

Proceedings

**2021 International Conference on
Software Engineering & Computer
Systems and 4th International Conference
on Computational Science and Information
Management**

ICSECS-ICOCSIM 2021

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Welcome Message from the General Chair

As General Chair for this joint international conference, it is my great honor to welcome you to the 7th International Conference on Software Engineering & Computer Systems (ICSECS2021) and the 4th International Conference of Computational Science and Information Management Computational Science and Information Management (ICoCSIM 2021), organized by Faculty of Computing, Universiti Malaysia Pahang (UMP) Pekan, Pahang, Malaysia. The conference committee and I welcome you to a virtual gathering of IT/Computer Science professionals, educators, and students dedicated to advancing computing research. This joint conference testifies to the continuous ICSECS/ICoCSIM since 2009 that supports the full spectrum of computing and information systems research.

The ICSECS-ICoCSIM 2021 draws researchers from all over the world to share ideas, innovations, and strategies that bring them together to explore and assess emerging opportunities and challenges in Computer Systems, Software Engineering Information Systems research, and practice to fulfill the conference theme - Advancing Digital Society with Advanced Technologies.

The ICSECS-ICoCSIM 2021 thrives through the efforts of many individuals. It is my pleasure and privilege to work with the faculty management, especially the Senior Dean, College of Computing and Applied Sciences Professor Ts. Dr. Ruzaini bin Abdullah Arshah, Dean of the Faculty of Computing Associate Professor Ts. Dr. Adzhar bin Kamaludin, and all the talented and tireless committee. They contribute tremendous work and efforts to make this event succeed.

We are incredibly grateful to 14 international universities for being our supportive collaborators and sponsors. I hope we can work again in the next series of ICSECS and ICoCSIM.

Welcome and thank you for supporting ICSECS-ICoCSIM 2021!

Jamaludin Sallim

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Proceedings

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Framework Of Strategic Alignment Through Enterprise Architecture For Organization Performance

Yoppy Mirza Maulana
Faculty of Computing
Universiti Malaysia Pahang
Malaysia
yoppy@dinamika.ac.id

Zafril Rizal M Azmi
Faculty of Computing
Universiti Malaysia Pahang
Malaysia
zafril@ump.edu.my

Ruzaini Abdullah Arshah
Faculty of Computing
Universiti Malaysia Pahang
Malaysia
ruzaini@ump.edu.my

Muhammad Aliif Ahmad
School of Computing, Faculty of
Engineering
Universiti Teknologi Malaysia
Malaysia
muhammadaliif@utm.my

Halah Zain
Faculty of Computer Science &
Information Technology
Jazan University
Malaysia
hzain@jazanu.edu.sa

Abstract— One of the topics in strategic planning of information systems is Business-IT alignment (BITA). BITA is manifested in strategic alignment, which is generally seen as an important factor as a driver for optimizing business performance. Strategy conformity is related to the suitability of internal resource capabilities and external opportunities towards superior performance. To realize the suitability of Business and IT strategies, a framework is needed, namely Enterprise Architecture (EA). Many studies have focused on business and IT customization using EA, but none have addressed how to relate it to organizational performance. Meanwhile, the goal of IT investment is to improve organizational performance by aligning IT with the business. For this reason, the solution is to develop a framework for conformity with Business and IT strategies through EA by mapping organizational performance. The resulting output is a framework used to align IT with business strategy through EA and its relationship to organizational performance.

Keywords— Enterprise Architecture, Strategy Alignment, Business Strategy, IT Strategy, Organization Performance, Cloud Computing.

I. INTRODUCTION

In strategic planning of information systems, one of the topics is business-IT alignment [1]. Business-IT alignment is a condition in which the vision, mission, values, goals, and business strategies are enabled by IT. [2] [18]. The strategic fit of business and IT is generally seen as an important factor desired in optimizing business performance [16]. In a study conducted by Malyzhenkov and Ivanova (2017), since 2000 the issue of compatibility between business and IT has become the three main attention of IT managers, namely business volatility, business productivity, and cost reduction [19].

The idea of alignment is rooted in strategy, where the component is the fit between the internal structure and the external conditions of the organization [1] [5]. This strategy is related to the match between the capabilities of internal resources and external opportunities towards superior performance [1]. Recent research shows empirical evidence

that the suitability of business and IT on organizational performance shows a positive impact [13]. The previous framework used to measure the impact of business and IT conformity on organization performance was financial performance [33].

Comprehensive organization performance measurement includes internal and external aspects, in this case the supporting theory is the balanced scorecard (BSC) [11]. In the BSC, the organizational performance measured is an increase in profits (financial perspective), market increase (customer perspective), productivity increase (internal business process perspective), and increase in human resource productivity (growth and development perspective) [5]. Therefore, organizational performance is the success of the organization so that business and IT alignment becomes a must if the organization makes IT investments to support its business processes.

To achieve alignment between internal resource capabilities and external opportunities, organizational needs and instruments that support alignment, in this case, Enterprise Architecture (EA) [5]. Currently, EA as a solution framework has been proposed to guide organizations in realizing IT-compliant business [3][17]. EA is useful because it provides a blueprint for developing and building IS/IT in an organization [6] [20]. EA is a tool in achieving comprehensive Business-IT alignment[15]. EA is also a set of structured plans that integrate business and IT and analyze conditions from the past, present, and future [7].

Currently, there are many literature studies that discuss strategic alignment through EA. In the literature review as shown in Table 1, a gap was found, namely the absence of research explaining the conformity of business and IT in relation to organizational performance which is a measure of organizational success. For this reason, the research question is how to create a framework in aligning Business and IT Strategy through Enterprise Architecture by mapping organizational performance, by aligning strategy, business processes, and resources through information systems and information technology [3][35].

II. THEORETICAL BACKGROUND

To analyze the problems described above, literature related to the appropriate theory is needed. To develop this framework, a strategic management model adapted from David's model focuses on strategy formulation [34], then the theories generated from the stages.

At the strategy formulation stage, it starts with internal and external analysis. In the internal analysis, what needs to be known is the resources and its capabilities and business processes within the organization. For internal analysis of resources and its capabilities, the Resource-Based View theory is needed [12]. Whereas to analyze all business processes in the organization, value chain theory is used.

External analysis is needed to define the competitors, the strength of buyers and suppliers, product substitutions, new entrants; in this case, the Porter Five Force theory is used. Furthermore, to formulate the results of internal and external analysis according to David's model is using SWOT analysis [10] [34]. From this SWOT analysis, a business strategy is created.

Furthermore, the business strategy is mapped to answer organizational goals and is used to determine the preparation of organizational goals and performance; in this case the Balanced Scorecard theory is needed. After the organizational goals are made, it is used as a basis in determining the IT strategy. This organizational goal is translated in the form of critical factors; to determine this, critical success factor theory is needed [21].

A. Resource Based View Theory

Resource Based View or called RBV is the work of Barney whose purpose is to analyze the internal organization which includes financial resources, technology assets, human resources, and organizational resources. RBV focuses on the role of heterogeneous and specific resources in an organization that cannot be imitated in creating and enhancing competitive advantage [12].

B. Value Chain Theory

Value chain (VC) was first introduced by Michael Porter, which is a diagram that has the meaning of a series of activities carried out by an organization in providing products or services of value to its customers. This VC consists of core and supporting activities that support each other in providing margin for the company. This VC concept aims to create and enhance excellent performance [8].

C. Porter's Five Forces Model

Michael Porter introduces the Five Forces Model which aims to analyze competition at the industry level. Competition at the industry level is strongly influenced by the power of suppliers with their ability to set prices. Buyers influence the profitability and competitiveness of companies through their ability to bargain prices and demand higher quality products or services. Substitute products can be a threat to companies because of the availability of the same products and services at the lowest price with good quality. New entrants bring good production process capabilities and resources by seizing the market so that they can pose a threat

to the company. Every company in the industry wants to gain a competitive advantage over its competitors, so the company will explore the level of competition. [11].

D. SWOT Analysis Theory

SWOT analysis involves identifying strengths (S) and weaknesses (W) for internal analysis, while for external analysis is opportunity (O) and threats (T) related to the system studied. SWOT analysis begins with the selection of factors that fill in accordance with the concept of S, W, O, T. For each concept, a set of factors that characterize this concept are selected a priori (by users or experts) [10].

E. Balanced Scorecard Theory

Kaplan & Norton were the first to introduce the Balanced Scorecard or the so-called BSC. BSC is a theory of business strategy and aims to measure company performance in four perspectives. These four BSC perspectives offer a balance between the expected outcomes and the performance drivers of those results, as well as objective and subjective measures [5]. In addition, the BSC also balances the internal and external aspects of the company [11].

BSC In mapping out the strategy from each perspective, it is described in the form of a strategy map. The strategy map explains the relationship between the vision, mission, values, goals, objectives, and strategies and measures of organizational performance in the scope of four perspectives. The four perspectives are the first organizational performance measures related to increasing profits (financial perspective), increasing market (customer process perspective), increasing productivity (internal business process perspective), and increasing human resource productivity (growth and development perspective) [11].

F. Critical Success Factor

Critical Success Factor (CSF) was first introduced by Daniel. This CSF is used in determining strategic planning and business strategy. CSF as a tool assists the CEO in determining his information needs for the success of his business. [21].

III. METHODOLOGY

Research methodology is a science that studies how research is carried out scientifically and systematically in solving research problems. [38]. The stages of the research methodology on alignment between Business and IT through EA by linking organizational performance are as follows:

A. Preliminary Phase

- Conducting literature review related to strategy alignment through EA.
- Determine research problems and research gaps on the alignment strategy through EA.
- Develop a conceptual framework related to the strategy alignment through EA.

B. Development Phase

Develop a framework of strategic alignment through EA for organizational performance based on the conceptual framework.

C. Final Phase

To establish the results of a strategic alignment framework through EA with organizational performance mapping.

IV. RESULT AND DISCUSSION

A. Preliminary Phase

The first step is conducting literature review related to strategy alignment through EA, as shown in Table I.

TABLE I. RESEARCH FINDING OF STRATEGY ALIGNMENT THROUGH EA

TITLE	RESEARCH PURPOSE
Modelling Strategic Alignment of Business and IT through Enterprise Architecture, Augmenting Archimate with BMM (2017, Elsevier, Conference)	The contribution of this paper is to add an Archimate modeling notation and as a model to explain the EA method in BITA [3].
Supporting Business and IT Alignment by Modeling Business and IT Strategy and its Relations to Enterprise Architecture (2014, IEEE, Conference)	This paper has contributed to BITA in relation to enterprise architecture [16].
Proposing a measurement model to determine Enterprise Architecture success as a feasible mechanism to align business and IT (2015, IEEE, Conference)	This paper has a contribution about modeling in measuring the effectiveness of EA on BITA [20].
Insight from a comparison of TOGAF ADM and SAM alignment processes (2017, Elsevier, Conference)	This paper aims to compare TOGAF ADM phase in the alignment process with the Strategy Alignment Model [22].
A systematic approach to enterprise architecture using axiomatic design (2016, Elsevier, Journal)	This paper contributes in terms of developing a methodology to clarify current conditions and determine future requirements at each stage of EA [23].
Process Oriented Approaches in Enterprise Architecture for Business IT Alignment (2016, Elsevier, Journal)	This paper contributes to the construction of enterprise architecture based on a process-oriented approach to BITA [24].
Leveraging business-IT alignment through enterprise architecture-an empirical study to estimate the extents (2016, Springer, Journal)	This paper has contributed to examining the effect of EA on BITA [25].
An OMG-based meta-framework for alignment of IS / IT Architecture with Business Models (2014, IEEE, Conference)	This paper contributes to solving problems in the conformity of IS/IT with business models, business strategies, goal modeling, and enterprise modeling [26].
Enterprise Architecture Design for Ensuring Strategic Business IT Alignment (Integrating SAMM with TOGAF 9.1) (2013, IEEE, Conference)	This paper contributes to ensuring alignment between business and IT by integrating between SAMM and TOGAF [27].
Strategic Planning and Enterprise Architecture (2013, IEEE, Journal)	This paper contributes to the method in terms of guiding the strategic planning and implementation process [32].

In this paper, a literature study is conducted based on strategy conformity business and IT through EA. The literature study as shown in Table 1, resulted in a classification that includes modeling, testing, influence, and strategic planning of EA implementation. This paper aims to create a framework based on modeling strategic alignment through EA for organizational performance.

The second step in preliminary phase is to determine research problems and research gaps on the alignment strategy through EA. Based on these studies, none has discussed the alignment of strategies through EA by considering organizational performance. Whereas strategic alignment objectives are an important factor in optimizing business performance [16]. The research problem that arises if the impact of strategic alignment is performed without considering organizational performance is that it cannot measure the success of IT investments towards organizational performance.

The third step is to develop a conceptual framework as proposed as in fig. 1, and is the basis for developing a strategic alignment framework through EA by mapping organizational performance.

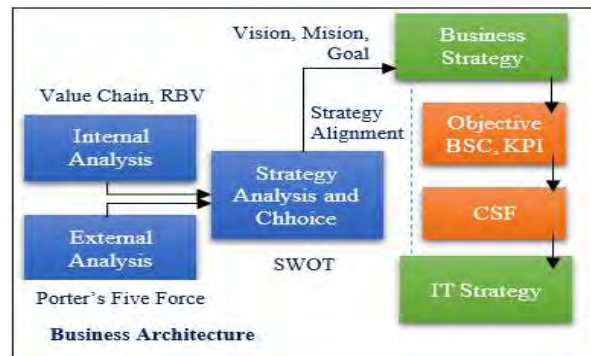


Fig. 1. Conceptual Framework Strategic Alignment

As in fig. 1, the business strategy embodies the vision, mission, and goals. In obtaining a business strategy, external and internal analysis is needed [30]. External analysis is performed based on portfolio five force and internal analysis is performed using RBV and VC. The results of external and internal analysis become SWOT inputs. SWOT is a way to determine business strategy to confirms objectives to determines the size and how to measure organizational performance [30]. All series explanation in fig. 1 within the scope of Business Architecture which is part of the Enterprise Architecture.

B. Development Phase

At the first stage, the preparation of a framework for internal environment analysis is carried out. Internal environment analysis is used to determine the goals, resources, and capabilities, processes, and culture within the organization. Theories used in the internal analysis are Value Chain [28] and Resource-Based View [12]. The stages of internal analysis are as follows; (1) Formulate the vision, mission, goals, and objectives of an organization based on organizational profile documents, (2) Develop business processes based on interviews and observations and value chain theory, (3) Identifying roles and responsibilities based on basic and functional task documents, (4) Organize organizational resources and capabilities based on interviews and related documents and resource-based view theory, (5) Formulate the results of the analysis into IFAS (Internal Factors Analysis Summary) document in the internal analysis category.

In the second stage, determine the external environmental analysis is determined. External environment analysis is used to determine competitive strengths, and business opportunities for the organization. The theory used in the analysis of the external environment is Porter's Five Force model [29]. The external analysis steps are as follows; (1) Identify and analyze competitors in the organization, (2) Identify and analyze new entrants, (3) Identify and analyze Threats of Substitute Products or Services, (4) Identify and analyze consumer bargaining power, (5) Identify and analyze bargaining power bid supplier.

At the third stage, strategic analysis is carried out based on internal and external analysis. Strategic analysis is the process of formulating internal and external analysis used to determine the right business strategy for the organization. The theory used in the strategy analysis is SWOT [30]. The stages of strategy analysis are as follows; (1) Formulating the results of Strengths and Weaknesses based on the Resource-Based Display and Value Chain, in the IFAS column, (2) Formulating the results of Opportunities and Threats based on Five Porter Strengths, in the EFAS column, (3) Give weights to the column IFAS and EFAS, (4) Calculating the IFAS and EFAS rankings, (5) Multiply the weights and ratings of each IFAS and EFAS, (6) Calculate the total score from the multiplication weights and ratings on IFAS and EFAS, (7) Determine the point X and Y as the business strategy coordinate, (8) Develop a SWOT matrix, to determine the right business strategy for the organization.

At the fourth stage, strategy mapping with Key Performance Indicators is prepared. A strategy map is the process of determining key performance indicators (KPI) as organizational performance indicators and mapped to business objectives [31]. The theory used in this preparation uses the balanced scorecard theory. The stages are as follows; (1) Formulating business goals according to 4 perceptions, (2) Formulating (result measures, Lag Indicators), (performance driving measures, Lead indicators) based on objectives business.

Finally, at the fifth stage, Critical Success Factors based on organizational goals is prepared. Mapping between business goals and Critical Success Factors aims to determine IT Strategy. The theory used is the theory of the Critical Success Factor [21]. The steps are as follows; (1) Formulating Critical Success Factors in accordance with business objectives, (2) Formulating Information System Requirements based on Critical Success Factors, (3) Developing Information System-based IT Strategy Requirements based on their respective business objectives.

C. Final Phase

Before determining the results of the strategic alignment framework through EA and organizational performance mapping, it is necessary to formulate a model and meta-model based on the development stage, and the results are as shown in fig. 2.

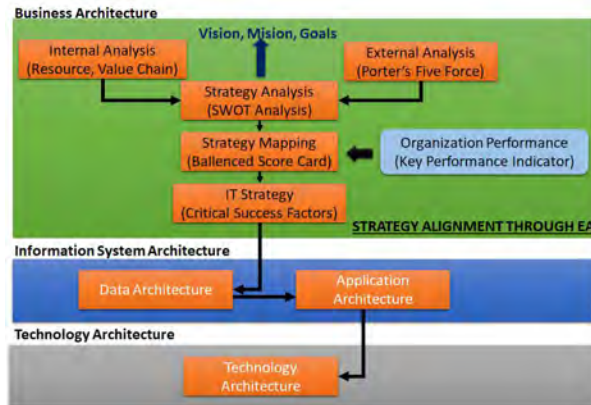


Fig. 2. Strategic Alignment Through EA Model

The following are 5 stages of the meta-model from Strategic Alignment Through EA:

Internal Analysis Stages: Explanation of the internal analysis process as shown in the fig. 3 with the following steps; (1) Formulate the organization's vision and mission then proceed with the goals and objectives as performance indicators based on the organization's strategic plan document, (2) Developing business processes based on interviews and observations and value chain theory. What needs to be done in this process is to write down the main and supporting processes of an organization. The main processes that need to be identified are inbound activities, production and operations, outbound activities, sales and marketing, and services. In the supporting process, the activities that need to be identified are finance, human resources, technology, and procurement, (3) Identify roles and responsibilities based on basic and functional task documents that are tailored to the activities that have been prepared in the previous stage, (4) Organize organizational resources and capabilities based on interviews and related documents and resource-based theoretical views. In this process, what needs to be identified are tangible and intangible resources, (5) After getting the results of the internal analysis, it is recorded in the IFAS (Internal Factors Analysis Summary) document for the category of internal analysis.



Fig. 3. Internal Analysis

External Analysis Stages: Explanation of the external analysis process as shown in fig. 4 with the following steps (1) Identify and analyze competitors in organizations, (2) Identifying and analyzing new arrivals, (3) Identify and analyze factors against the threat of substitutes for a product or service, (4) Identifying and analyzing the bargaining power of consumers, (5) Identify and analyze the components of the bargaining power of suppliers.



Fig. 4. External Analysis

Strategy Analysis Stages: Explanation of the internal analysis process as shown in fig. 5 with the following steps (1) Formulate Strength and Weakness results based on Resource-Based Display and Value Chain, in the IFAS column, (2) Formulate the results of Opportunities and Threats based on the Five Porter Strengths, in the EFAS column, (3) Give weights to the IFAS and EFAS columns, (4) Calculating IFAS and EFAS ratings, (5) Multiply the weights and rankings of each IFAS and EFAS, (6) Calculate the total score from weight and rating multiplication on IFAS and EFAS, (7) Assign points X and Y coordinate to business strategy, (8) Develop a SWOT matrix, to determine the right business strategy for the organization.



Fig. 5. Strategy Analysis

Strategy Mapping Stages: Explanation of the external analysis process as shown in fig. 6 with the following steps (1) Formulate business goals according to 4 perceptions, (2) Formulate (outcome measures, Lag Indicators), (performance driver measure, Lead indicator) based on business goals.

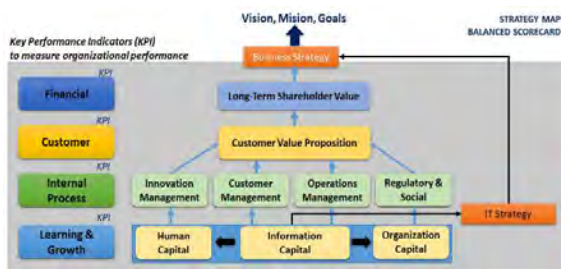


Fig. 6. Strategy Mapping

IT Strategy Stages: Explanation of the external analysis process as shown in fig. 6 with the following steps (1) Formulate the Critical Success Factor in accordance with business objectives, (2) Formulate Information System requirements (Information System Requirements) based on the Critical Success Factor, (3) Develop an IT Strategy based on Information System Requirements based on each business goal. The IT strategy is supported by IT Infrastructure such as Data Governance, Data Security both in the organization's internal or external storage or cloud computing[36][37].



Fig. 7. IT Strategy

V. CONCLUSION AND FUTURE DIRECTION

This paper presents a new framework for describing the fit of business and IT strategy through EA and describes ways in which EA can strategically align business and IT and also map organizational performance. This study can be used as a framework to achieve alignment strategy through EA for organizational performance in various organizations. In the future, before implementing this framework in an organization, testing is carried out based on its size and business model.

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