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INFORMATION SYSTEM STRATEGY PLANNING RELAT-ED TO SEAM: A CASE STUDY OF EA AND DIGITAL TRANSFORMATION COMBINATION

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Research full-length paper

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Abstract

Inconsistency always occurs between digital transformation (DT) strategy and information system (IS）and enterprise architecture (EA) planning. This symptom leads to repeated investment, delay, or failure in DT projects. In addition, it will create leakages in DT value. Moreover, in the dynamic digital environment, the inconsistency of between DT strategy and EA planning process is exacerbated due to dynamic business strategies. This paper applies SEAM and BPM （business process management） theories to explore the scenario method for applying EA to DT strategies operation to explain inconsistent strategic planning symptoms and outline the DT-EA strategy planning integration process framework. The research method of this paper is multiple case studies, and the data collection sources include semi-structured interviews of 106 interviewees, material collection, literature comparison, and observation. By comparing four critical cases, this research shows the relationship between DT and EA and reveals the dysfunction in DT strategic implementation from the SEAM and BPM perspective. In practice, this research integrates DT and EA to provide a context method for enterprise DT strategy planning design.

Keywords: socio-technical philosophy, IS, SEAM, EA, DT, strategic planning.

1 Introduction

Digital transformation (DT) usually refers to a disruptive phenomenon that has dramatically changed the ways organizations develop, compete, and create value (Kotusev, 2019). Therefore, organizations must make full use of the business potential of DT, update operation and decision-making processes, and develop new strategic business models. In this complex work, DT strategy is an important aspect (Hinkelmann & Pasquini, 2014). The EA method has gained high-level influence in many organizations as a tool for DT (Brownet al.2010). EA can be used as a planning and governance method to manage business-driven and value-oriented organizational transformation and help the organization transform business strategy into daily operation and master the emerging complexity of the whole enterprise (Wetering et al., 2021).

EA-driven dynamic capability can support enterprise innovation capability (Korhonen & Halen, 2017; Wetering et al., 2021). EA also supports the DT program (Wan, 2021). EA can actively support decision-makers in making full decisions on the rapidly changing business and IT environment (Wetering et al., 2021) that meet the needs of the DT (Hakim, & Osman, 2020). For many organizations, the EA method has been widely deployed as a planning and governance method to manage complexity and continuous change, promote the consistency between the organization's strategic business unit objections and IT, and is a crucial component to support the sustainable growth and success of the organization (Cameron & McMillan, 2013; Essien, 2020).

Furthermore, EA is committed to managing the complexity of the organization and aligning the organization's business with IT (Banaeianjahromi, 2018). However, adopting EA in practice is still a considerable challenge (Banaeanjahromi, 2018). Especially in the era of DT, EA management becomes more difficult. Developing an organization's business strategy is the starting point for further determining IT strategy. Enterprise architecture planning (EAP) is a collection of EA and business strategies. DT involves the formulation of a change implementation roadmap, portfolio management, and constantly correcting the dynamic business strategy to make it consistent with the IT strategy. In essence, the challenge of EAP concerns how to maintain a high degree of consistency with the digital innovation strategy, which is the problem faced by many organizations.

The lack of consistency in strategic is the main reason why many organizations cannot obtain value from DT (Hinkelmann & Pasquini, 2014). The inconsistency of strategy implementation is considered a phenomenon of dysfunction; for example, the DT investment may bring little business value or repeated digital investment. The dysfunction will bring huge value loss to any sized company and industry (Savall & Zardet, 2008). In fact, a company can be compared to a strategic tool that loses too much energy due to leakage or internal and external bleeding. Internal bleeding originates from many dysfunctions that occur every day (Cappelletti et al., 2018). Although employees and managers intuitively feel these daily losses, they often underestimate the cost. For managers, the biggest problem is still how to evaluate these huge hidden costs and turn them into tangible performance. The social-economic approach method (SEAM) and its hidden cost method offer a way to solve such a problem (Cappelletti et al., 2018). SEAM tells us that, due to the dynamic friction between organizational structure and employee behavior, there are inherent conflicts within the organization, resulting in dysfunction and subsequent hidden costs, thus damaging the sustainable socioeconomic performance. The reasons behind this conflict include imperfect information use, the organization-components complexity, the different logic between participants and departments, the simplistic mental models, and the instability of the external environment exacerbating the negative consequences of these other factors (Cappelletti et al., 2018).

On the other hand, the unreasonable design of EA planning process and DT planning process leads to duplication and waste in strategic planning process, which is also one of the conceptions of organizational dysfunctions and business process management refers to the design of solutions at the technical level and the behavior of people in the organization. Therefore, in this regard, business process man-

agement and organizational dysfunction can jointly explain the inconsistency between EA planning process and DT planning process within the organization which this research will conduct 4 cases.

On the other hand, the unreasonable process design of the EA planning and DT planning leads to duplication and waste, which is also one of the reasons for the organizational dysfunctions. Because Business process management refers to the process solutions design and people's behaviours in the organization, therefore, as this regard, business process management and organizational dysfunction can jointly explain the inconsistency process between EA planning and DT planning within the organization.

Above all，this research supposed to use a alignment framework to explain it，and even guide this non-alignment strategy in digital transformation. So, this research aims to understand the inconsistent process of the DT planning and EA planning, further outlining the DT-EA strategy planning integration process framework. The research questions raised in this paper are:

RQ1: What are the reasons for inconsistent process between DT and EA planning?

RQ2: How can organizations integrate planning process of the DT strategy and EA?

2   Business Strategy and EA

Alfred Chandler is one of the earliest researchers in the field of management. He gave the earliest definition of the word "strategy." In Strategy and Structure (Chandler, 1969), He defined strategy as determining the primary long-term objectives of an enterprise, meaning it entails taking action policies and allocating the resources required to achieve these objectives. A strategy is a formal and systematic planning process in this interpretation. Generally speaking, the business's strategic functions can be divided into strategic planning, implementation, and evaluations.

The concept of business strategy plays a vital role in EA discussions. Business strategy is widely regarded as the starting point or basis for developing EA artifacts, which define the future structure of the information system required by the organization. In practice, all mainstream EA approaches recommend developing EA artifacts in some form starting directly from the organization's business strategy, such as tasks, visions, drivers, goals, objectives, and key performance indicators. Modern organizations strive to keep up with the rapidly changing technology and business environment. This is where the concept of EA comes into play (Wetering et al., 2021), which involves the design, management, and transformation of modern organizations as complex systems to ensure the value of critical stakeholders (Lankhorst, 2016). EA take business objectives, the value chain, and business capabilities as management elements In addition, EA pays more and more attention to enterprise transformation and strategic management (Kudryavtsev & Kubelskiy, 2018). EA aims to bridge the gap between these elements, from strategy to operation, and better adjust, integrate, optimize, and coordinate the whole organization (Kappelman & Zachman, 2013).

In sum, in the existing EA literature, business strategy is widely regarded as the necessary basis of EA, and the concepts of business strategy and EA are inseparable (Kotusev, S. et al., 2020). Kudryavtsev & Kubelskiy (2018) proposed the potential and results of using EA to support strategic management. Their research pointed out that one of the motivations or driving factors for the application of EA is the need for continuous change in business transformation. The relationship business transformation and EA is receiving increasing attention; that is, the gap between the goal and the current state will be transformed into the development of an organization initiative. The target architecture is the embodiment of organizational strategy and vision, and designing future architecture is a part of strategic planning. Since EA is responsible for integration, its application includes realizing collaboration from the organization's assets and business capabilities. It provides integrity and consistency at all levels of EA and can create a competitive advantage by coordinating and ensuring the consistent operation of elements (Kudryavtsev & Kubelskiy, 2018). Proper (2014) regarded the practice of EA as capability-based planning, a technology for planning capability investment which helps achieve the business results specified in the strategy. At the same time, Proper (2014) further posited that EA-based capabil-

ity planning refers to using organization-specific resources to align strategic objectives with technology. It is a powerful mechanism to ensure that the strategic plan is promoted from top to bottom. In other words, EA-based capabilities facilitate decisions about standardized processes, integrated data, applications, and IT infrastructure (Graveet al., 2021).

3 Theoretical Framework

3.1 SEAM and dysfunctions

SEAM （social-economic approach method ）was designed by Henri Savall in 1973. It is a management method aimed at coordinating the economic and social aspects of performance. SEAM is based on a set of values and a management belief system different from the traditional management premise. The foundation of traditional management involves conducting scattered analysis of the organization based on incomplete financial data and insufficient attention to relevant personnel. SEAM includes both human and financial factors in its analysis (Saab, R., 2017). Based on the implicit cost method, it evaluates the economic consequences of organizational dysfunction, which is usually ignored by the traditional accounting information system (Saab, R., 2017; Cappelletti et al., 2018).

"Dysfunction" refers to problems or difficulties that constantly interfere with a company's regular operation. Dysfunction prevents a company from fully achieving its goals and effectively using its human and material resources (Savall & Zardet, 2008). Savall & Zardet (2008) identified six types of dysfunctions: working conditions, work organization, communication/coordination/cooperation, time management, comprehensive training, and strategy implementation. More precisely, dysfunctions will generate hidden costs related to monitor and management (see table 1), which are undetected costs concerning the performance of the company (Savall & Zardet, 2008). For example, communication/coordination/cooperation may occur between departments or functions, such as the marketing and R&D departments, resulting in the delay of new product development. In practice, these hidden costs are easy for company management to ignore. Improving the hidden costs caused by cross-department collaboration can improve organizational performance. Management system dysfunction has brought about huge value loss to companies of all sizes and in all industries, but traditional information systems often overlook such losses (Cappelletti et al., 2018).

Dysfunctions	ISEOR Model	Charateristic
1 Coordination between departments	Indicators of hidden costes	Absenteeism
2 Work Organization		Occupational injuries and disease
		Staff turnover
3.Time Management		Low-quality work
		Direct production gaps
4.Strategy Implementation	Financial consequences of dysfunctions	Excess salary
		Wasted time and/or overtime
5.Integrated Training		Overconsumption
		Non-production
6.Working Conditions		Non-creation of potential risks

Table 1.   Indicators of Hidden Costs: Financial Consequences of Dysfunctions (ISEOR 1974–2017).

The concept of SEAM is based on three axes: the political and strategic decision-making axis (a), the change process axis (b), and the management tool axis (c) (Cappelletti et al., 2018). SEAM starts with the organization's leaders assessing which functions are abnormal or disorders. These interventions combine diagnosis and correction with the introduction of management tools, the assessment of hidden costs, and the political and strategic aspects of the change process (Saab, 2017). SEAM is formulated through the intervention research process on the basis of observing the specific management practice. It is based on the assumption that the sustainable performance of a company depends not only on its social performance—that is, the satisfaction of employees and stakeholders—but also on its economic performance (Cappelletti et al., 2018).

3.2   Business process management (BPM)

In the mid-1990s, as interest in business process reengineering surged, the importance of BPM grew and attracted widespread attention from all variety of companies (Hammer, 1990).Currently BPM is as a way of management has been generally accepted and it even has been as an effective method and technology which is used to study organizational business processes(Denner et al., 2018). Davenport (1993) explained business processes are a set of dynamically coordinated activities controlled by a number of socially-dependent participants designed to achieve a specific operational objective. It is a management concept used to control, adjust, and optimize business processes. From a lifecycle perspective, BPM generally defines that each business process follows a lifecycle approach, including identification, definition, modeling, implementation and execution, monitoring and control, and process improvements, as a model that emphasizes the core activities performed by business process managers (Dumas et al., 2013).

More importantly, BPM needs to support effective organization management and improvement practices by explicitly modeling organization base processes (Harmon ,1990). BPM aims to improve company performance by optimizing and managing the business processes (Paschek et al., 2018), it mainly focus on improving enterprise operational processes through process designing, implementation, monitoring and improvement. Business processes should be consistent with business strategy, customer needs, and business objectives, so that the realization of process objectives can be measured and controlled. In short, BPM aims to achieve strategic and operational enterprise goals and improve effectiveness and efficiency (Paschek et al., 2018). Business process improvement is done by overseeing the process of performing work, utilizing gaps and inconsistencies to discover improvement opportunities to ensure consistency of results and expectations (Dumas et al. 2013). The goals of business process improvement include cost reduction, efficiency improvement, quality improvement and error rate reduction. And the improvement of business processes focuses on improving organizational capabilities, rather than improving the way individuals move, ultimately add value to the organization and its customers (Denner et al., 2018).

3.3   Strategic Alignment Model

This research explores the strategic integration in DT environment by building an EA alignment strategy planning conceptual framework, which is improved based on the strategic alignment model proposed by J. C. Henderson & N. Venkatraman (1989). The strategic alignment model distinguishes four components (see Figure 1).

(1) Business strategy: "business strategy" is defined according to the choices related to the positioning of the business in the product market (Henderson & Venkatraman, 1989).

(2) IT strategy: "IT strategy" is defined according to the choices related to the positioning of enterprises in the information technology market (Henderson & Venkatraman, 1989).

(3) Organizational infrastructure and processes: this field is defined by selection related to specific internal arrangements and design of management structure and workflow" (Henderson & Venkatraman, 1989).

(4) IS infrastructure and processes: this domain contains all components related to the IT infrastructure and applications used in the organization. IS infrastructure and processes are defined by choices related to internal arrangements and processes that determine the scope and type of IT/IS products and services provided to the organization (Henderson & Venkatraman, 1989).
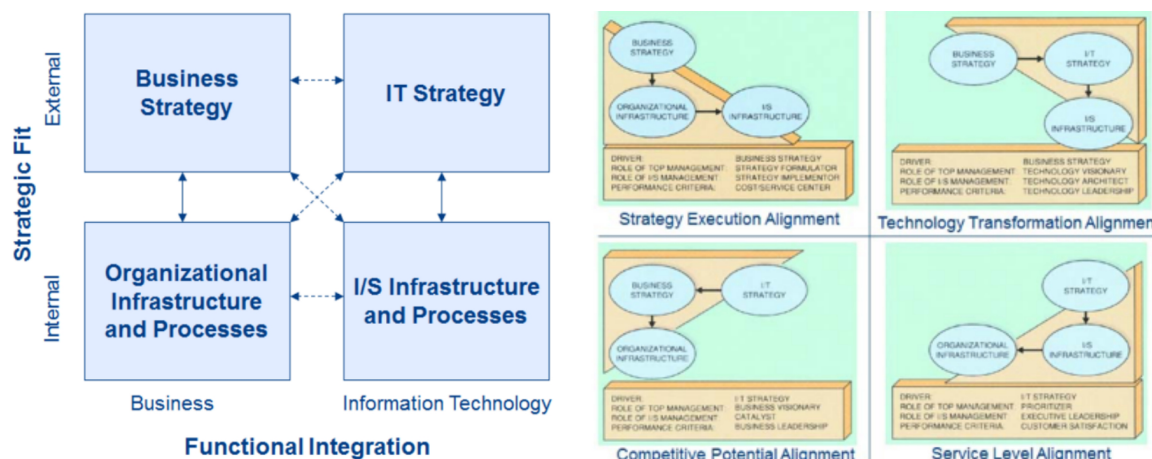
Figure 1. Strategic Alignment Model (1), Source：Henderson &Venkatraman，1989.

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Henderson & Venkatraman describes four perspectives to align business and IT (see Figure 3): strategic implementation, technological transformation, competitive potential, and service level. The first two perspectives are driven by business strategy, while IT strategy drives the latter two perspectives. The model proposed by Henderson & N. Venkatraman (1989) is widely accepted, but in practice, it does not point out how to achieve the consistency and coordination of the four strategies, and it is still difficult to establish a solid and appropriate relationship between business and IT.

4 Research Method

4.1 Method and data

The research of EA in practice is a very suitable case study method, because this method allows investigation and study of phenomena in real life, especially when the boundaries between phenomena and backgrounds are not clear (Yin, 2017). Furthermore, we selected multiple case studies in this research because the knowledge gained from repeated case studies allowed intra-case and cross-case analyses and improved the research data's external validity (Yin, 2017).

We selected 4 cases because these cases adopted different EA methods in different contexts, these cases are considered the key cases adopted by EA. Through research observation, we can understand the scope of different EA projects and determine their driving forces, situational factors, and results.

The case data were collected from March 2018 to September 2021. A total of 106 people were interviewed in a semi-structured manner, supplemented by document analysis and observation. Respondents included CEOs, CIOs, IT managers, and heads of relevant departments (see table 2).

Two researchers conducted each interview, with an average interview time of 40 minutes. Transcripts and collected data were used to elaborate a comprehensive case record. Summarizing the empirical data into a consistent whole and ensuring unique cases can accelerate cross-case comparison. Cross-case analysis means a detailed search for the similarities and differences between cases (Eisenhardt, 1989).

Due to the complexity of EA practice, semi-structured interviews are considered suitable for data collection (Myers & Newman, 2007). In this way, the interviewer ensures all pre-planned questions are covered, and the respondents can think about and reflect on the topic connecting their experience and views with the discussion. The main questions in the interview involved the motivation, objectives, tasks, obstacles, and benefits of the EA projects so as to observe the relationship between the EA project and DT. After 106 interviews, the researchers reached the data saturation point. Further data did not add any meaningful observations to the information obtained in the previous interviews. According to Yin (2017), data saturation means that the rest of the interview data repeated the views already provided, which was the case here.

Interpretive research methods were used in our data analysis (Klein and Myers, 1999; Walsham, 1995). The interview topic was first searched as the initial coding category. Then, the data and these categories were iteratively reanalyzed to determine all attributes and interrelationships related to EA barriers, benefits, and relationships with DT. In the data analysis process, we made a comparative analysis of our cross-case analysis and literature data to verify further the obstacles and benefits of EA projects under different contexts. Through a case and literature comparative analysis, the research gained two analysis tables—an obstacle comparative analysis table and an income comparative analysis table—which were used as the essential data input of the EA integration strategy planning process framework.

Case	CEO	CIO	COO	VP	Business director	Business employee	IT employee	Business Process and IT director	Total
Case 1				1	7	10	2		20
Case 2				1	5	4	3		13
Case 3				3	1	11	10		25
Case 4	1			5	11	23	3		43
Case 1 Case 2 Case 3 Case 4		1	1					3	5
Total	**1**	**1**	**1**	**10**	**24**	**48**	**18**	**3**	**106**

Case	Sponsor	Project manager	Core member	General member	Total
Case 1	1	1	8	10	20
Case 2	1	1	7	4	13
Case 3	1	2	10	12	25
Case 4	1	2	17	23	43
Case 1 Case 2 Case 3 Case 4	2	2	1		5
Total	**6**	**8**	**43**	**49**	**106**

Table 2.   Number of interviews per Population.

4.2   Filed case

Here firstly explains the strategy background information about 4 cases. The selection of multiple cases spanned different fields or branches within a single multinational enterprise, not span different companies. Case 1 is facing the digital transformation and intelligence manufacturing strategy, as far as this research, this field finished the information construction, and more efficient and more safety is its goals. The Case 2 strategy is not about the information or digital transformation, the most importantly point is to make sure the regular compliance and reduce the business risk in the global environment, so completely business architecture is the key by EA. Case 3 is 2C business, so its strategy is making the operation flexible, and finally improve the customer satisfaction, so agile and fast feedback to customer and marketing is its goal. Case 4 is a manufacturing company, it provides the digital products and service, it is a start -up, so innovation and operation are both important for it.

Case 1 (Supply Chain): The supply chain department is responsible for HQ manufacturing, procurement, and business logistics. The total number of employees is 10,000+, and there are four production bases worldwide. In IT applications, all business areas have been covered by information system, including planning, procurement, manufacturing, logistics, reverse, and other businesses, and even some outsourcing suppliers have realized the information systems integration. There are 60+ people in the IT team responsible for the daily maintenance of information system and the implementation of IT projects. Most of the IT teams are business analyst engineers and development engineers. The TOGAF method has just been introduced into EA architecture, and there is only one architect-engineer at present.

Case 2 (Internal Control and Risk): Internal control and risk department is responsible for the group company's risk, internal control, audit, and compliance management. This organization is responsible for the financial audit and management audit for the HQ every year and establishes the whole group's risk internal control system. With the expansion of the group's business overseas, it is more and more critical to meet the requirements of external supervision and internal control requirements. Nevertheless, the internal control business has not been carried out. There are more than 200 audit projects every year, all of which are carried out offline without an information system's support. The organization plans to use digital technology to realize digital audits and improve audit efficiency.

Case 3 (ESVIZE): ESVIZE department was established in 2015 and is a group's subsidiary, focusing on smart home services. It has independent functional departments, such as marketing, sales, R&D, supply chain, finance, and 2,000+ personnel. The company's primary customers are end-users. The company hopes to use digital technology to improve customer experience, so it has launched IT architecture planning for the front, middle, and back model, some of which have been implemented. In terms of IT, the company has 100+ IT employees focusing on daily IT requirements and IT project development. The planning and implementation of change projects are under the management of the company's strategic department.

Case 4 (ROBOT): ROBOT department was established in 2015 and is a group's subsidiary, focusing on AGV business. It has independent functional departments, such as marketing, sales, R&D, supply chain, and finance, and the IT department reuses the group's resources. The number of personnel is 2,000+. The company is just beginning to make profits, and its main customers are enterprise customers. In terms of IT, the company's R&D and supply chain system are shared with HQ, but HQ systems of market and sales have not been used, although information system has supported it. The delivery business is its own unique business different from HQ, and only scattered functions have information support at present. Even reusing the group's information system, there are many inapplicable situations due to the business context. As a result of the above situation, the subsidiary has almost no management methods and systems. Senior management hopes to introduce the EA project and establish a management planning system.

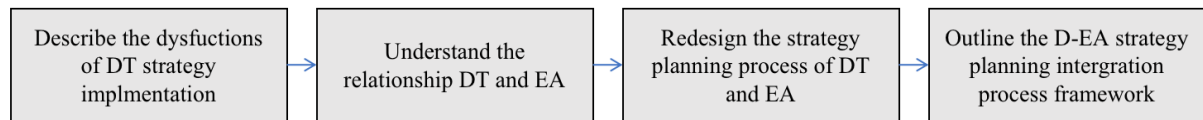The research framework of this paper as shown in Figure 2

Figure 2.   Research framework.

5   Findings and Discussion

5.1   Findings

The basic information of the four cases is shown in table 3. The EA project sponsors of the four cases came from different roles. The sponsors of cases 1 and 2 were the process owner, and the sponsors of cases 3 and 4 were the business leader and CEO. Different sponsors indicate that the influence degree of the EA project was different. The personnel of the IT department undertook the project managers of the four EA projects because the organizational skills of EA were currently in the IT department. The motivation for implementing the EA project was different in each case. The motivation of case 1 was that, under the requirements of external competitive pressure, business transformation needed to be achieved and supported by architectural tools. Case 2 was that, due to the requirements of the enterprise system and external supervision, it was necessary to implement overall planning for the business and have specific maturity requirements. Case 3 was driven by the organization's DT, hope to build the front-middle-back IT mode, realize the C2M manufacturing mode, and improve the customer experience. The motivation of case 4 was strongly related to enterprise DT; the motivation was the demand for internal management. Due to the increase of business scale, IT requirements are becoming more complex. The organization has an urgent need for a method and tool to facilitate the overall planning of the enterprise from top to bottom and point out the direction and suggestions for business implementation. Case 4 regarded EA as an enterprise as a whole and described a unified vision for the enterprise.

In the process of EA implementation, the motivation of case 1 was that the IT department hoped to guide the business transformation. However, even for the projects planned by EA, the effect of EA planning projects guiding the business transformation was not evident because of the conflict of existing best practices in case 1. According to the vertical IT planning, some were consistent with the EA transformation planning project. In Case 2, the motivation was driven by regulatory authorities enforcing EA implementation, and the planned projects were not carried out after completing the EA project. As a result, some DT projects were realized separately and sporadically, not by EA planning. In essence, case 2 DT had nothing to do with EA planning. Cases 3 and 4 were also business-driven motivation, and there was a strong demand for DT in case 3. The EAP project will be adjusted and implemented according to the annual strategy. In case 4, after implementing the EA project, the management department was appointed to support the implementation of the EA project, so EAP and implementation was kept relatively consistent. However, due to department business capacity and IT resources constraints, a few planning projects were not carried out. In case 4, the EAP did not reflect the DT planning because the business presently has no demands for digitization.

Table 4 summarize the main questions of the interview. Based this questions summary and data coding, this research has 3 key findings, as following.

Basic Information	Case 1 (Supply Chain)	Case 2 (Internal Control and Risk)	Case 3 (ESVIZE)	Case 4 (ROBOT)
Sponsor	VP	Business director	CEO	CEO
Project manager	IT	IT	IT	IT
EA motivation	Change planning	IT planning	DT strategy	Business strategy
If have clear strategy	Yes	NO	Yes	NO
If alignment EA planning with business strategy	Yes	Not involved	Most of Yes	Most of Yes
If have EA implementation	NO	NO	Yes after adjust	Yes
If have EA implementation base EA planning	Yes	Yes	Yes	Yes
If implementation DT project	Yes	Yes	Yes	Yes
If have relationship EA planning and DT	NO	NO	Yes	NO
How to active the DT project	IT planning	Only sigle project	EA planning	Not involved

Table3.   Case basic information.

EA obstacles category 1	EA obstacles category 2	EA obstacles category 3	Case 1 (Supply Chain)	Case 2 (Internal Control and Risk)	Case 3 (ESVIZE)	Case 4 (ROBOT)
Organization	Organization readiness	Poor control	No control	No control	No control	No control
		Lack of awareness and readiness	Y	Y	N	N
		Too large project scope	No involved	No involved	Y	Y
	Organization commitment	Limited resources	N	N	N	Y
	Organization culture	Lack of alignment business with IT	Y	Y	N	Y
	Top management support	No clear leadership	Y	Y	N	Y
		Communication failure	Y	Y	N	Y
	EA knowledge and skills	Limited EA knowledge and skills	Y	Y	Y	Y
	Financial commitment	Financial commitment	N	N	Y	Y
Organization envirement	Knowledge precipitation	Lack of EA use and accumulation	Y	Y	Y	Y
	Process and policy	Complex organizational procedures	N	N	N	N
	Atmosphere culture	Lack of perceived value	Y	Y	N	Y
Technology	Investor support	/	N	N	N	N
	Technical readiness	/	Y	Y	N	N
	Technical complexity	Competition from other best practices	Y	N	N	N
		Fuzzy and incompatible IT systems	Y	N	N	N
External organizational pressure	Competitive pressure	Lack of motivational factors	Y	Y	N	N
	Government	Legislation and authorization	N	N	N	N
	Mandatory /Normative	Mandatory /Normative	Y	Y	N	N
	Imitative	Imitative	Y	Y	Y	Y

Table 4   EA Obstacles Comparison.

5.1.1 EA and DT is not a strong binding but depends on the motivation and understanding of EA

Many EA methods are based on the motivation to express knowledge about information, processes, and technology in a concise and easily understood way. Therefore, understanding business motivation is essential to achieve business objectives, ensure the successful implementation of EA plans, manage business processes, and adapt to the changing business environment (Essien, 2020). From our case, we can see that the motivation of EA comes not only from enterprise DT. As shown in case 4, EAP can be a good support for DT planning. Due to DT's complexity and its need for complex IT systems to support it, it is an excellent way to use EA for overall IT planning and change planning. Case 1 and 2 show that the organization can also carry out DT in a point-to-point manner. DT's scope and influences are much larger than that of EA. If the business takes the motivation of EA as the tool or method of DT, the relationship between EA and DT is strong, such as in case 4. On the other hand, due to IT personnel's insufficient understanding of business, business personnel do not have a strong understanding of EA, which also affects the relevance between EA and DT.

5.1.2 EAP can provide systematic or context methods for DT planning

The developments in information science have been successfully applied to many management fields, such as finance, operation, or supply chain management. However, in the field of strategic management, IT-based methods and technologies are not widely used. In our current era of knowledge, the amount of information that needs to be processed to make the most accurate strategic decision has increased significantly. In addition, due to the

high uncertainty of the change of the external environment, the increasing diversification of business methods, and the acceleration of scientific and technological progress, the problem of strategic decision-making has become increasingly complex. All these coalesce to form an arduous task for modern strategic management: to maintain the organization's competitiveness, we must adapt to the strategy quickly and flexibly. This problem can be solved by increasing the participation of IT in the strategic decision-making process (Kudryavtsev & Kubelskiy, 2018). Enterprise change may take many shapes. It may be planned from top down, or it may be spontaneous, self-organized, and bottom up; it can be a forward-looking prediction of value opportunities or a response to value crises; it may be limited in scope and implemented rapidly, or it may be significant in scale and implemented slowly. Change may involve restructuring work, reengineering business processes, innovating new products or services, or rethinking the whole business model, but it is inadequate in the face of unpredictable changes, which require customer pull rather than planning and production promotion (Korhonen & Halen, 2017). EAP can provide systematic, top-down predictive change and deal with dynamic and reactive change. In addition, dynamic and reactive change is needed by IT support, and they are reflected in the change planning of the business context. This context-based planning solves the problem of inconsistency between business and IT from technology-driven.

5.1.3 Inconsistent process between EA and DT planning, and the DT project as only a part of EAP

DT drives more and more changes. However, the implementation of DT is related to key business and expensive IT transformation projects (Nowakowski et al., 2018). EA is considered a blueprint and solution to deal with change, reducing IT implementation failures, improving profitability, and enhancing IT coordination with business (Jusuf & Kurnia, 2017). The challenges faced by EA involve the formulation of a change implementation roadmap, IT portfolio management, and correcting the dynamic business strategy (Hakim, L., & Osman, B., 2020). EA provides information to realize business strategies and objectives for companies operating in a turbulent business environment. It achieves this goal by arousing strategic and operational benefits and promoting competitive performance (Wetering et al., 2021). Korhonen & Halen （2017) proposed that, in a highly volatile environment, a sustainable competitive advantage requires inherent organizational flexibility, and EAP and EA management also need to meet this requirement.

Since EA implementation and DT are not powerful binding, success depends on EA motivation and understanding. We can see the relationship between EA and DT project implementation from our cases. The funnel of projects driven by business strategy, the DT projects, is only a part of EAP, as shown in Figure 3. Suppose an organization is ready to use EA as a partner in DT planning; it needs to consider the value leakages of EAP to ensure that EAP can provide the greatest value for DT. These value leakages need to consider the maturity of the organization and the resolution of obstacles of EA implementation.
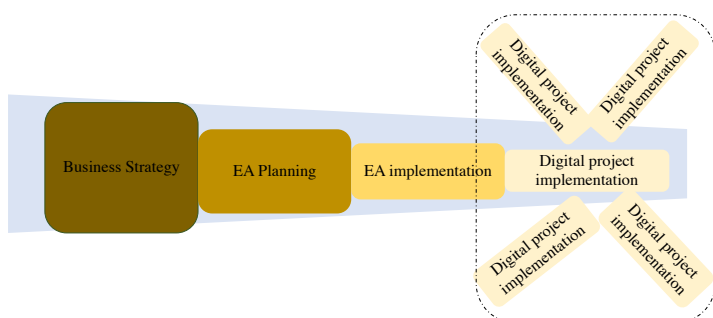

Figure3.   The funnel of projects driven by business strategy, source: by author.

5.2   Discussion

5.2.1   The Principle of the DT and EAP Process Redesign

Through the case study, we conclude that EAP can be used as an effective method of DT planning. However, EA encounters various obstacles in its actual implementation, resulting in value leakages.

Therefore, we propose a DT-EA strategy planning integration process framework based on the strategic integration model proposed by Henderson & Venkatraman (1989) to alleviate these EA obstacles. Furthermore, through twice verification of business strategy, the DT and EA planning framework integrates dynamic and situational elements and constructs EAP in different DT situations.

Evolutionism and contingency theory are the two main viewpoints of EA adaptation. The evolutionary perspective describes the single path adopted by EA, which is usually associated with a maturity level. The contingency view holds that there is no best way to adopt EA, that the adoption of EA depends on different contextual factors (Haki et al., 2012).

- Dynamic

Dynamics are related to maturity, including EA and strategy dynamics. Dynamic evolutionary methods are widespread in information system research, especially in EA. It assumes a step-by-step EAM implementation, which is reflected by mature EAM frameworks (such as Togaf, DoDAF). These frameworks define specific phases, usually centered on the EA lifecycle. The dynamic evolutionary approach means that the explicit maturity levels adopted by EAM can be distinguished. However, the dynamic evolutionary view has been criticized for its limited potential to explain complex organizational phenomena.

The dynamic strategy is strongly related to the business environment. In the 1990s, there was a deep-rooted view that strategy could vary greatly depending on the environment. The development of this concept is a framework called the "strategic palette" (Kudryavtsev & Kubelskiy, 2018). According to this framework, five strategic formation methods can be determined according to the context and environment: classic, adaptability, renewal, vision, and shaping. According to this classification, different types of strategies should use different types of strategic analysis tools. Gartner (2016) confirmed the five possible roles of EA external environments and contexts. Different strategic types correspond to different EA roles. EA roles represent the maturity of EA in the organization to a certain extent and further reflect the maturity of the organization and process. The maturity data analysis in the 4 cases is shown in table 5

Dynamic	Case 1 (Supply Chain)	Case 2 (Internal Control and Risk)	Case 3 (ESVIZE)	Case 4 (ROBOT)
Strategy environment	Orchestrate	Grow	Adapt	Experience
EA role	Connector	Analyst	Conductor	Innovator
Organization and process maturity	H	M	M	L
Organization and process complexity	H	L	M	H

Table5.   Maturity Data Analysis.

- Context

Previous studies have emphasized the relevance of context factors when using EAM and explained them through contingency theory (Haki, M.K., legner, C., & Ahlemann, F. ,2012). They concluded with the construction process of the context approach but did not identify any EAM design related to specific contextual factors. In short, although some researchers have tried to use the concept of contingency theory, they usually adopt EAM with a rather process and evolution-oriented proposition. Haki, Legner, and Ahlemann (2012) proposed that the primary context factors in EAM are as follows: (1) organizational structure, which has three main corporate governance modes: a centralized, decentralized, and federal structure; (2) IT management structure, which is usually a function of the organizational structure and has a similar model: centralized, decentralized, and joint; (3) size; (4) commercial and industry type; and (5) IT penetration, considering the technology and management IT infrastructure in the organization. These context factors affect the willingness, motivation, organization and op-

eration form, obstacles, and benefits of EA implementation. For example, in the four case backgrounds, different context factors can be reflected, as shown in table 6 .

Context	Case 1 (Supply Chain)	Case 2 (Internal Control and Risk)	Case 3 (ESVIZE)	Case 4 (ROBOT)
Organization structure	Centralize	decentralized	Centralize	Federation
IT management structure	Centralize	Centralize	Federation	decentralized
Size	Large	Small	Middle	Middle
Business model	Product	Function Management	R&D, Product, Sale	R&D, Product, Sale
Business complexity	High	Low	Middle	Middle

Table6.   Context Factors Data Analysis.

5.2.2   The Integration of the DT and EAP Process

In the strategic alignment model, the twice verification included the first verification of the alignment of business strategy and organization process-driven EA planning and the second verification of the alignment of business strategy and technology-driven digital planning, as shown in Figure 3.

- Integration with business strategy and organization process-driven EA planning (the first verification)

Business strategy is the goal and direction that the organization needs to confirm. Based on business strategy, we used traditional EA planning to identify business capability planning and align it with business planning. This verification will realize the alignment process and organization planning with business strategy. The process and organization planning are strongly related to business maturity. Organizations with different maturity levels will formulate different processes and organization planning. Process and organization planning can systematically design business change initiatives. This first verification will align the business strategy, organizational and process strategy, and IT strategy to reduce value leakages.

- Integration with business strategy and technology-driven digital planning (the second verification)

IT can dynamically identify the needs of business digital scenarios and align them with business strategies driven by digital technology. This integration is to introduce technology-driven change into the business strategy and, in so doing, align the business strategy, technology strategy, and IT strategy. As DT is complex and huge, using the scenarios of digital opportunities can enhance the possibility of implementation of change and reduce the complexity of technology implementation.

- Strategic alignment model and digital EA planning: by choosing different paths to achieve based on

process, business strategy and technology driven planning to ensure the consistency of business strategy and digital EA planning. This means if company strategy have adjustment in different strategies，it can deduce the non-alignment， and also can results the EA and digital strategy and business alignment .This process can be realized through DT-EA strategy planning integration process framework See figure 4）.
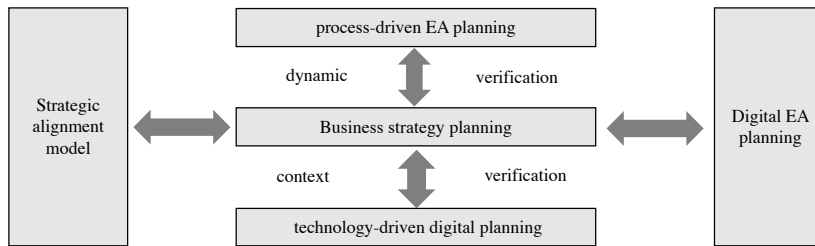
Figure4. *Twice verification of DT planning, source: by author.*

5.2.3 DT-EA Strategy Planning Integration Process Framework

According to the dynamics and scenario, we propose a DT and EA planning process framework which is divided into four modes, as shown in Figure 5:

The first quadrant is higher dynamic and more scenarios; business strategy needs to be aligned with the change planning of the process and organization to achieve consistency and needs to be aligned with the digital change of scenario to meet the EA planning of complex dynamic scenarios.

The second quadrant is higher dynamic and fewer scenarios; business strategy and process and organization planning are aligned. The traditional EA planning method for the change planning of process organization is the suggested approach.

The three quadrant is lower dynamic and fewer scenarios; business strategy and process and organization planning are aligned. The change planning of process and organization can be realized by traditional EA planning or sporadic, passive, single-change planning.

The fourth quadrant is lower dynamic and more scenarios; business strategy and IT planning are aligned. The IT planning here can be identified through the scenario business requirements and characteristics, identifying the digital opportunity of business organizations by EA, and selecting the appropriate opportunity through which to align business strategy.
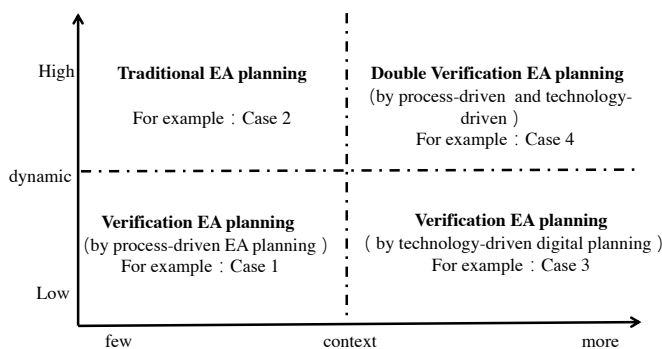

Figure5. *DT-EA strategy planning integration process framework: by author.*

6 Theoretical and Practical Implications

6.1 Theoretical implications

The theoretical contribution of this research applies SEAM and BPM theory to explain the phenomena of dysfunction in DT strategy. Comparing the case analysis demonstrates that this research outlines a new theoretical construction on the DT strategic planning model, the model bases on the process oper-

ation perspective, which tentatively provides an integration method for DT strategic planning and EA planning. Although the research only provides a strategy implementation dysfunction perspective about the integration of EA and DT, we hope that this research represents a small step in better understanding the role of EA in DT and its evolution.

6.2   Practical implications

The practical contribution of this research is to provide an integrated practice for organizations that implement DT and EA simultaneously and provide ideas for organizations to give full play to the practical value of EA. DT is a complex process. Different organizations have different contexts, and EA integration cannot be simply one-size-fits-all. At the same time, according to different types of case analysis, this study provides ideas and reference practice for organizations of different maturity and types to implement EA and DT.

7   Conclusions

This research uses the SEAM and HDC theories to show the connection between the SEAM and EA. This research started with validation of the obstacles and benefits of EA implementation proposed in the previous literature by analysing four different EA cases. On this basis, it further refines the relationship between these obstacles and benefits and DT. This research finds that the obstacles and benefits of EA implementation are related to organizational maturity and context. In practice, EA implementation is not a strong bundle with DT, which depends on the motivation and understanding of EA. As a method of overall system planning, EA can be used as an input for an organization's DT planning. However, it is easy to leak value in the actual implementation, leading to DT projects only being a part of EA planning. The SEAM aims to provide scientific consultation for our theoretical construction and create operable knowledge for organizations and scientists at the same time (Cappelletti et al., 2018). Our research proposes a EA and DT planning framework for digital transformation. According to the viewpoint of EA dynamics and context, different verification methods are adopted for the strategic integration process framework to meet the needs of different digital planning. This research has made some contributions in theory and practice. In theory, it developed the strategic consistency model integrated with DT. In practice, it provided EA and DT integration for different types of organizations.

Of course, this research also has limitations. Multiple case studies are adopted in this research, but the selection of multiple cases spanned different fields or branches within a single multinational enterprise, not span different companies. The cases being selected from the same background may impact our conclusions. DT is a complex process. This research only found a relationship between EA planning and DT. Other aspects, such as EA implementation, EA management, EA control, EA artifacts, EA digital technology, etc., can serve as the direction of future research.

References

Banaeianjahromi, N. (2018a). The Role of Top Management Commitment in Enterprise Architecture Development in Governmental Organizations. *Complex Systems Informatics and Modeling Quarterly*, *17*, 95–113. https://doi.org/10.7250/csimq.2018-17.05

Banaeianjahromi, N. (2018b). Where enterprise architecture development fails a multiple case study of governmental organizations. *2018 12th International Conference on Research Challenges in Information Science (RCIS)*. https://doi.org/10.1109/rcis.2018.8406644

Blosch, M., Burton, B. 2016. Using EA to Support a Palette of Business Strategy Approaches, *Gartner report*, 25 March 2016, G00291302.

Cappelletti, L., Voyant, O., Savall, H., & Noguera, F. (2018). 40 Years of Socio-Economic Approach of Management (SEAM): What We Know and Where We Go? Academy of Management Proceedings, 2018(1), 11756. https://doi.org/10.5465/ambpp.2018.11756abstract

Chandler, A. D., Jr. (1969). *Strategy and Structure*. Amsterdam University Press.

Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2013). *Fundamentals of business process management*. Heidelberg: Springer.

Davenport, T. H.(1993). Process Innovation: Reengineering Work through Information Technology: *Harvard Business School Press,* 1993.

Denner, M. S., Püschel, L. C., & Röglinger, M. (2018). How to Exploit the Digitalization Potential of Business Processes. *Business and Information Systems Engineering*, 60(4), 331–349. https://doi.org/10.1007/s12599-017-0509-x

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, *14*(4), 532. https://doi.org/10.2307/258557

Essien, J. (2020). Model-Driven Strategy for Aligning Business Motivation with Enterprise Business Processes.

Haki, M.K., Legner, C., & Ahlemann, F. (2012). Beyond EA Frameworks: towards an Understanding of the Adoption of Enterprise Architecture Management. *ECIS.*

Hammer, M. (1990). Reengineering Work: Don't Automate, Obliterate. *Harvard Business Review*, 68(4), 104–112. https://hbr.org/1990/07/reengineering- work-dont-automate-obliterate

Henderson, John & Venkatraman, N. (2022). Strategic alignment: A framework for strategic information technology management.

Hinkelmann, K., & Pasquini, A. (2014). Supporting Business and IT Alignment by Modeling Business and IT Strategy and Its Relations to Enterprise Architecture. *2014 Enterprise Systems Conference*. https://doi.org/10.1109/es.2014.65

Jusuf, M. B., & Kurnia, S. (2017). Understanding the Benefits and Success Factors of Enterprise Architecture. *Proceedings of the 50th Hawaii International Conference on System Sciences (2017)*. https://doi.org/10.24251/hicss.2017.593

Kappelman, L. A., & Zachman, J. A. (2013). The Enterprise and its Architecture: Ontology & Challenges. *Journal of Computer Information Systems*, *53*(4), 87–95. https://doi.org/10.1080/08874417.2013.11645654

Klein, H. K., & Myers, M. D. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, *23*(1), 67. https://doi.org/10.2307/249410

Korhonen, J. J., & Halen, M. (2017). Enterprise Architecture for Digital Transformation. *2017 IEEE 19th Conference on Business Informatics (CBI)*. https://doi.org/10.1109/cbi.2017.45

Kotusev, S., Kurnia, S., Taylor, P., & Dilnutt, R. (2020). Can Enterprise Architecture Be Based on the Business Strategy? *Proceedings of the Annual Hawaii International Conference on System Sciences*. https://doi.org/10.24251/hicss.2020.690

Kudryavtsev, D., & Kubelskiy, M. (2018). Using Enterprise Architecture Management Methods and Technologies for Knowledge Structuring in Strategic Management.

Lankhorst, M. (2016a). *Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series)* (Softcover reprint of the original 3rd ed. 2013 ed.). Springer.

Lankhorst, M. (2016b). *Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series)* (Softcover reprint of the original 3rd ed. 2013 ed.). Springer.

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization*, *17*(1), 2–26. https://doi.org/10.1016/j.infoandorg.2006.11.001

Nowakowski, E., Hausler, M., & Breu, R. (2018). Analysis of Enterprise Architecture Tool Support for Industry 4.0 Transformation Planning. *2018 IEEE 22nd International Enterprise Distributed Object Computing Workshop (EDOCW)*. https://doi.org/10.1109/edocw.2018.00034

Paschek, D., Ivascu, L., & Draghici, A. (2018). Knowledge Management – The Foundation for a Successful Business Process Management. *Procedia - Social and Behavioral Sciences,* 238, 182–191. https://doi.org/10.1016/j.sbspro.2018.03.022

Proper, H. A. (2014). Enterprise Architecture: Informed Steering of Enterprises in Motion. *Enterprise Information Systems,* 16–34. https://doi.org/10.1007/978-3-319-09492-2_2

Saab, R. (2017). UPGRADING CORPORATE GOVERNANCE REGULATIONS TO FOSTER SUSTAINABILITY: AN INTERVENTION RESEARCH PROCESS IN SUPPLY CHAIN RESILIENCE.

Savall, H., & Zardet, V. 2008. *Mastering Hidden Costs and Socio-Economic Performance (Research in Management Consulting)*. Information Age Publishing.

van de Wetering, R., Hendrickx, T., Brinkkemper, S., & Kurnia, S. (2021). The Impact of EA-Driven Dynamic Capabilities, Innovativeness, and Structure on Organizational Benefits: A Variance and fsQCA Perspective. *Sustainability*, 13(10), 5414. https://doi.org/10.3390/su13105414

Walsham, G. (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4(2), 74–81. https://doi.org/10.1057/ejis.1995.9

Yin, R. K. (2017). *Case Study Research and Applications: Design and Methods* (6th ed.). SAGE Publications, Inc.