Global Container Shipping Line Digital Transformation and Enterprise Architecture Modelling

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Abstract. Currently new competitive environment and fundamental changes in the traditional industries are taking place. The digital transformation of companies can be an effective tool to gain a competitive advantage, but its success requires consistent actions, from the strategic vision to implementation. New architectural solutions are needed to ensure a strategic alignment of business and IT architecture for further successful development.
The purpose of this research paper is to develop a conceptual approach and method of Enterprise Architecture modeling for global container shipping lines, allowing the companies an effective development in the context of global changes in business forms and methods, reducing negative impacts and taking advantage arising from these changes.

Introduction

The container shipping industry contributes significantly to global world trade, but now it has reached its maturity stage, which is characterized by declining income growth, structural overcapacity and changes in customer demand. Furthermore, established companies face new competition from “digital disruptors” – new industry players who have more opportunities to influence customers because of the implementation of new technologies. To overcome these problems, companies have to adopt strategic changes such as business consolidation, processes integration, investments into digitalization.

Analysts define seven trends of digital transformation, which are capable to change the container liner shipping industry: Blockchain, Electronic Platforms, Internet of Things, Predictive Analytics, Artificial Intelligence, Autonomous Vessels and Robotics, and Cyber Security. [1]

Digital transformation change five strategic domains are as follows:

1) connection with customers;
2) competition;
3) data processing and analysis;
4) innovation process;
5) creating value for customers. [2]

The company digital transformation can be an effective tool to gain competitive advantage, but its success requires consistent actions, from strategic vision to implementation. New architectural solutions are needed to ensure strategic alignment of business and IT architecture for further successful development.

The purpose of this research paper is to develop a conceptual approach and a method of Enterprise Architecture modeling for global container shipping lines, allowing the companies effective development in the context of global changes in business forms and methods, reducing negative impacts and taking advantage arising from these changes.

Materials and methods

Strategic alignment has been explored by researchers over the last three decades. Mintzberg argues that the strategy and structure of an organisation are equally important that there should not be an established precedence between the two, but they should be intertwined. [3]

Based on Mintzberg ideas Henderson and Venkatraman have introduced the concept of strategic alignment: it is an alignment between business strategy, business structure, Information Technology (IT) strategy and IT structure. [4]

Strategic alignment is an ideal state in which an organization goes through a process of continuous adaptation and change. [2] Therefore multiple studies have investigated that this process could be very difficult for organizations. 56.5% of organizations experience problems during strategy formulation while 74.6% experience problems during strategy implementation. [5]

The methodological framework of current research become an Enterprise Strategic Alignment Method which is based on researches results of the University of Twente (Enschede, the Netherlands) and the BiZZdesign company (Enschede, the Netherlands) scientists group. This method represents cross-disciplinary approach business and IT enterprise architecture alignment for the purpose of the company strategic objectives achievement. This method unites approaches of such disciplines as Strategic Management, Capability Based Planning, Enterprise Architecture and Project Management. [6]

Enterprise Strategic Alignment Method (ESAM) is presents a company activity business model as a subject domain, allowing to coordinate all strategic stages of the company transformation according to its changes.

According to [7], the strategic planning process has five steps: selecting the corporate mission and major corporate goals, analyzing the external environment, analyzing the internal environment, selecting organizational strategies, and implementing the selected strategies. These five steps are however not sufficient for the purposes of the ESAM [8]. A valuable addition to these steps is the evaluation and control step proposed in [9]. ESAM have refined these steps into eleven phases: visioning process, business model, environmental analysis, strategic options, strategic choices, strategy elaborations, strategic measurements, implementation design, transformation planning, implementation governance, strategy evaluation. Each of these phases contains at least one strategy model.

ESAM, according to its authors, is not a top-down only approach. Iterations can be made at any point in the method and it is possible to use only specific phases of the method if deemed necessary. In essence, the ESAM should be seen as a toolbox with guidelines and models. [6]

Fig. 1. The phases of the Enterprise Strategic Alignment Method [6]

In this paper Enterprise Strategic Alignment Method was adopted for global container shipping lines digital transformation planning and implementation. For this purpose, strategic models as Business Model Canvas [10]and Capability Based Planning [11-12] are used. The global container shipping lines are considered as a logistics system in terms of the Value-based Supply Chain Management concept [13] and the Balanced Scorecard [14] should be used to estimate the digital transformation impact on the company long-term shareholder value. For global container shipping lines Enterprise Architecture modelling The Open Group Architecture Framework (TOGAF) standard, the modelling language Archimate and the modeling tool Archi were used [15].

Results

Digital economy has given rise to several new business models. Modern Information and Computer Technologies have made it possible to conduct many types of businesses on a substantially greater scale and over longer distances. The digital economy key features are as follows:

1) mobility;
2) reliance on data and user participation;
3) network effects;
4) multi-sided business models;
5) tendency toward monopoly or oligopoly;
6) volatility. [16]

It is necessary to formulate the following architectural approach concepts for the global company Enterprise Architecture:

1. Digital business ecosystem architecture [17].
2. New network communications and new storage and data processing technologies development [17].
3. Strong inherent relationship between three main aspects, namely EA models, data from enterprise information systems and IoT devices, and advanced analytics [18].

The digital transformation is the process of digital technologies integration into all company business activities, requiring fundamental changes by introducing new technologies, culture, operations and new products and services. The creation of new business offers for company clients and partners remains the digital transformation obligatory feature. For the digital transformation success, companies need to undertake consecutive actions starting from the strategic vision and followed by fundamental realization mechanisms. [19]

For the global container shipping lines digital transformation planning and implementation and business and IT strategic alignment current research paper propose method of Enterprise Architecture modelling based on Balanced Scorecard.

This method allows formalizing subject area – company business model- with strategic and financial models. The method has five stages:

1) Company Business Model analysis;
2) Capability Based Planning;
3) Financial modelling with Supply Chain Value-based Management approach;
4) Balanced Scorecard development;
5) Targeted Reference Enterprise Architecture Model creation.

The targeted reference business model of global container shipping line is represented on the figure 2.

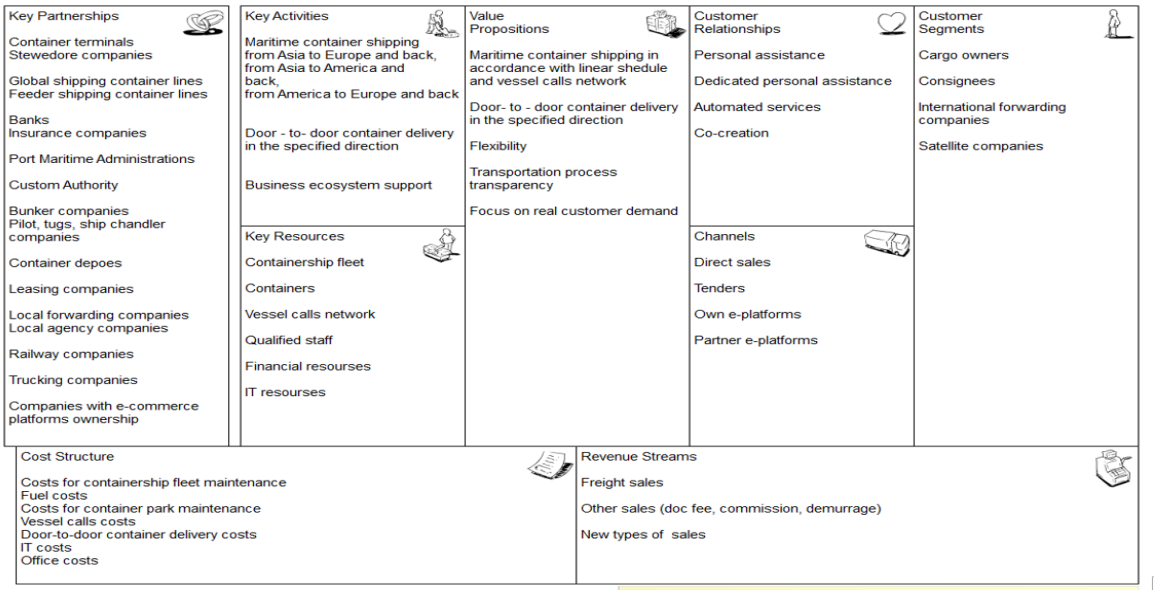

Fig. 2. Targeted reference business model of the global container shipping line

The business model describes the basic principles of the company creation, development and successful activity. According to a Business Model Canvas, a company business model consists of nine blocks, which reflect the logic of the company activity and are aimed to generate profit. These nine blocks cover four main business aspects: customer relationship, value proposition, company infrastructure and financial efficiency. The business model is like a strategic plan, which is realized through organizational structures, processes and systems.[10] The global container shipping lines digital transformation will affect all nine blocks of a company's business model.

The capability-based theories focus on adapting, integrating and re-configuring internal and external organizational skills, recourses and functional competencies toward a changing environment. [6]

To characterize the global container liner shipping business capabilities more precisely it is necessary to consider the company as a complex logistic network, the international supply chain basis.

Thus, the logistic network represents the multilayered closed flow process: the upstream and downstream flows of products, services, finances, and information. Logistic networks, united by logistic agreements, represent a supply chain. [19] Therefore, global container shipping lines digital transformation should provide an effect on physical, logistical, financial and service supply chain flows.

Value-based management (VBM) is a creation of an activity results assessment system on the company value basis and aligning management tools in accordance with this integrated indicator. Based on the comprehension of Modigliani and Miller (1958), the financial value of a firm is determined by the present value of its future cash flows. [19]

There is a direct interrelation between the company value and its business model as the used business model determines company future cash flows. As the global container shipping lines are a logistic network and international supply chain basis, it is necessary to consider the company management as the Value-based Supply Chain Management. [20]

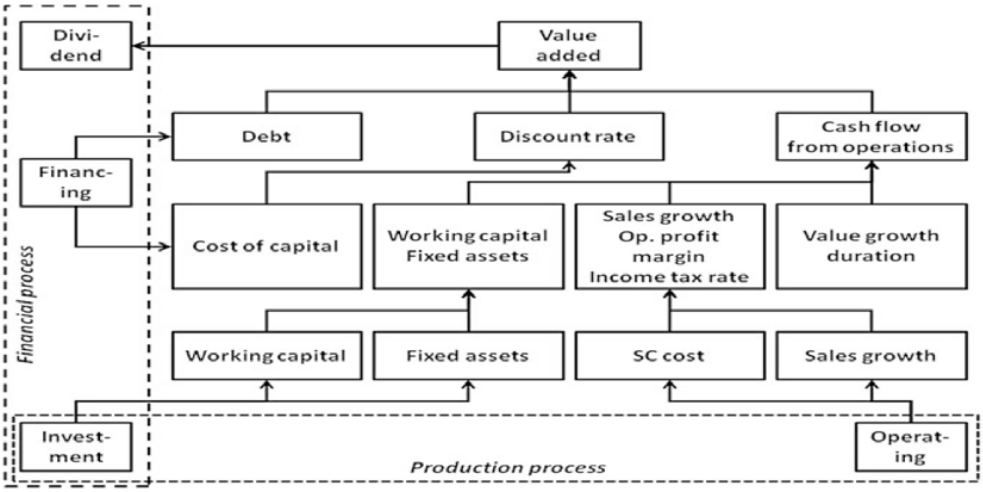

Fig.3. Conceptual Framework of Value-Based Supply Chain Management [20]

The Balanced Scorecard reference model, suggested by authors [21], is a logical extension of Value-based Supply Chain Management Framework and consists of Financial, Customer, Internal Process and Organizational Capacity Perspectives reference models.

The Financial Perspective represents a set of the operating, financial, investment activity goals, and strategic objectives of company financial position should also be defined. The digital transformation strategic objectives achievement will allow increasing the company long-term shareholder value. Strategic objectives of Customer, Internal Process, and Organizational Capacity perspective are specified by decomposition of the financial perspective goals via drivers. [21]

Digital transformation strategic objectives could be defined; their achievement will allow to increase the long-term shareholder value of global container shipping line:

1) Increase of the market share;
2) new products and services sales;
3) sales to new customers;
4) value co-creation;
5) working capital effectiveness maximizing;
6) service maintenance costs reducing;
7) assets utilization effectiveness maximizing. [21]

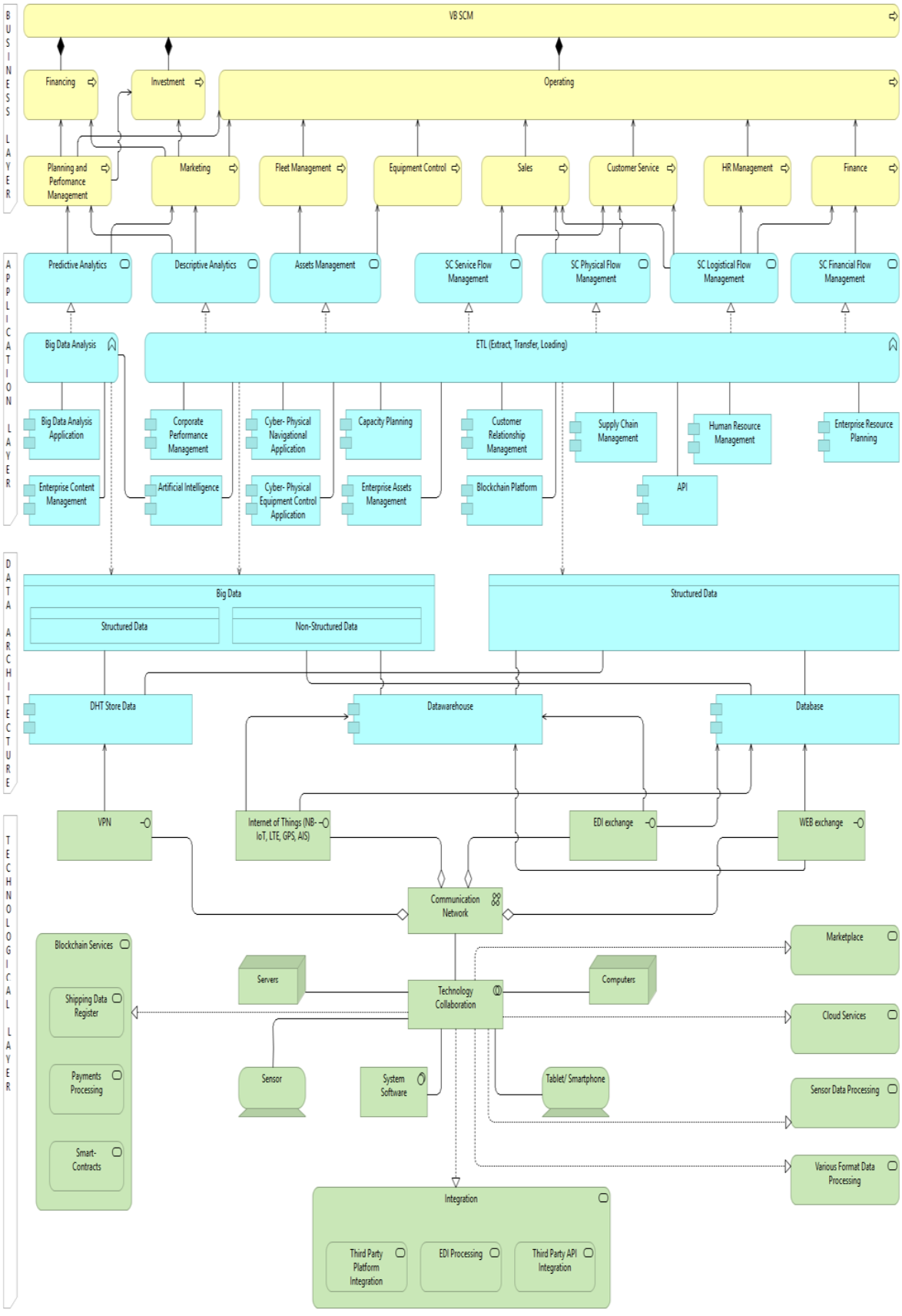

Fig. 4. Targeted Reference Enterprise Architecture Model

TOGAF originated as a generic framework and methodology for development of technical architectures but evolved into an enterprise architecture framework and method could be tool for enterprise architecture design. [22]

The Architecture Development Method (ADM), which is considered the TOGAF core, and consists of a stepwise cyclic approach for the development of the overall enterprise architecture, will provide necessary support for global container shipping line Enterprise Architecture modelling. [15] The language Archimate and the modeling tool Archi are used successfully by researchers for the Enterprise Architecture analysis and modelling and were applied for the Targeted Reference Enterprise Architecture Model creation. [23-28]

The targeted Enterprise Architecture Model should be based on following requirements:

1) comply with the global company Enterprise Architecture conceptual provisions;
2) meet the Organizational Capacity Perspective criteria of the strategic map reference model;
3) ensure the goals achievement of the strategic map reference model for Internal Process, Customer, Financial Perspectives.

Targeted Enterprise Architecture Model is represented on figure 4.

Discussion

In this paper the authors do not consider Cyber Security aspects of the implementation of new technologies and changes in the Enterprise Architecture. Nevertheless, this aspect is very important during digital transformation of a company and could become subject of the further research.

Conclusion

The digital transformation of companies can be an effective tool to gain a competitive advantage, but its success requires consistent actions, from strategic vision to implementation. New architectural solutions are needed to ensure strategic alignment of business and IT architecture for further successful development.

Global container shipping lines have a good position for implementing new technologies and thus using their advantages in a global scope, but this large-scale process needs to be handled with appropriate methods. The method of Enterprise Architecture modelling based on the proposed Balanced Scorecard in this research paper, could become an effective tool for the digital transformation planning and implementation of global container shipping lines.

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