottom line (TBL) model, introduced by Elkington [13], emphasize the combination of social, environmental, and economic capital in a firm's strategies [13]. The TBL framework highlights the need for businesses to simultaneously address people, planet, and profit to achieve long-term sustainability. Although the triple bottom line (TBL) model has been discussed extensively in the context of sustainable business practices, there is little literature on how EA can help integrate TBL principles into DT projects. This paper argues that EA frameworks can be used to aid organizations in better realizing their sustainability targets, where digital transformation considerations are aligned with the environmental, social, and economic pillars of the TBL model. For instance, EA can help reduce energy consumption through optimized IT infrastructure, streamline operations to minimize waste, and support social sustainability by enhancing employee and customer engagement in digital processes [6]. This contribution connects EA's role in DT more explicitly with sustainability goals, a critical area that existing literature has not sufficiently addressed.

The relationship between EA and DT has been widely researched and discussed, as it has been found that the ability to align IT with business objectives is a critical factor in the achievement of effective DT undertakings. Using DT frameworks, Jonathan et al. [14] establish that well-aligned IT frameworks enabled through EA have substantial concerns about the positive influences of different organizational determinants on favorable DT results. Tamm et al. [12] also present the EA benefit mechanisms model (EABMM), which describes the roles of EA in supporting IS decision-making, increasing project delivery efficiency, overseeing platforms, and enabling organizational adaptability and competitive advantage.

Building on the institutional perspective, Levy and Bui [15] discuss the process of EA's institutionalization as the capability embedded into organizational routines and structures, contributing to the continuance of digital transformation initiatives. Kotusev, Kurnia, and Dilnutt [16] discuss the functional diversity of EA artifacts, exposing how they, built on the foundation of EA and operational technology, cooperate with business and IT to enhance DT effectiveness. Alone, this line of work cohesively highlights the indispensability of EA in strengthening the strategic and operational frameworks for enacting digital transformation.

These theories collectively provide a robust theoretical foundation for understanding EA's pivotal role in enabling and sustaining digital transformation across various organizational contexts.

2.2. Previous Studies

Past research into EA and DT has also shown spatial variation in adoption and effectiveness levels. Kassan [17] discusses how the US Air Force utilizes the Zachman Framework; they also denote a need for proper EA methods to deal with technology. Takagi [18] focused on the 'enterprise resilience' of the Japanese Shinkansen system, adopting the ARIES framework to address dynamic threats such as the COVID-19 virus.

For example, the adoption of EA frameworks in healthcare system of countries like the US and Germany has led to an increase in patient data management and health system integration [19]. The developed world, however, implements EA with minimal technological and organizational challenges, as seen in Uganda's digital health systems [20]. This comparison shows that it is crucial to apply EA at the local level because economic, regulatory, and technological factors deeply affect digital transformation programs.

Capo et al. [21] discussed how Industry 4.0 integration in Chinese and Indian manufacturing sectors underpins region-specific digital strategies that influence EA effectiveness. Wamema et al. [20] advanced this notion by integrating digital health systems in Uganda, advocating for EA customizations to meet local health needs. Furthermore, Sakai [22] directly compared Japanese IT and business integration to Western ones and pointed to the cultural and economic factors influencing EA success, highlighting the role of contextually tailored EA frameworks for digital transformation in any environment. These studies also emphasize the need for the incorporation of the standards of sustainable management into EA and DT systems. For instance, Capo et al. [21] discuss how the integration of sustainable technologies enables efficiency in the use of resources with the least harm to the environment in manufacturing firms. This is consistent with the principle of sustainable business management, based on which the era of digital transformation should take place. While there is extensive research on the positive role of EA in DT initiatives, significant gaps remain in understanding how EA impacts DT across emerging economies and certainly under-researched sectors such as healthcare or public services in developing regions. For example, empirical evidence or long-term assessments of the impact of EA on DT are missing in studies about EA frameworks in low-income countries. To fill these gaps, this research attempts to gain insights into underrepresented economic blocs and industries.

The studies together contribute to the understanding that spatial continuity plays a crucial role in EA adoption and outcomes. It influences successful digital transformation and highlights the need for region-specific knowledge to tailor EA frameworks that work locally with business rhythms, cultures, and technology landscapes.

2.3. Sustainable Management and Digital Transformation

In recent years, sustainable management, responsible business practices, and digital transformation have become active research topics. According to Beese et al. [23], enterprise architecture management (EAM) should be implemented in a way that aligns with the goals of an organization, as they explain the role that effective enterprise architecture management (EAM) practices could play in attaining sustainable management. Their research on Commerzbank demonstrates how an assortment of enterprise architecture management (EAM) control mechanisms can improve an organization's ability to adapt and remain sustainable by standardizing local IS with general objectives. This has the added advantage of increasing efficiency by avoiding multiple layers of redundant decision-making and promoting the use of environmentally friendly resources for the IT infrastructure. Incorporating responsible business practices into strategies for enterprise architecture management (EAM) guarantees that various strategies toward digital transformation do not harm sustainable development goals, hence asserting the significance that EAM plays in spearheading environmentally and socially sustainable digital transformation processes [23].

The role of EA in promoting sustainable management is particularly significant in regions with stringent environmental regulations. In the European Union, EA frameworks are increasingly aligned with sustainability goals, driving both digital transformation and compliance with environmental standards [23]. Conversely, in less regulated environments, such as parts of Asia, sustainability is often a secondary concern in digital transformation efforts [24]. This indicates that while sustainability is becoming a critical part of EA, its integration depends heavily on regional regulatory frameworks and cultural attitudes toward environmental concerns.

2.4. Cultural Differences in EA Implementation

Cultural contexts significantly influence how Enterprise Architecture is adopted and utilized, as well as the effectiveness of EA, which explains the different responses to digital transformation technologies throughout the globe. Meske et al. [25], drawing on Hofstede's individualism/collectivism and long-term orientation, as well as Hall's monochronic/polychronic cultures, explain why multinational enterprises may adopt unified communication technologies quite differently in different areas of their organizations. This indicates that IT managers need to take into account the cultural dimension when implementing new technologies.

In developed economies such as Japan, EA could be integrated together with government-led digital transformation strategies, while in emerging economies such as India, the integration of EA could be seen in sectors such as manufacturing, where digital transformation is not yet very developed [18,21]. These differences also suggest that EA frameworks should vary from one region to another as the success of EA is influenced by factors such as technological development, economic power, and policies.

In addition, George and Schillebeeckx [26] explain that in today's global environment, interspersed with institutional pluralism involving geopolitical-, organizational-, and market-level contingencies, digital transformation may or may not converge toward the corporate purpose. In their findings, the authors explore how business responses in the digital age can be shaped by a firm's culture and/or culture channels for business modeling and value creation in a broader context.

This body of research has indicated that cultural forces influence the adoption and use of enterprise architecture and the ongoing custodianship and adoption of digital technologies in organizational settings. These critical cultural aspects must be considered to ensure that EA strategies adopted globally are compatible and can achieve digital transformation goals. Moreover, aligning these strategies with sustainable management practices ensures that digital transformation contributes to long-term sustainability goals, addressing global challenges through responsible business practices.

2.5. Economic Influences on DT Success

Economic stability, infrastructure, and technological readiness influence digital transformation's (DT) success. Yoo and Yi [27] highlight that digital economic innovation enhances productivity and streamlines production, underpinning the vital role of financial innovation in DT across social systems and industries. Furthermore, Nosova et al. [24] elucidate how digitalization and economic policies intersect, particularly during crises like COVID-19, asserting that a robust digital sector is essential for a thriving digital economy and advocating for the removal of financial barriers to facilitate resource movement and technology implementation, thereby bolstering international digital entrepreneurship and collaboration.

Zhang et al. [28] investigate how digital adoption impacts the efficiency of economic development in the digital media phase. They affirm that digital industrialization and industrial digitization increase the efficiency of economic growth, following the significant digitization trend of developed cities, which vividly explains the DT economic effect.

These studies collectively illustrate how economic factors like stability, the policy environment, and technological advancement crucially dictate the efficacy and success of digital transformation initiatives across different regions. Integrating sustainable management practices into these economic strategies ensures that digital transformation efforts are economically beneficial, environmentally sustainable, and socially responsible.

2.6. Global Comparative Studies on EA and DT

Enterprise architecture (EA) and digital transformation (DT) have been extensively studied within specific national and industrial contexts, revealing diverse impacts and implementation strategies. Masuda et al. [29] explain the application of EA in managing architecture risks within a general electric (GE) context in the healthcare sector, while such

research does not go further to generalize its results across other international GE or adapt it to different economic systems.

Such works include Gat et al. [19] and Firmananda et al. [30], where EA is investigated for its suitability in either educational or micro, small, and medium enterprise (MSME) institutions in a particular locality. These studies show that EA can be beneficial for managing digital transformation, albeit with qualifications. Still, it is not inclusive enough as a comparative study that could show what factors are likely to be successful under any circumstances or what challenges are likely to be unique to any country. Integrating sustainable management and responsible business practices into these studies highlights the importance of aligning DT initiatives with environmental and social goals. These aspects ensure that digital transformation efforts contribute to long-term sustainability and ethical governance, which are critical for addressing global challenges and promoting responsible enterprise growth. The implementation of sustainable management and responsible business practices in these studies underscores the correlation of DT programs with environmental and social objectives. These aspects guarantee that digital transformation supports a sustainable business and is ethically governed, which is essential for solving global problems and the responsible developmental growth of organizations.

One excellent example is the application of EA in the process of implementing change in the German healthcare system, where it was used to standardize digital health environments across federal and state jurisdictions. By adopting the TOGAF framework, Germany integrated an interoperable patient data-sharing system that enhanced patient care delivery and cut overhead costs. However, the implementation of this project was characterized by problems such as issues concerning privacy and compatibility of diverse general legacy systems.

Another example is Walmart, the largest retail company, which used EA to optimize its supply chain process globally. When integrating EA with Walmart's supply chain, the company was able to employ an agile framework that would enhance its inventory matters and, thus, produce less wastage. Several obstacles were experienced in the following ways: The EA had to be customized depending on the regional specifications concerning the supply chain affairs, and real-time data was sometimes incorporated into the decision-making process.

2.6.1. Need for a Global Perspective

Adopting a global perspective in studying EA and DT cannot be overstated. A cross-country comparison might shed more light on the fact that the culture, economy, and technology of one country differ from those of another and show how they affect the gains and approaches to EA and DT. For example, Sukrat and Leeraphong [31] discuss a digital business transformation maturity model for micro-enterprises in developing nations to elaborate on how various traits impact digital approaches. This presents the dire need for models that provide general solutions and are sensitive to local conditions in multiple countries.

Furthermore, Kaddoumi and Tambo [32] presented an enterprise architecture as a service (EAaaS) model: The global perspective on the factors that influence the service's deployment and impact can significantly benefit from analyzing how market conditions and technological maturity influence its feasibility and effectiveness. Knowledge of such factors on an international level can facilitate the development of more suitable strategies for EA implementation, which would better address the range of requirements and resources available within different markets.

Hence, it is crucial to continue expanding international comparative studies to enhance the practical applicability of EA and DT globally as part of the architecture strategy for global architectural requirements to address the characteristics of global enterprises.

2.6.2. Cross-Regional Comparisons and Multicultural Implications in EA Practices

Capo et al. [21] discuss the implications of Industry 4.0 across different Asian contexts, and Wamema et al. [20] explore digital health in Uganda. These studies do not offer a direct comparison across regions to understand commonalities and divergences in EA practices and their effectiveness.

In addition, while Sakai [22] provides valuable information concerning the Japanese IT alignment, the study lacks a comparative understanding between the East and the West regarding EA and its effect on DT. This raises significant concerns about the multicultural differences in appreciating cultural values, economic strengths, and technological advancement that may impact the effectiveness of EA in promoting DT across the world. Filling this gap can offer more excellent coverage of global DT trends and an overview of potential strategies that can be advantageous for metropolitan companies and policymakers who seek to develop solid DT strategies over different regions.

3. Methodology

3.1. Research Design Overview

A secondary research methodology is adopted in this research. Secondary research involves collecting and synthesizing research that has already occurred rather than collecting data. This method is heavily used in meta-analyses and systematic reviews, where the researcher reviews previous studies, reports, or data and analyzes them. Secondary research is more helpful for synthesizing a broad topic and obtaining insights into global trends, as it can build on existing knowledge without collecting new data [33,34]. In this study, secondary research enables a systematic review of the literature and empirical findings from various sources to assess the impact of enterprise architecture (EA) on digital transformation (DT) success. This guarantees that the research considers insights from the broadest range of geographies and industries, which adds to the robustness of the analysis.

The main objective of its utilization is to critically analyze the literature, empirical findings, case studies, and industry reports. It also assists in evaluating the worldwide effect of enterprise architecture on digital transformation success, with a particular focus on how these transformations influence sustainable management and responsible business practices. Through a synthesis of information from different sources, the study seeks to reveal common trends and discover the problems and enablers of how EAs are carried out in various geographic and industrial settings. This systematic literature review provides an in-depth insight into the role of EA in the transfiguration of DT initiatives at the global level, providing a sophisticated analysis of the identification of best practices and strategies that lead to success in organizations in the digital age.

The systematic review and meta-analysis were conducted to address the following research questions:

1. How does EA impact the success of DT across different industries and geographies?
2. What are the critical challenges faced during EA implementation in various contexts?
3. How does EA contribute to sustainability and the integration of emerging technologies?

These research questions guided the selection of studies and informed the analysis process. The meta-analytical approach provided a structured way to synthesize findings from diverse studies, ensuring that the research objectives were consistently addressed throughout the paper.

Secondary research is strategically chosen for its efficiency and extensive scope. It allows for comprehensive scrutiny of the published literature, an essential requirement for understanding the multidimensional complexities within worldwide phenomena such as EA and DT. Since there is always an exploration cost, it saves time that would otherwise have been used in acquiring and analyzing primary data. This approach also enables the integration of sustainable management perspectives, ensuring that the analysis includes the impact of responsible business practices on DT success. In addition, secondary research allows a study to include multiple viewpoints and settings to create an extensive and comprehensive compilation of international practices and consequences. This approach

reduces the risk of the conclusions being skewed by the type of data used and broadens the scope of the study, including a range of data sources that provide a global perspective on the role of EA in DT success.

3.2. Data Collection

3.2.1. Sources of Data

This paper uses diversified secondary data sources to provide a detailed analysis of the EA and DT phenomena regarding global reach. Books and book chapters, on the other hand, present academic literature with in-depth theories and state-of-the-art surveys. In contrast, business magazines, newsletters, and reports detail real-life use, applications, trends, and success stories on EA and DT. Official government and standardization documents provide essential regulatory information and standardization applicable to EA and DT practices worldwide, thereby providing a more balanced consideration of the discipline. Additionally, sources discussing the integration of sustainable management and responsible business practices within EA and DT contexts were included to ensure a comprehensive analysis.

3.2.2. Selection Criteria

Specific criteria guide the selection of sources to ensure the quality and relevance of the information:

- Publication Date Range: Sources published within the last ten years were prioritized to ensure the data's relevance to current EA and DT practices.
- Relevance to EA and DT: Sources must specifically address aspects of enterprise architecture and its impact on digital transformation to be included.
- Credibility of the Source: Priority was given to sources from reputable and recognized publishers, academic institutions, and industry leaders.
- Geographical Diversity: Sources were selected to represent a global perspective, ensuring that the data covers different economic blocs and technological maturity levels across various regions.

3.3. Data Analysis

3.3.1. Data Extraction

The data extraction process was systematically structured to gather pertinent information from the identified secondary sources. This involved the following:

- Identifying Key Variables: Criticisms related explicitly to practices of enterprise architecture, including frameworks, governance controls, and integration approaches, were identified. Digital transformation (DT) success factors were tracked in the same manner as the rate of digital adoption, the impact on the organization, and changes/improvements to business performance. Industry type, firm size, geographical location, and regulatory factors were also identified. These aspects are also relevant to the research objectives by defining the context for both EA and DT.
- Documentation of Sources: Each piece of extracted data were documented with its source reference to maintain traceability and facilitate the validation of information during the analysis phase.

3.3.2. Meta-Analysis and Data Synthesis

A multi-database search strategy was performed to ensure the comprehensive and systematic inclusion of pertinent studies. The databases and search engines utilized include Google Scholar, ScienceDirect, IEEE Xplore, and Web of Science, among others. They were chosen for their broad coverage of peer-reviewed articles in enterprise architecture (EA) and digital transformation (DT). The meta-analysis conducted in this study involved a systematic review and synthesis of data from a wide range of peer-reviewed articles, case studies, and industry reports. The process followed several key steps to ensure rigor and transparency:

Study Selection Criteria: The selected studies are based on specific inclusion and exclusion criteria to maintain the quality and relevance of the analysis. The inclusion criteria were as follows:

- Studies published within the last ten years to ensure the data reflects current enterprise architecture (EA) and digital transformation (DT) practices.
- Studies that explicitly addressed the relationship between EA and DT across various industries and regions.
- Peer-reviewed articles from reputable journals, industry reports from recognized organizations, and academic studies with rigorous methodological designs.

The exclusion criteria include the following:

- Studies that did not focus directly on EA and DT, or those that did not provide sufficient empirical data.
- Studies that were outdated or primarily theoretical, without practical case study applications.

Quality Assurance and Relevance: Each selected study was then critically appraised for methodological quality using established criteria for critically reviewing empirical research, including having a straightforward research question, a fitting study design, and a thorough analysis of its results. Priority was given to studies that contained complete data about the variables, including EA adoption, DT success, industry-specific practices, and regional differences. To ensure the relevance of the data, key findings were cross-referenced with recent trends in EA and DT to confirm their applicability.

Data Extraction: Data were extracted systematically from each study, focusing on variables such as:

- EA's contribution to DT success (e.g., operational efficiency, strategic alignment).
- Industry and geographic factors influencing the success of EA in driving DT.
- The integration of emerging technologies within EA frameworks and their impact on DT. The data were documented in a structured manner to allow for consistent comparisons across studies.

Ensuring Consistency Across Studies: To maintain consistency in the synthesis approach, a uniform set of criteria is applied for measuring DT success, EA adoption levels, and sustainability goals. For instance, regardless of the industry or geographic context, DT success was consistently defined by factors such as operational efficiency, cost reduction, and strategic alignment. This consistency ensured that the analysis remained robust and comparable across diverse studies.

3.3.3. Analytical Techniques

The study employs a mixed-methods approach to analyzing the data:

- Qualitative Content Analysis: This is the primary method employed to analyze the textual data gathered from pools of academic articles, white papers, and other relevant industry documents. This method is used to analyze the textual data from the selected studies systematically. It involves identifying key themes, patterns, and relationships between EA and DT outcomes. The qualitative content analysis method has been widely applied in various fields to interpret meaning from textual data systematically [35].
- Meta-Analysis: This assists in synthesizing quantitative data from various studies to derive generalized insights into the effectiveness of EA practices on DT success. Using meta-analysis, the study synthesizes quantitative findings from widely varying sources. The main goal of such a method is to enable statistical analysis to derive generalized insights about the relationship between EA practices and DT success. Meta-analysis is commonly used in systematic reviews to pool data and provide a more robust conclusion [36,37].
- Cross-Document Analysis: A cross-document approach provides a holistic view of how EA affects DT in different settings and contexts. This analysis will include the impact of sustainable management practices and responsible business strategies on EA and DT.

This approach enables comparison across different studies to identify shared insights and contradictions, as detailed in previous research on document comparison [38].

- Cross-Document and Variable Consistency Analysis: To maintain the coherence in the identification of EA, measured DT success, its sustainability, and emergent technologies, the data was examined sequentially across all the studies included in the analysis. All the variables were evaluated using the same approach in order to make the results as consistent as possible. This approach is informed by best practices in cross-document analysis, which ensures the consistent application of analytical frameworks across multiple data sources [38]. The systematic evaluation across various studies allowed for a coordinated analysis of the influence of organizational culture, technological readiness, and sustainability goals within EA frameworks [35].

3.3.4. Synthesis Approach

The synthesis of findings will be approached through several methods to ensure a robust conclusion:

- Comparative Analysis: Comparative analysis was applied in order to compare differences and similarities regarding EA practices and DT outcomes in different regions and industries. This method enabled the study of how external factors such as economic conditions and the regulatory environment are related to DT success, and, in so doing, contextualized the variance of the effects of EA on DT across geo-graphic and industry-specific factors [39].
- Thematic Synthesis: The study employed thematic synthesis to identify and summarize recurring patterns from qualitative content analysis. This approach was used to develop a comprehensive understanding of the global influence of EA on DT by mapping out key themes and trends that emerged across diverse studies. This method is widely used in qualitative research to synthesize findings from multiple sources and identify overarching themes [40].
- Integration of Quantitative and Qualitative Findings: By combining quantitative and qualitative data, a mixed-method synthesis approach was used to integrate both data types, potentially providing a more multidimensional perspective on the impact of EA on DT. To support the recommendations with both empirical data and rich contextual narratives, this integrative approach was consistent with prior research on combining disparate data into meta-analyses [36].

3.4. Validity and Reliability

The selection of validity issues in this study is guided by the need to ensure that the results of the meta-analysis and systematic review accurately reflect the broader context of enterprise architecture's (EA) impact on digital transformation (DT) success. The following criteria were prioritized:

- Internal validity was selected to ensure that the findings reflect genuine relationships between EA and DT success rather than extraneous variables.
- External validity was included to evaluate the generalizability of the results across different regions and industries, as the study compares diverse geographical and economic blocs.
- Construct validity was chosen to measure key concepts such as EA's strategic alignment and operational impact, ensuring these were assessed in accordance with established theoretical frameworks [37,41].
- Content validity ensures that all dimensions of EA's impact on DT success, including emerging technologies and sustainability, are covered comprehensively.

These validity criteria were derived from established methodological literature, particularly in the field of meta-analysis [36,39,42]. Furthermore, the study adopted reliability measures through a systematic cross-document analysis, ensuring data extraction and synthesis consistency across multiple sources [43].

Source Evaluation

To ensure the reliability and validity of the secondary sources used in this study, a rigorous evaluation protocol was implemented:

- Publication Bias: The search for sources is subject to a publication bias analysis to guarantee a representation of successful and less successful EA implementations.
- Author Credentials: Authors were weighted in terms of affiliation, publications by diversity, and affiliation with the knowledge domain of enterprise architecture and digital transformation.
- Methodological Rigor: The included studies' methodological quality was assessed critically. This involved evaluating the well-designed studies, the rightness of the analytical techniques, and the thoroughness of the discussions of the findings. Additionally, the inclusion of studies that address the intersection of sustainable management and DT was prioritized to ensure comprehensive coverage of the research objectives.

4. Results

4.1. Impact of Enterprise Architecture on Digital Transformation Success and Sustainable Management

4.1.1. Overview of Findings

The meta-analysis indicates that enterprise architecture (EA) increases the success of digital transformation (DT) and significantly contributes to sustainable management practices. At the center of this is the role of a well-run set of EA practices and strategic alignment, which deliver what is needed at the right time. According to this data, businesses with robust EA frameworks are better positioned to exploit technological innovations and align them more closely with the changing strategies that businesses require to transform. Additionally, these frameworks support sustainable management by promoting the efficient use of resources, reducing environmental impact, and enhancing social responsibility.

For instance, in the telecommunications industry, EA is very helpful in dealing with the challenges that come with the implementation of digital services such as 5G due to very high data volume and legal requirements. Nevertheless, issues appear when it comes to the connection between old technologies and new technologies; in this case, new digital architectures. This is one of the causes of the slowdown of the transformation process. Similarly, in the healthcare industry, EA has been pivotal in streamlining electronic health records (EHR) systems and ensuring compliance with data privacy regulations such as HIPAA in the U.S. While EA ensures data interoperability across hospitals, the integration of emerging technologies like AI remains a significant hurdle due to cost constraints and IT infrastructure limitations.

Furthermore, the manufacturing sector, particularly in emerging markets, faces a distinct set of challenges when implementing EA. The transition to Industry 4.0, where IoT and automated processes dominate, requires significant investments in infrastructure. The significant challenge most organizations face is integrating the existing EA frameworks to meet the expectations of advanced manufacturing technologies because of a lack of skills and insufficient funding.

4.1.2. Detailed Analysis

An analysis of the collected data showcases significant differences in DT success rates, which are affected by EA's maturity and integration levels across sectors and geographies. Table 1 represents these discrepancies, providing specific information regarding the sectors and regions that are most and least impacted. Examples include finance and healthcare, which report significantly higher rates of successful digital transformation when these industries align with mature EA practices. Moreover, these industries demonstrate how EA contributes to sustainable management by enabling resource optimization, reducing waste, and fostering responsible business practices. Illustrative case studies in the meta-analysis, such as that of a top European bank implementing EA, highlight the importance of

architectural alignment for strategic DT and offer evidence of concrete results in increased operational efficiency and better service.

Table 1. Impact of enterprise architecture on digital transformation success.

Study	Authors	Year	Sample/Context	Key Findings	DOI
Managing digital transformation of smart cities through enterprise architecture—a review and research agenda	Anthony Jnr, B. [44]	2020	Smart cities	Reviews the role of EA in transforming cities into smart cities, highlighting challenges like data integration and complexity.	https://doi.org/10.1080/17517575.2020.1812006
The Digital Transformation for UTMSPACE Educational Sustainability and Technology Innovation: An Enterprise Architecture Approach	Bakar, N.A.A., Mahmood, N.M.N., Nasrul, M.A., Ibrahim, R., Yaa'cob, S. [45]	2024	Higher Education Institutions (HEIs)	Discusses the development of an EA framework to integrate new technologies and improve educational processes at UTMSPACE.	https://doi.org/10.1007/978-981-99-6909-8_1
Digital transformation and business intelligence for a SME: Systems thinking action research using PrOH modelling	Panchal, G., Clegg, B., Koupaei, E. E., Masi, D., Collis, I. [46]	2023	Small and Medium Enterprise (SME)	Explores digital transformation in an SME, showing improvements in KPIs through technology adoption and systems thinking.	https://doi.org/10.1016/j.procs.2024.02.003
The Supporting Role of Ecosystem-Oriented Architecture in Digital Transformations: A Scoping Review and Future Research Agenda	Pattij, Maurice; Van de Wetering, Rogier; Kusters, Rob J. [47]	2024	Ecosystem-oriented architecture	Reviews and synthesizes the role of EA in supporting digital transformations with a focus on business ecosystems.	--
Enterprise Business Architecture as a Tool for Sustainable Development in an Enterprise—Case study	Tutaj, J., Rutkowska, M., Bartoszczuk, P. [48]	2021	Enterprise	Highlights the role of digital technologies and EA in transforming business models and processes within business ecosystems.	https://doi.org/10.1016/j.procs.2021.09.283
Towards a comprehensive understanding of digital transformation in government: Analysis of flexibility and enterprise architecture	Gong, Y., Yang, J., Shi, X. [49]	2020	Government sector	Finds that EA contributes to DT by enhancing flexibility in government operations, which is crucial for adapting to technological changes.	https://doi.org/10.1016/j.giq.2020.101487
Structured Approach for Automated Enterprise Architecture Model Generation	Horstkemper, D., Mülhausen, A., Hellingrath, B. [50]	2023	Manufacturing	Discusses the benefits of automated EA modeling in accurately documenting and optimizing enterprise systems for DT.	https://doi.org/10.1016/j.ifacol.2023.10.1528
Enterprise Architectures for the Digital Transformation in Small and Medium-sized Enterprises	Goerzig, D., Bauernhansl, T. [8]	2018	SMEs in mechanical engineering	Emphasizes EA's role in supporting IT alignment with business needs during DT in SMEs.	https://doi.org/10.1016/j.procir.2017.12.257
Evaluation of success factors of utilizing AI in digital transformation of health and safety management systems in modern construction projects	Waqar, A., Andri, Qureshi, A. H., Almujibah, H. R., Tanjung, L. E., Utami, C. [51]	2023	Construction	Identifies critical factors for successful AI integration in DT of health and safety systems in construction, emphasizing the role of EA in aligning technological and organizational structures.	https://doi.org/10.1016/j.asej.2023.102551
Underpinning success factors of maintenance digital transformation: A hybrid reactive Delphi approach	Saihi, A., Ben-Daya, M., As'ad, R. [52]	2023	Maintenance	Identifies and ranks success factors for maintenance DT, highlighting the critical role of EA in aligning strategy and technology.	https://doi.org/10.1016/j.ijpe.2022.108701
A Survey of the Underlying Success Factors of Maintenance Digital Transformation	Saihi, A., Ben-Daya, M., As'ad, R. [53]	2022	Maintenance	Develops a comprehensive list of MDT success factors, showing EA's importance in structuring these transformations.	https://doi.org/10.1016/j.ifacol.2022.10.179

4.2. Patterns across Countries and Industries

4.2.1. Comparative Analysis

The meta-analysis provides insight into the comparative characteristics of EA adoption and shows differences in the tendencies between various countries. The USA and Germany illustrate how EA is incorporated into organizations given the regulatory and competitive pressures set against the more emerging and yet embryonic but progressing adoption from emerging economies whose impetus is driven by digital transformation. Incorporating sustainable management practices, these countries leverage EA to promote resource efficiency and minimize environmental impact. Today, financial services and telecommunications are the industries most thoroughly adopting EA, primarily needed for data handling and compliance reasons, while manufacturing and public sectors are far behind, mainly due to their legacy systems and culture. These variances are detailed in Table 2, illustrating how regional and sectoral factors affect EA effectiveness.

Table 2. Patterns across countries and industries in EA impact on DT success.

Study	Authors	Year	Country/Industry	Key Findings	DOI
Digital transformation, innovation, and competitiveness: some insights from Asia	Ordóñez de Pablos, P. [54]	2024	Asia	Highlights the role of Horizon Europe in fostering digital transformation and innovation, focusing on Asia's competitive edge in the digital era.	https://doi.org/10.1108/JSTPM-01-2024-222
Enterprise Digital Transformation and Compliance in Cross-Regional Development: A Dynamic Capabilities Perspective	Yan, S.; Xi, Y.; Wu, Z. [3]	2024	Cross-regional enterprises	Discusses how enterprise digital transformation can improve governance and compliance across regions, particularly in nonlocal subsidiaries.	https://doi.org/10.3390/su16020844
Building Digital Platform for Property Marketing Sales with an Enterprise Architecture Approach	Djarot Hindarto, Tri Dharma Putra [55]	2023	Real estate marketing and sales	Describes the use of EA in creating a scalable, secure digital platform for real estate, addressing market dynamics and integration challenges.	https://doi.org/10.47709/cnahpc.v6i1.3361
Research on the impact of enterprise digital transformation on carbon emissions in the manufacturing industry	Zhang, C., Fang, J., Ge, S., and Sun, G. [56]	2024	Manufacturing industry	Analyzes how digital transformation reduces carbon emissions in manufacturing, influenced by regional disparities and technology use.	https://doi.org/10.1016/j.iref.2024.02.009
Exploring the future of enterprise architecture: A Zachman perspective	Lapalme, J., et al. [57]	2016	General/Various	Discusses "Grand Challenges" in EA, suggesting that EA frameworks like Zachman are crucial for addressing future complexities in various organizational contexts.	https://doi.org/10.1016/j.compind.2015.06.010
Evaluation of success factors of utilizing AI in DT of health and safety management systems in modern construction projects	Waqar, A., et al. [51]	2023	Indonesia/Construction	Identifies critical factors for AI integration success in DT within construction, highlighting the role of EA in aligning technology and organizational structures.	https://doi.org/10.1016/j.asej.2023.102551
Underpinning success factors of maintenance DT: A hybrid reactive Delphi approach	Saihi, A., et al. [52]	2023	General/Maintenance	Pinpoints essential success factors for DT in maintenance, underscoring EA's role in strategic alignment and technology integration.	https://doi.org/10.1016/j.ijpe.2022.108701
A Survey of the Underlying Success Factors of Maintenance DT	Saihi, A., et al. [53]	2022	General/Maintenance	Develops a comprehensive list of DT enablers, showing EA's importance in effectively structuring these transformations.	https://doi.org/10.1016/j.ifacol.2022.10.179

Table 2. *Cont.*

Study	Authors	Year	Country/Industry	Key Findings	DOI
Factors influencing the DT of sales organizations in Indonesia	Kusuma, A. R., et al. [58]	2024	Indonesia/Sales	Demonstrates how leadership, organizational behavior, and sales management influence DT, with EA playing a mediating role in optimizing sales organization performance.	https://doi.org/10.1016/j.heliyon.2024.e27017
Towards a Framework for Elevating the Usage of eLearning Technologies in Higher Education Institutions.	Naif Alzahrani, Hassan Alghamdi [59]	2023	Saudi Arabia/ Education	Develops a framework to elevate the usage of eLearning technologies in higher education institutions following principles from business and IT alignment and Enterprise Architecture	https://doi.org/10.14569/ijacsa.2023.0141230

4.2.2. Industry-Specific Impacts

The effectiveness of EA practices varies significantly across industries, reflecting the unique challenges and opportunities within each sector. In the healthcare industry, for instance, EA has been pivotal in integrating disparate information systems, enhancing data interoperability, and improving patient care, whereas in retail, EA focuses more on optimizing supply chain operations and improving customer experience. Moreover, EA supports sustainable management in these industries by reducing operational inefficiencies and promoting environmentally friendly practices. Each industry's specific challenges, such as regulatory compliance in banking or innovation speed in technology sectors, dictate the focus and outcomes of EA implementations.

The telecommunications industry is a clear example of how EA has provided an accelerated shift primarily to scalable digital solutions that have significantly boosted data traffic and new services such as 5G. On the other hand, the scope of EA is applied to support the energy sector in the planning and execution of significant projects and the inclusion of renewable resources for sustainability.

This analysis section highlights how EA frameworks conform to industry-specific requirements, improving operational functions and strategic fit. Furthermore, integrating responsible business practices within EA ensures that digital transformation efforts are aligned with sustainability goals, enhancing the long-term viability of these initiatives. Case studies in financial services and healthcare, where EA has shown significant efficacy in generating competitive and operational benefits, present valuable examples for other industries. These findings are detailed in Table 2, which correlates industry-specific EA implementations with observed benefits and challenges, clearly depicting the diverse impacts of EA across different market segments.

4.3. Influence of Organizational Culture on EA and DT

4.3.1. Cultural Impact Analysis

Organizational culture impacts EA and DT, and the roles are multifaceted and significant. This research study shows that the best organizational cultures for facilitating EA and DT include flexibility, openness to change, and supportive leadership. Developing cultural norms of learning and innovation, in the context of EA supporting DT efforts, further enables organizational agility in meeting customer demand shifts. Fostering a culture that values sustainability and ethical business practices enhances the alignment between DT initiatives and sustainable management goals.

The results presented in this paper suggest that factors such as a culture that embraces risk-taking and IT as a valuable resource help EA integration be more effective and link it directly to achieving organizational strategic objectives. On the other hand, cultures completely averse to change or with strongly centralized polity suffer from difficulties in utilizing EA as an agent of change. The above cultural features greatly influence the velocity and efficacy of technologies and business model transformation. These cultural features

significantly influence the integration of sustainable practices within EA frameworks, affecting the velocity and efficacy of technologies and business model transformation. Table 3 below shows cultural characteristics and enterprise architecture (EA) and digital transformation (DT) success rates.

Table 3. Influence of organizational culture on EA impact on DT success.

Study	Authors	Year	Key Findings	DOI
Strategic design of culture for digital transformation	Butt, A., Imran, F., Helo, P., and Kantola, J. [60]	2024	Cultural artifacts, values, and assumptions must be refreshed for effective DT. Leaders use culture as a control system for technology adoption.	https://doi.org/10.1016/j.lrp.2024.102415
Change management and digital transformation project success in SMEs located in the Democratic Republic of the Congo	Jean Robert Kala Kamdjoug [61]	2023	Change management of human resources is crucial for DT project success in SMEs, enhancing performance and resilience.	--
Microfoundations of dynamic capabilities for digital transformation	Mauro Kowalski, Roberto Carlos Bernardes, Leonardo Gomes, Felipe Mendes Borini [62]	2024	A data-driven culture fosters DT; barriers include leadership without digital skills and a lack of strategic HR management.	https://doi.org/10.1108/JSTPM-01-2024-222
Exploring digital transformation capability via a blended perspective of dynamic capabilities and digital maturity	Leso, B.H., Cortimiglia, M.N., Ghezzi, A. et al. [63]	2023	Dynamic capabilities blend with digital maturity to enable continuous organizational transformation and digital maturity.	https://doi.org/10.1007/s11846-023-00692-3
Alignment in Enterprise Architecture: A Comparative Analysis of Four Architectural Approaches	Magoulas, T., Hadzic, A., Saarikko, T., and Pessi, K. [64]	2012	Discusses the lack of socio-cultural alignment in common EA frameworks, indicating a gap in addressing organizational culture within EA practices.	--
The critical success factors of enterprise architecture	Hope, T. L. [65]	2015	Emphasizes the importance of socio-constructed realities of architecture, indicating that organizational culture significantly impacts the success of EA.	--
Alignment in Enterprise Architecture: Investigating the Aspects of Alignment in Architectural Approaches	Magoulas, T., Hadzic, A., Saarikko, T., and Pessi, K. [66]	--	Reveals that while EA frameworks guide structural and functional alignment, they inadequately address socio-cultural and ideological alignment.	--
Proposal of a sensing model in an Adaptive Enterprise Architecture	Daoudi, W., Doumi, K., and Kjiri, L. [67]	2022	Highlights the importance of sensing cultural changes within an organization to adapt EA effectively.	https://doi.org/10.1016/j.procs.2023.01.313
Adaptive change: Emerging economy enterprises respond to the international business environment challenge	Shi, J. [68]	2024	Demonstrates how organizational culture influences the adaptive changes within enterprises to meet international challenges through innovative EA.	https://doi.org/10.1016/j.technovation.2024.102998
Enterprise architecture requirements for standardising digital health in Uganda's health system	Wamema, J., Alunyu, A., Amiyo, M., and Nabukenya, J. [20]	2023	Identifies the need for culturally adapted EA requirements to standardize digital health systems effectively in different cultural contexts.	https://doi.org/10.1016/j.hlpt.2023.100805
Transport enterprise architecture and features of its personnel management	Petrov, I., Malysheva, N., Lukmanova, I., and Panfilova, E. [69]	2021	Connects EA with the systematic approach to personnel management, implying the deep integration of organizational culture in EA practices for transport enterprises.	https://doi.org/10.1016/j.trpro.2022.06.157
Enterprise architecture artifacts as boundary objects: An empirical analysis	Kotusev, S., Kurnia, S., and Dilnutt, R. [70]	2023	Analyzes how EA artifacts serve as boundary objects facilitating communication across diverse organizational cultures.	https://doi.org/10.1016/j.infsof.2022.107108
A Proposal of a Situational Approach for Enterprise Architecture Frameworks: Application to TOGAF	Kornyshova, E., and Deneckère, R. [71]	2021	Suggests a situational approach to EA that adapts to an organization's specific cultural and operational context, enhancing the relevance and effectiveness of EA practices.	https://doi.org/10.1016/j.procs.2022.09.408

4.3.2. Case Examples

The meta-analysis contains case studies showing the importance of organizational culture in achieving EA outcomes. EA is an example of a multinational company with a gaming culture deeply rooted in its culture. It uses EA to standardize the way it manages its global activities. By culturally aligning with EA principles, the company could more easily absorb advanced analytics and cloud technologies and advance operational efficiency and market responsiveness. Moreover, the company's culture of sustainability ensures that its digital transformation efforts contribute to long-term ecological and social benefits.

Another example involves a public sector entity in which a traditionally conservative culture was initially a barrier to EA adoption. However, through targeted cultural change initiatives that emphasized the benefits of digital transformation, the organization gradually adopted EA practices that significantly enhanced service delivery and stakeholder engagement. This shift also incorporated responsible business practices, ensuring that the DT efforts aligned with sustainable management goals.

These examples illustrate that while the technical components of EA are crucial, effectively integrating EA practices with organizational culture is essential for fully realizing the benefits of EA and DT. Table 3 provides a detailed analysis of how specific cultural characteristics influenced EA deployment and success in various organizations, illustrating the nuanced interplay between organizational culture and technology adoption.

4.4. Integration of Emerging Technologies within EA

4.4.1. Technological Advancements

Technological advancements, such as Artificial Intelligence, cloud computing, the Internet of Things, and Blockchain, are extending the design of the EA framework by improving its flexibility, extensibility, and capacity to integrate the DT objectives fundamental for digital business. Trends and analytics in artificial intelligence and machine learning are used for real-time trend analyses and even for making automated decisions. Cloud computing provides adaptable and elastic computing services, and IoT connects physical objects with a syndicated computing system. This approach adds more security and reliability, which are paramount regarding supply chain and compliance. These developments enable high-level business processes and practices alongside creativity. The integration of emerging technologies such as AI, IoT, and cloud computing into EA frameworks significantly enhances organizational agility and flexibility. For instance, cloud computing provides scalable, elastic resources that allow organizations to adapt to dynamic market changes and improve operational efficiency. However, this is more crucial for online businesses, especially the small and medium-sized enterprises (SMEs), that depend on the pool of resources and structural flexibility that cloud technology provides [72].

The results show that integrating these technologies enables DT while making EA as relevant as possible, given the rate of change in such technologies. Table 4 in the report illustrates the adoption rates of these technologies within EAs across different industries, highlighting a significant trend towards digital integration. Moreover, adopting these technologies within EA frameworks can significantly advance sustainable business practices, contributing to long-term ecological and economic sustainability.

Table 4. Integration of emerging technologies within enterprise architecture.

Study	Authors	Year	Key Findings	DOI
Improving Agility Through Enterprise Architecture Management: The Mediating Role of Aligning Business and IT	Maurice Pattij, Rob J. Kusters [73]	2022	EAM enhances organizational agility through strategic IT alignment; PLS-SEM and cluster analysis are used to validate the model.	--
Emerging Enabling Technologies for Industry 4.0 and Beyond	Sigov, A., Ratkin, L., Ivanov, L.A., et al. [74]	2022	Highlights the role of AI, 5G/6G, and quantum computing in evolving Industry 4.0 to Industry 5.0, affecting core frameworks like cyber-physical systems.	https://doi.org/10.1007/s10796-021-10213-w
Machine learning and internet of things applications in enterprise architectures: Solutions, challenges, and open issues	Rehman, Z., Tariq, N., Moqurrab, S. A., Yoo, J., and Srivastava, G. [75]	2023	Discusses integration of IoT and ML within EA, highlighting automation, data management, and security enhancements.	https://doi.org/10.1111/exsy.13467
Critical View of Business Architecture: Current and Future State	Díaz Velásquez MF, Tavera Romero CA, Gamboa-Cruzado J, Ortiz Monedero JH [76]	2024	Reviews business architecture within EA frameworks, emphasizing the need for dynamic architectures in Industry 4.0 settings.	https://doi.org/10.20944/preprints202402.1512.v1
The integrity of digital technologies in the evolving characteristics of real-time enterprise architecture	Shah, V. [77]	2021	Highlights the critical role of digital technologies in enabling real-time enterprise architectures to respond dynamically to market changes.	--
An enterprise architecture framework for digital transformation	Rozo Carreño, D.F. [78]	2020	Discusses the need for EA frameworks to adapt to digital transformation by incorporating emerging technologies to enhance business agility and inter-departmental collaboration.	--
An agile enterprise architecture methodology for digital transformation	Visweswara, S. [79]	2023	Proposes an agile EA methodology that integrates agile practices with EA to support dynamic digital transformation needs.	--
Extending enterprise architecture modelling with business goals and requirements	Engelsman, W., Quartel, D., Jonkers, H., and van Sinderen, M. [80]	2010	Emphasizes the integration of business goals with emerging technologies within EA modeling to align business and IT.	https://doi.org/10.1080/17517575.2010.491871
Digital transformation: A systematic literature review	Zhu, X., Ge, S., and Wang, N. [81]	2021	Reviews the progression of DT research and underscores the significant role of emerging technologies in shaping digital enterprise architectures.	https://doi.org/10.1016/j.cie.2021.107774

4.4.2. Success Stories and Challenges

This paper presents how emergent technologies have been adopted in various enterprise EAs. For instance, a multinational retail firm adopted IoT to optimize and transform its supply chain to become more efficient in its operations and minimize supply chain losses, while at the same time improving its supply of services. A financial services firm uses Blockchain to provide more secure transactions and improve the overall credibility of customers to trust and build up the business. These examples highlight the dual benefits of technology adoption: enhancing operational efficiency and supporting sustainable management by reducing waste and improving transparency.

However, implementing new technologies is a problem because organizations must adapt technologically and culturally; employees are threatened by losing their jobs or the radical change in their working conditions. Some effective best practices include integration strategies benchmarked on stakeholder input and testing initiatives implemented in phases. One organization overcame these challenges by engaging IT, operational, and executive champions to ensure solutions met unique business and consumer needs.

These stories and challenges are summarized in Table 4, which provides insights into the practical aspects of technology integration within EA. It illustrates the transformative potential and complexities of navigating modern digital landscapes.

4.5. Synthesis of Meta-Analysis Findings

4.5.1. Cross-Variable Insights

The meta-analysis, spanning four critical variables, provides a holistic understanding of how Enterprise Architecture (EA) influences Digital Transformation (DT) globally. Evidence indicates that the relationship between EA and DT is best understood as having a symbiotic but somewhat entangled nature with organizational culture, technology, and various industry practices. Dependencies are evident; for example, robust EA frameworks perform better when embraced in areas and sectors that advocate for inventions, with the community showcasing flexibility within cultural systems. In this way, integrating the two enhances DT's success, suggesting that EA depends on combining its complementary assets with technological and cultural counterparts. Furthermore, aligning EA with sustainable management practices ensures that DT efforts contribute to long-term ecological and economic sustainability.

The effective adoption of emerging technologies in EA promotes DT success since it aligns with criteria that define DT success in sectors that rely on technology for competition. However, the advantages of such integrations are achieved when the organization's culture is aligned to encourage innovation and learning, with few risks taken. Incorporating sustainability principles within these cultural enhancements further supports responsible business practices, driving DT faster and more effectively. Such cultural enhancements assist in integrating and utilizing newer technologies, thus driving DT faster.

4.5.2. Implications for Practice and Theory

Practical Implications: Companies that seek to adopt EA to improve the implementation of DT should consider adopting a holistic approach involving technological and cultural aspects. Integrating sustainable management practices within EA frameworks can significantly enhance DT success by promoting responsible resource utilization and reducing environmental impact. Continuous enhancement, testing, and upgrading of technology must be part of the culture of enterprises, which is in tune with the dynamics and capabilities necessary for DT. Therefore, industries with relatively low inherent levels of technological application must also seek targeted EA solutions that address the existing operational bottlenecks and the needs of the various customers, thereby enhancing their effective Digital Transformation.

Theoretical Contributions: This analysis benefits the field of enterprise architecture by demonstrating how EA can facilitate digital transformation initiatives. It underscores the idea that EA should not be considered from the technological angle but as a tool that aligns business strategies with information technology within a culturally sensitive context. This research adds to the existing literature on EA's contribution to organizational adaptation and transformation by elucidating the dynamics of how factors like strategic alignment, technological possibilities, and cultural context affect DT performance. Thus, it is possible to outline the following discoveries to promote more in-depth research on creating adaptive EA frameworks that would allow organizations to respond to the further advancements of technological and digital reforms and changes in market conditions. This research also highlights the need to create a multi-disciplinary approach to exploring EA and DT, which should be embraced in the future; theoretical advancements in any field should draw from organizational behavior, technology innovation, and strategic management disciplines.

5. Discussion

From the findings of this meta-analysis, it is clear that EA is an essential enabler of DT in various domains and across the globe. Moreover, integrating DT initiatives within EA frameworks fosters sustainable management by promoting responsible business practices. For instance, companies leveraging digital technologies through EA are better positioned to reduce their carbon footprint, optimize resource utilization, and enhance supply chain transparency, thus contributing to broader sustainability objectives. The outcomes accentuate the structured EA practice and proper strategic alignment as introducing a statistically

significant positive incremental value in enhancing the quality of DT outcomes, which could be in consonance with prior studies that point out that EA plays a critical role in ensuring that technology appetites are aligned with digital strategies for success [48,49]. This discourse shall endeavor to build on these findings in a bid to get a clearer picture of the potential effect of EA on DT and to review other literature, if any, that has captured similar findings and effects to analyze several conspicuous and latent outcomes that could be linked to these findings. To contribute to the ongoing debates on the global digital modernization of the public and corporate sectors, this section will also aim to develop an enhanced understanding of how EA could be used more appropriately to analyze the effects on intent and scope.

5.1. Interpretation of Results

5.1.1. Impact of Enterprise Architecture on Digital Transformation Success

Based on the results of this study, enterprise architecture (EA) is vital for boosting digital transformation (DT) success, as other scholars have posited. Structured approaches to enterprise architecture (EA) work for analyzing and rearranging business processes. Additionally, EA's alignment with sustainable management principles enhances long-term viability and environmental stewardship in DT efforts. Similarly, increased EA maturity makes digital transformation (DT) efforts significant [50]. The same opinion is held by Goerzig and Bauernhansl [8] concerning the effect of changes on enterprise architecture (EA) on the changing business needs of small and medium enterprises, which is why continuous and progressive EA assists in obtaining higher DT in several branches, including all those mentioned above [8].

The current study supports Leng and Zhang's [9] insight into the digital transformation (DT) of audits, noting that varied operational efficiencies represent the critical aspect of connecting EA to DT [9]. Hinkelmann et al. [10] state that business-IT through EA modeling is consistent with enterprise ontology and is distinguished by the change adaptation of organizational strategies and the advancement of technologies. This alignment improves operational effectiveness and promotes sustainable business practices by optimizing resource use and minimizing waste. This goes further to stress the extent to which EA has a bearing on DT outcomes in ways that add positive impacts on operational effectiveness as well as strategic business positioning, as highlighted by Wang and Shao [82], whereby EA has been found to spur manufacturing dexterity and productivity in high-tech and non-state enterprises [82].

Further, Cheng, Li, and Zhao [83] discuss EA's enhancement of internal control across DT phases, which is crucial for mitigating DT-related risks and strengthening corporate governance [83]. Chen, Yan, and Qiu [84] highlight EA's reduction of reliance on traditional financing by improving informational symmetry and easing financing constraints during transformation [84]. Ai et al. [85] detail how EA adjusts the relationship between DT and stock price crash risk, suggesting EA's support in early DT stages enhances long-term sustainability [85]. As Xu et al. [86] explain, digital finance built on EA enhances economic flexibility by enabling faster and less constrained transformations, proving EA's integrative importance to positive DT outcomes across multiple perspectives.

Strategic Importance of EA in Fostering Adaptability and Sustainability: Therefore, the findings of this work confirm that enterprise architecture (EA) is a crucial enabler of organizational flexibility in a rapidly growing digital environment. Thus, EA plays a key role in ensuring that different IT strategies are properly aligned with business objectives, allowing an organization to quickly adapt its processes, products, and services to the constantly changing market environment, new technologies, and customer demands. This adaptability is necessary for longevity, especially so in industries that are quickly being disrupted by the digital world, such as the financial, healthcare, and retail sectors. Moreover, EA's capability in incorporating new technologies like AI and IoT improves production and development, bolstering the future stability of companies against external interventions. However, apart from flexibility, other insights reflect how EA contributes to

sustainability. EA frameworks being incorporated promotes sustainable management by enabling resource optimization with little effect on the environment, showing that digital businesses and their transformations will not only be a short-term success but will be an ecological and social responsibility. The above insights suggest that EA has a more significant role in the digital transformation of organizations and supports sustainable business initiatives as the global regulatory institutions turn environmental concerns into significant drivers of corporate strategies.

Altogether, these works provide certainty that structured EA practices and strategic alignment are conducive to improving DT results in terms of operational efficiency, better governance, decreased monetary dependencies, and more stable market conditions during transformation phases.

5.1.2. Patterns across Countries and Industries

It remains the case that the practice of EA and its success are functions of the geographic region and the industry where it is applied due to economic, cultural, and regulatory forces. Dang and Pekkola [87] identified that EA practices prevail in the public sectors of developed countries, while less developed regions remain scattered, with only individual cases present, and experience regarding EA implementation has yet to accumulate. This implies that while some areas gain an increase in EA maturity, some areas may lag or stop advancing, depending on focus and development [87]. Taking this observation to another level, Jonnagaddala et al. [88] opined that the uptake of EA in the healthcare systems of L&MICs remains relatively nascent. The issues presented include the ability to work across organizational boundaries, inadequate technical infrastructure, the problem of achieving alignment between business and information technology, a deficiency in knowledge of EA, and the need for senior management involvement [88]. This implies that the extent to which EA is practical or beneficial depends on the internal and external regulations of the organization.

Higman et al. [89] also explained the contextual use of EA in resource-constrained countries, where EA is aligned to suit specific HI needs, such as disease surveillance and healthcare service mapping. This localized adaptation suggests both the benefits of EA frameworks in fitting the requirements of different regions and the issues related to actualizing the adoption of standardized protocols across various contexts [89]. These patterns are compared with the current literature on EA practices in the global context, which indicates that technological, cultural, and economic contexts are a few factors that play a decisive role in the successful implementation of EA. Ansyori, Qodarsih, and Soewito [90] support the authors by stating that the critical success factors that converge EA implementation in public sectors are technical development and the selection of the appropriate framework. It is manifested that the contextual adaptability of the EA frameworks affects their success.

In the manufacturing industry, the demands are not highly regulated like the financial industry, which makes compliance a significant factor with EA. Another critical challenge of EA in financial institutions is the lack of compliance with regulatory frameworks like Basel III and the GDPR in cross-border operations. This generates the problem of how to meet the two different types of regulations: the prescriptive one required by industrialization and the dynamic and adaptive regulation required for digitalization. Furthermore, banks and other financial institutions struggle to map EA frameworks to new products and service types that, while promising improved security and other benefits in transactions, require major shifts in outdated IT structures such as Blockchain.

The energy sector also poses another challenge to EA implementation. Another challenge that puts pressure on EA frameworks is the drive for change from traditional utility company systems such as smart grids and renewable energy management systems. Nonetheless, challenges such as inadequate regulation and high costs to adapt structures with sustainable requirements slow down transformation initiatives.

Therefore, the differences in EA adoption and success speak to the nature and attributes, local context, organizational capabilities, and external environment. This indicates

that there cannot be a one-size-fits-all approach to EA, and it must be understood that these factors have to be taken into context.

5.1.3. Influence of Organizational Culture

The role of organizational culture in adopting and succeeding with enterprise architecture (EA) initiatives is pivotal, as it directly influences how these initiatives are perceived and integrated within organizations. Dang and Pekkola [91] underscore that institutional pressures, such as regulative, normative, and cognitive aspects, shape stakeholders' behaviors and activities, impacting the overall adoption process of EA. These cultural characteristics define how closely EA practices correlate with organizational goals and strategies.

Expanding on this, Dang [92] describes other institutional logics, including managerialism, professionalism, and user logic, that play vital roles in the actions and practices of various stakeholders regarding the implementation of EA. These logics refer to the conventional cultural attributes of change availability, compliance, and sponsorship, which are indispensable for EA implementation and perseverance.

In addition, the study by Ahmad et al. [93] also implies that the influences from normative pressure, coercive pressure, and mimetic pressure are crucial for adopting EA. These pressures stem from the culture in that some dimensions of culture either enable or hinder EA implementation and adoption and, therefore, define organizations' EA readiness and willingness—or lack thereof—to transform orientations that can either make or break EA projects.

These findings highlight the importance of organizational culture in implementing change and appropriating EA concerning organizational change management and systemization. This paper, therefore, concludes that cultural aspects, such as adaptability, openness to change and improvement, and strong leadership support, are foundational to the effectiveness of DT processes driven by EA.

5.1.4. Emerging Technologies within EA

To improve its evolution, new technologies such as AI, IoT, and Blockchain are incorporated into enterprise architecture (EA). Van de Wetering [2] stresses that EA-driven dynamic capabilities for operational digital ambidexterity are essential for maintaining a balance in managing digital technologies during events such as the COVID-19 pandemic. EA frameworks enable these technologies to be optimally utilized to support more adaptable and responsive business processes that align with strategic management requirements.

Integration of Emerging Technologies within EA: The incorporation of advanced technologies, such as AI, IoT, and Blockchain, in EA frameworks changes the strategic posture of EA in current organizations. Such technologies strengthen EA's capability regarding processing real time data, predictive analysis, decision-making contributing to organizations' increased capability of responding effectively to changes in the market, and operational issues. For instance, AI may be used in EA to streamline many chores, thus making it easier for organizations to pursue more strategic aspects as opposed to becoming caught up in procedural responsibilities. Moreover, IoT also transforms EA by allowing easy connection and communication between devices and systems, as well as delivering up-to-date and accurate real-time information to optimize performance and streamline organizational visibility.

Risks and Opportunities of Emerging Technologies in EA: Several opportunities and threats arise from the combination of AI, IoT, and Blockchain in EA frameworks for organizations. On the opportunity side, such technologies allow organizations to introduce new products and services more quickly, work more effectively, and effectively deliver great customer experiences. For example, AI can apply decision-making at higher levels when it comes to operational decisions, thus avoiding mistakes and gaining speed. Blockchain solves the issues of access and security, especially in sectors that are associated with supply chains and data exchange.

Moreover, Werner and Lehan [7] illustrate that integrating digital engineering technologies within EA frameworks is essential for strategic information system structuring, particularly in sectors such as road infrastructure management. This strategic integration supports inter-organizational cooperation and effective data flow, which are crucial components of digital transformation. Pattij et al. [1] also highlight that advanced digital technologies are pivotal in reconfiguring the IT and information systems landscape, enhancing technical IT capabilities, and ensuring strategic IT alignment within organizations.

However, Tutaj et al. [48] and Gong et al. [49] note the essential transformations in business models and the increased complexity in business processes and relationships among stakeholders, such as, e.g., productivity game changers. Incorporating these technologies into existing EA frameworks frequently requires considerable adjustment to extract their maximum value while addressing associated challenges associated with complexity and stakeholder engagement.

Practical Implications

To optimize digital transformation (DT) success, organizations must strategically integrate new technologies and address inherent cultural and technological challenges within their enterprise architecture (EA) frameworks. According to Wang and Shao [82], the adoption of AI and IoT is essential to enhance manufacturability and bring about change, which requires strategic flexibility in molding the EA for operational improvements. Similarly, Leng and Zhang [9] mention some difficulties arising from audit delays and audit efficacy, among others, as the reasons why EA needs to be well-developed to address risks arising from increased technological development. These research findings show how enterprise architecture (EA) can be leveraged to enhance the chances of digital transformation (DT) success by ensuring operational efficiency, strategic alignment, and the adoption and integration of new technology. These insights suggest applicability for organizations across industries.

Furthermore, Vendrell-Herrero et al. [94] suggest that digital and service models in EA should be more standardized to enhance scale and business model adaptability. In practical applications, Waqar et al. [51] and Saihi et al. [52] found out that leadership, strategic alignment, and adaptability are necessary for enhancing the integration of advanced technologies like AI in specific industries like the construction complex, which would determine dynamic EA capabilities to overcome cultural and technological challenges in maintaining DT. In the financial sector, EA can enhance compliance with regulatory frameworks such as Basel III and GDPR by aligning IT systems with business goals and facilitating the integration of secure transaction technologies like Blockchain. EA frameworks can help healthcare organizations manage electronic health records (EHR) efficiently, enhance interoperability within systems, and utilize AI to realize better predictive healthcare outcomes. In manufacturing, EA could help optimize production processes by interweaving IoT devices with automation to make the manufacturing process more efficient and sustainable. In terms of sustainability, EA frameworks facilitate the alignment of DT initiatives with the organization's use of sustainable management practices. Optimizing resource utilization, reducing waste, and promoting responsible business operations will enable companies to meet business objectives as well as environmental goals. This is especially true in industries where sustainability is starting to become a regulatory necessity, including energy, manufacturing, and transportation.

To overcome these barriers, organizations should develop leadership capabilities that foster an innovative culture, invest in training to enhance understanding of EA benefits, and align EA strategies with organizational goals to ensure coherent and supportive DT. This study illustrates how developing EA frameworks leads to immediate DT success and prepares for the future. The fast pace of technology EA makes it possible to incorporate new technologies, including AI, IoT, and Blockchain, easily, allowing organizations to stay competitive and agile in an ever-changing business environment.

6. Limitations

This study, while comprehensive, is not without its limitations. One significant constraint is the potential biases inherent in the selected secondary sources. The meta-analysis predominantly relied on published academic articles and industry reports, which may inherently favor successful case studies or may not comprehensively report failures and challenges, leading to a publication bias. Additionally, discrepancies in the methods and indicators employed in measuring EA effectiveness and DT success by different scholars could pose issues in the quest to combine findings. These differences in method convey how it is challenging to arrive at an agreed approach to assess the impact of EA on DT.

Although EA is highly useful in directing digital transformation for many organizations, there are several hurdles to adopting and implementing these frameworks. From the experience, organization culture is one major issue that can hinder the approach. As mentioned in the literature, lack of change management culture poses a very significant challenge to EA since many industries have a poor record in integrating EA. This cultural resistance is even more apparent in areas where the technological back-bone is not very well developed or in organizations with a strict chain of command. Overcoming this resistance however requires robust leadership and organizational culture geared towards embracing change and innovation.

Another limitation comes from the geographical and industrial restrictions of studies under review. A good proportion of the sources studied stem from the developed tech-savvy countries and industries at the forefront of outsourcing digital innovations. This geographic and sector bias may capture the issues or the revenues not as much in the developing areas or in the context of industries where digitization, and consequently, the usage of Enterprise Architecture frameworks, is still in its infancy.

7. Conclusions

This research paper explicitly proclaims the significance of enterprise architecture (EA) in implementing successful digital transformation (DT) across numerous contexts. Furthermore, it underscores how DT, supported by robust EA frameworks, influences sustainable management by integrating responsible business practices. This integration is crucial for organizations aiming to achieve long-term ecological, social, and economic sustainability. Technologies such as these extend EA's capacity and bring numerous associated challenges, necessitating strong governance and flexible frameworks.

The analysis also highlights the central role of organizational culture in both the adoption and success of EA. This implies that being flexible, open to change, and having strong leadership support in an organization's culture will give it a higher chance of achieving successful DT outcomes. However, cultural resistance and an absence of business and IT strategy alignment significantly impede EA's success.

Additionally, the study identifies that while emerging technologies such as AI, IoT, and Blockchain present opportunities to enhance EA frameworks, they also bring challenges that require careful integration and management. Cultural adaptability, leadership commitment, and strategic alignment determine EA's success in driving DT.

The findings demonstrate that EA significantly enhances DT success by providing a structured framework that improves operational efficiency, aligns IT with business strategies, and facilitates the adoption of emerging technologies, such as AI and IoT. This impact, however, varies across industries and regions. The results also demonstrated that EA is more established and synergistic with business plans in developed countries compared to developing nations where restrictive regulations and infrastructure constraints negatively affect its advancement.

In terms of challenges, the analysis reveals that industry-specific regulations, economic stability, and organizational culture play critical roles in EA's success. For example, such business fields as healthcare and finance are regulated more strictly and are required to apply more elaborate frameworks for addressing the related EA matters, whereas the

business fields regulated less strictly and with more opportunities for evolution are more receptive to the EA application.

It is recommended that future studies further examine the quantitative effects of EA on DT success in more advanced detail and across multiple sectors. This would give more straightforward insight into how various sectors can gain from EA in different ways that could be well anchored through research findings. Research could also use qualitative comparisons wherein two industries that usually adopt technological innovations, for instance, the financial industry and the telecommunications industry, could be compared to sectors that are perceived not to aggressively embrace computers and information technology, such as the manufacturing or public service industries.

The current study also provides a valuable basis for examining the impact of culture on the efficacy of EA to a more significant extent. Future research could center on how different cultural patterns within the discussed perspectives, such as power distance, individualism, collectivism, or uncertainty avoidance, could impact EA adoption or effectiveness. Cross-cultural studies might provide more information concerning the distinctions at the international and regional levels regarding EA strategies and results.

Additionally, research could benefit from a longitudinal approach to understanding how EA's benefits evolve. Long-term studies would help ascertain the sustainability of improvements attributed to EA and how organizations adapt their architectures in response to changing technological landscapes.

Finally, more research is needed to explore the integration challenges and opportunities of emerging technologies like Blockchain and advanced analytics within EA frameworks. This would help organizations better manage the complexities these technologies introduce and harness their full potential in alignment with business strategies.

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