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Using Archimate and BMM to Model Enterprise-Level Alignment of Business and IT

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Abstract

In the last decade, Enterprise Architecture (EA) has been proposed to have the potential to improve and support strategic alignment between business and IT. This paper presents a new model, using a new modelling technique based on two leading modelling techniques, to depict strategic alignment between business and IT through the lens of an Enterprise Architecture framework, The Open Group Architecture Framework (TOGAF). The contribution of this paper is two-fold. Firstly, it augmented the Archimate modelling notation with the constructs of the Business Motivation Model (BMM) to present a more comprehensive technique of modelling strategic alignment of business and IT. Secondly, the paper also presents a new model that aims to explain the mechanism through which an Enterprise Architecture can enable strategic alignment between business and IT.

Keywords: Enterprise Systems, ERP, Enterprise Architecture, Strategic Alignment, Enterprise Modelling

Introduction

In recent times, Enterprise architecture (EA) has been proposed as a guiding solution framework to realise the much-desired business-IT strategic alignment (Wegmann 2002; Chen et al. 2005, Pereira and Sousa 2005; Gregor, Hart and Martin 2007; Saat, Franke, Lagerström and Ekstedt 2010; Cuenca, Boza, and Ortiz 2011; Seigerroth 2011; Zarvic and Wieringa 2014). Enterprise Architecture Body of Knowledge defines the term Enterprise Architecture as 'a practice, which analyzes areas of common activity within or between organizations, where information and other resources are exchanged to guide future states from an integrated viewpoint of strategy, business and technology'. Enterprise architecture, more specifically, is defined as a coherent whole of principles, methods, and models that are used in the design and realisation of an enterprise organisational structure, business processes, information systems, and infrastructure. Architecture models, views, presentations, and analyses all help to bridge the communication gap between architects and stakeholders (Lankhorst 2013).

Enterprise Architecture is implemented using several widely accepted standards and frameworks. The most common frameworks are the Zachman's Framework, The Open Group Architecture Framework (TOGAF), Four Domain Architecture, Reference Model for Open Distributed Processing (RM-ODP), OMG's Model Driven Architecture (MDA), Department of Defence Architecture Framework (DoDAF), Generic Architecture Reference and Methodology (GERAM), Nolan Nortan Framework and others (Lankhorst 2013). Furthermore, to keep the scope of the research realistic and feasible, two decisions are made: (a) one is about the Enterprise Architecture Framework tostudy Strategic Alignment of Business and IT (b) the other is about the kind of Information Technology to study suchalignment. For the first decision, TOGAF is chosen as the EA framework that will be used to study the phenomenon, as it is one of the key and widely accepted frameworks of Enterprise Architecture. For the second decision, Enterprise Systems are used as the chosen type of IT. Enterprise Systems (ES) can be defined as widely- used, large-scale, packaged, application software systems that can be used to streamline and integrate the business processes of an organization, and considerably improve information levels (Davenport 2000; Davenport et al. 2004).

While the literature is replete with studies on strategic alignment as well as on Enterprise Architecture, there is a lack of studies that synthesize the two themes with an aim to explain the mechanism of how strategic alignment can be achieved between business and IT through Enterprise Architecture. The discovery of the above-mentioned researchgap paved way for the research question:

How can we model Strategic Alignment of Business and IT through Enterprise Architecture?

1. A Review of Relevant Literature

After making the above-mentioned two choices to study strategic alignment of business and IT, a review of the literature was done in this narrowed scope: to explore the best that is known in explaining the mechanism of how such alignment can be achieved with Enterprise Architecture (TOGAF) in the context of Enterprise Systems.

In recent times, Enterprise architecture (EA) has been proposed as a guiding solution framework to realize the much-desired business-IT strategic alignment. Several studies have explored how different EA frameworks (including TOGAF) can be used to achieve strategic alignment (Wegmann 2002; Chen et al. 2005, Pereira and Sousa 2005; Gregor, Hart and Martin 2007; Saat, Franke, Lagerström and Ekstedt 2010; Cuenca, Boza, and Ortiz 2011; Seigerroth 2011; Zarvic and Wieringa 2014). However, these studies do not provide prescriptive guidelines to achieve this alignment in real life settings.

Some studies lately (like those by Bleistein et al. (2006), Derzsi and Gordijn (2006), Fritscher and Pigneur (2011)) have attempted to explain the mechanism of how strategic alignment can be achieved using Enterprise Architecture (including TOGAF) using techniques like Business Model Canvas (BMC), the 'SEAM' paradigm, Business IT Alignment Method (BITAM) and others. These studies have presented traceability models, tracing business strategic objectives to IT capabilities. A very small number of studies, like those by Grant (2003) and Lance & Muretta (2013), has been done on exploring strategic alignments in the context of Enterprise Systems in particular.

However, these studies suffer from one or more of the three major limitations. Firstly, these models are developed for specific organizations (case studies); there is no generic model presented that can fit other organizations. Secondly, these frameworks show uni-directional traceability, from business strategic objectives to implementing them using IT capabilities; traceability is not shown in the opposite direction. Thirdly, limited research (with the exception of the studies by Grant 2003 and Lance & Muretta 2013) has been done on exploring strategic alignments in the context of Enterprise Systems in particular, creating a research gap for further exploration of strategic alignment in the context of Enterprise Systems. So, a research gap was found for a generic model to explain strategic alignment by showing traceability between business strategic objectives and IT capabilities.

2. A New Modelling Technique to Explain Strategic Alignment With Enterprise Systems Through TOGAF

In attempt to answer the research question, a new model is being proposed that intends to explain how strategic alignment can be achieved using Enterprise Systems (as a dominant form of IT) through the lens of an Enterprise Architecture Framework: TOGAF. The chosen modelling language/framework used for this purpose is a combination of (a) Archimate from the Open Group, and (b) the Business Motivation Model (BMM) from the Object Management Group.

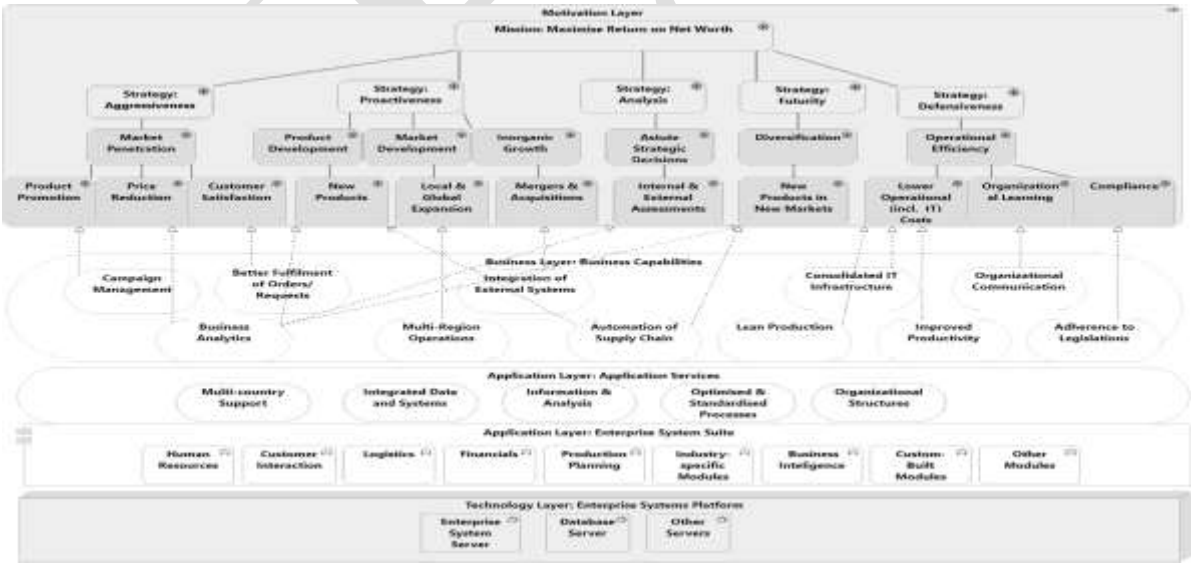

Fig 1. A modelling technique to model Strategic Alignment of Business and IT through Enterprise Architecture

2.1. Choosing a Modelling Notation

ArchiMate is a modelling language, founded by the Open Group (also the founder of TOGAF), which is used to design Enterprise Architecture. Also, Archimate is arguably the most comprehensive and widely used modelling language for Enterprise Architecture, with full support for the TOGAF framework (Fritscher and Pigneur 2011; Clark,

Barn, Oussena 2012). However, several researchers, who suggested combining Enterprise Architecture modelling techniques (like Archimate) with other business strategy modelling techniques like the i* Model or the Business Model Canvas (Yu, Strohmaier, and Deng, 2006; Quartel, Engelsman, Jonkers, & Van Sinderen, 2009; Iacob, Meertens and Jonkers 2011). So there seems to be a need to augment Archimate with techniques for better modelling business strategy. The Business Motivation Model (BMM) from the Object Management Group is a modelling framework which has been purpose-built for modelling business strategy. Increasingly, the BMM Model is being used in conjunction with other techniques and architectures like Role Activity Diagrams and Service Oriented Architecture and even Archimate (Beistein et al 2006; Feglar 2006; Quartel, Engelsman, Jonkers, & Van Sinderen, 2009). Thus, a carefully combined approach of Archimate and BMM components is used as a technique to develop a model for achieving alignment with Enterprise Systems.

2.2. Setting the Boundaries

A key thing to be noted here is that this new model does not intend to depict the entire Enterprise Architecture of all, or even any single organization(s). Instead, it attempts to depict a visual and high level model explaining alignment between business strategy and IT (and specifically Enterprise Systems) through the lens of an Enterprise Architecture framework namely TOGAF. So, while there could be different types and components of IT in an organization, this model only depicts the kind of IT for demonstrating strategic alignment of business and it which is in question for this research - Enterprise Systems.This proposed model is built around several layers, based on the TOGAF framework: technology layer, applications layer, business layer and motivation layer, corresponding to the TOGAF phases of technology, information systems, business, and architecture vision respectively. The model intends to show how strategic alignment of business and it can be achieved by traversing through these different layers.

2.3. Explaining the Core Concepts: Deconstructing the Layers

The model is explained by breaking it down into its constituent layers namely technology layer, applications layer, business layer and motivation layer.

2.3.1. The Technology Layer

The technology layer, shown as a single level layer (TL1) shows the deployment of technology (specifically IT) that an organization has in place as a part of their IT platform. However, due to the scope of our research, we limit our interest to the one node i.e. Enterprise System Platform. Enterprise Systems are used as the chosen type of IT. Enterprise Systems (ES) can be defined as large-scale, packaged, application software systems (Davenport 2000). These systems come in different forms, but the most dominant forms are the Enterprise Resource Planning (ERP), Customer Relationship Management (CRM). As shown in the technology layer, Enterprise Systems are usually deployed with an application server that manages the software and an independent database server. This form of technological deployment of Enterprise Systems is widely witnessed irrespective of the vendor and the system (Motiwalla and Thompson 2009).

2.3.2. The Applications Layer

The applications layer shows the IT applications that an organization has in place as a part of their IT portfolio and the services that it provides to them. The application layer is shown to consist of two levels: the application systems level (AL1) and the application services level (AL2). Irrespective of the vendor and the system, most Enterprise Systems are composed of in-built functional units called ‘modules’ that interact with each other to provide all the functionality. As shown in the applications layer, Such modules include Financials, Human Resources, Sales and Distribution, Materials Management, Production Planning and many others. Additional modules are available for specific industries like banking, Retail, Education, Mining and many others. (Motiwalla and Thompson 2009).

The top part of the applications layer shows the different application services that are offered by the application(s) – in this case the Enterprise System. These application services offered are the provisions or capabilities that are realized by implementing and using Enterprise systems. It may be noted here that these application services will be realized upon (a) successful implementation (via one or more projects) and (b) effective use of the Enterprise System. Ia. Integration Data and Systems: Enterprise Systems provides the capability to unify and harmonize data and systems with an organization’s unique environment, and use the systems to better connect organizational units and processes, as well as customers and suppliers (Markus 2000; Al-Mashari 2003; Puschmann and Alt 2004; Kelle and Akbulut 2005; Karimi et al. 2007).

Ib. Optimised and Standardized Processes: Enterprise Systems provides the standardization of processes using best practices embodied in the software, and shape processes to fit the unique or strategic needs of the business (Davenport 2000; Al-Mashari 2003; Siau and Messersmith 2003; Botta-Genoulaz and Millet 2005; Chand et al. 2005; Rikhardsson and Krammergaard 2006).

Ic. Information and Analytics: Enterprise Systems also provides information in real-time and transforms data into context-rich knowledge that supports the unique business analysis and decision-making needs of multiple work forces (Davenport 2000; Spathis and Constantinides 2003; Botta-Genoulaz and Millet 2005; Rikhardsson and Krammergaard 2006; Harley and Wright 2006).

Id. Multi-Country Support: Enterprise systems have built-in support for multiple currencies, multiple languages, and multiple global locations of business. (Chand et al 2005 ; Utecht and Hayes 2004).

Ie. Organizational Structures: Enterprise Systems support the setting up of organizational hierarchies and structures in a uniform and standardized way across the entire organization. This ranges from the corporate level (headquarters and branches) to business unit levels, and also include multi- entity organizations (holding and subsidiaries).

2.3.3. The Business Layer

This layer, in a single level (BL1), shows the capabilities that the technology layers helps to build in the organization, that may contribute towards meeting its objectives, goals and mission. These capabilities include (but not limited to):

IIa. Better Fulfilment of Orders/Requests: Timely and accurate fulfilment of orders and service requests through faster, accurate and integrated transaction processing enabled by Enterprise Systems (Kennerley & Neely 2001; Spathis & Constandines 2003; Chand et al 2005; Rikhardsson & Krammergaard 2006)

IIb. Lean Production: Reduction in inventory carried due to better production planning enabled by the optimized processes in the Enterprise System (Kennerley & Neely 2001; Spathis & Constandines 2003; Harris & Davenport 2006)

IIc. Automation of Supply Chain: Linking supply chain partners like suppliers, wholesalers, retailers etc. using the Enterprise System's integration tools (Kennerley & Neely 2001; Grant 2003; Harris & Davenport 2006; Rikhardsson & Krammergaard 2006; karimi et al 2007; Lance & Muretta 2013; Mostaghel et al 2015)

IId. Organizational Communication: Co-ordination between business units through standardized processes and user interfaces of the Enterprise System (Grant 2003; Spathis & constandines 2003; Gattiker & Goodhue 2005; Rikhardsson & Krammergaard 2006; Teo, Singh and Cooper 2014)

IIe. Consolidated IT Infrastructure: Common infrastructure through integration and standardization of IT components in the form of the Enterprise System (Grant 2003; Spathis & Constandines 2003)

IIf. Business Analytics: Analysis of the organization's operations finances, customers, suppliers and other stakeholders enabled by the real-time information and analytical tools provided by Enterprise Systems (Spathis &Constandines 2003; Harris & Davenport 2006; Chen and Fang 2013; Mathrani and Mathrani 2013)

IIg. Integration of External Systems: integrating other systems quickly and easily into the already integrated Enterprise System (Grant 2003; Harris & Davenport 2006)

IIh. Compliance: Adherence with legislations, like the Sarbanes-Oxley Act with the built-in support for such laws in Enterprise Systems (Thomson and Motiwalla 2009).

2.3.4. The Motivation Layer

This layer presents the topmost layer of the organization: the 'ends' that organizations wish to achieve and the 'means' through which they can achieve those 'ends'. In other words, the 'motivations' for the organizations to exist.This layer is structured in a hierarchy designed as a combination of concepts proposed by Archimate and Business Motivation Model, and supported by several researchers like Beistein et al (2006), Feglar (2006), Quartel, Engelsman, Jonkers, & Van Sinderen, (2009), Fritscher and Pigneur (2011), and Clark, Barn, Oussena (2012).

At the top of the hierarchy is the mission of business organizations: maximizing the benefits/returns of the owners/shareholders of the business. A key measure for this is the Return on Equity (RoE), also called Return on Net Worth (RoNW) and has been widely used as the 'end' for any business organization, as suggested by Tully et al (1993), Hitt & Brynjollson (1996) Barua et al (1995). Return on Equity is the amount of net income returned as a percentage of shareholders' equity. It measures a corporation's profitability by revealing how much profit a company

generates with the money shareholders have invested. This measure which is calculated as pre-tax income divided by equity. Thus 'Maximising Return on Net Worth' is shown at the topmost level (ML0) of the motivation layer in the model; this can be taken to be the ultimate 'end' for any business organization.

The next level (ML1) shows that to achieve this ultimate 'end', different organizations employ different 'means'. These different means can be well and comprehensively depicted by a widely cited framework called the Strategic Orientation of Business Enterprises (STROBE) by Venkatraman (1989). This framework suggests that business organizations choose one or more of the six 'strategic orientations' to achieve their end goal. These six strategic orientations are: Aggressiveness, Proactiveness, Defensiveness, Analysis, Futurity and Riskiness. However, stated by Venkatraman, the riskiness orientation has more to do with individual traits and less with the orientation of the organization as a whole, this orientation is being excluded from the model. Also, the essence of riskiness is captured in pieces in the other orientations the futurity orientation. Therefore, at the next level of hierarchy in the model, we have five strategic orientations (based on STROBE) as the 'means' to achieve the end goal: 'Aggressiveness', 'Proactiveness', 'Defensiveness', 'Futurity' 'Analysis'. Each of these concepts are defined below as per Venkatraman (1989).

1a. Aggressiveness: It is the strategic orientation in which the organization aims to improve its existing marketshare and outperform competitors.

1b. Proactiveness: It is the strategic orientation in which organization searches for new market opportunities and business ventures as well as new products and services that can be offered.

1c. Defensiveness: It is the strategic orientation in which an organization engages in activities to improve its efficiency and reducing the costs of business operations in an effort to preserve its prospective domain.

1d. Futurity/Riskiness: It is the strategic orientation in which an organization's decisions or activities reflect long-term considerations. These often tend to be venturing into new high risk areas based on future predictions.

1e. Analysis: It is the strategic orientation in which an organization takes actions based on factual, comprehensive information for decision-making through detailed root-cause analyses and potential solutions.

The next level (ML2) shows how the different strategic orientations mentioned in the above level can be translated in the form of different high level 'goals'. These are based on the explanations given by Venkatraman (1989) for each of the above strategic orientations. These explanations are used in combination with the terms used in Ansoff's (1957) widely used Product-Market strategy.

In Agressiveness, the main goal is to achieve Market Penetration.

2a. Market Penetration: this means that the organization aims to increase its revenue using its existing offerings (products and services) in existing markets.

In Proactiveness, the main goals are to achieve Product Development, Market Development and Inorganic Growth.

2b. Product Development: this means that an organization aims to increase its revenue by creating new products and services targeted at its existing markets.

2c. Market Development: this means that an organization aims to increase its revenue by expanding into new markets (customer segments, geographies, countries etc.) using its existing offerings.

2d. Inorganic Growth: this means that an organization aims to increase its revenue by acquiring or merging with other organizations.

In Defensiveness, the main goal is to achieve Operational Efficiency

2e. Operational Efficiency: this means that an organization aims to reduce costs by improving productivity and efficiency of its operational and administrational activities

In Futurity, the main goal is to achieve Diversification

2f. Diversification: this means that an organization aims to increase revenue by introducing new offerings in new markets. It is the riskiest strategy because both product and market development is required.

In Analysis, the main goal is to make Astute Strategic Decisions

2g. Astute Strategic Decisions: this means that an organization aims to make 'intentional choices or programmed responses about issues that materially affect the survival prospects, well-being and nature of the organization' (Schoemaker 1993 p.107)

The next level (ML3) shows how the different goals mentioned in the above level can be realized through more specific, achievable, measurable 'objectives'. These are based on the different indicators given by Venkatraman (1989) for each of the above strategic orientations. These indicators are again used in combination with the terms used in Ansoff's (1957) widely used Product-Market strategy.
Market Penetration can be realized through: 3a. Price Reduction; 3b. Increase in promotion and distribution, 3c.Increase in Customer Satisfaction
Product Development can be realized through: 3d.Offering new products
Market Development can be realized through: 3e.Selling to different customer segments 3f.Local and GlobalExpansion
Inorganic Growth can be realized through: 3g. Mergers and Acquisitions
Operational Efficiency can be realized through: 3h. Decrease in Operational/Direct Costs, 3i.Decrease inAdmin/Indirect (including IT) Costs, 3j.Organizational Learning, 3k.Adherence to Legislations
Diversification can be realized through: 3l. Offering new products to new markets
Astute Strategic Decisions can be realized through 3m. Internal and External Assessments

Going Further: Linking The Business Layer To The Motivation Layer

This section presents new knowledge claims about the key purpose of proposing the model: how can SABIT be achieved through Enterprise Systems. This is done by linking the (a) Business Capabilities provided by Enterprise Systems (shown in the Business layer) and (b) the Objectives of the organizations, as derived from its goals, strategiesand ultimately mission (shown in the Motivation Layer). This section lists the proposed relationships of the model, asshown by the arrows in the figure.
ES-enabled Campaign Management facilitates Product Promotion
ES- enabled Business Analytics facilitates Price Reduction
ES-enabled Better Fulfilment of Orders facilitates Customer Satisfaction
Business Analytics enables New Products
Automation of Supply Chain enables New Products
Multi-Region Operations enables Local and Global Expansion
Integration of External Systems enables Mergers and Acquisitions
Comprehensive Reporting enables New Products in New Markets
Automation of Supply Chain enables New Products in New Markets
Lean Production enables Lower Operational Costs
Consolidated IT infrastructure enables Lower Operational Costs
Improved Productivity enables Lower Operational Costs
Organizational Communication enables Organizational Learning
Adherence to legislation enables Compliance
The relationships suggested above are based on logic and the authors experience with Enterprise Systems. As further research, a study can be to explain the above mentioned hypotheses and test those using empirical data from case studies to arrive at valid hypotheses about strategic alignment of business and IT.

Conclusion

This paper presented a new model, using a new modelling technique, to depict strategic alignment between business and IT through the lens of an Enterprise Architecture framework. The contribution of this paper is two-fold. Firstly, it augmented the Archimate modelling notation with the constructs of the Business Motivation Model (BMM) to present a more comprehensive technique of modelling strategic alignment between business and IT. Secondly, the paper also presents a new model that aims to explain the mechanism through which an Enterprise Architecture can enable strategic alignment between business and IT. However, this paper aims to pave way for further research to elaborate and empirically tests the knowledge claims that link the 'business layer' to the 'motivation layer' of the model to establish evidence of its validity. Such research can be used as a prescriptive framework to (a) model, and (b)achieve strategic alignment between business and IT in a wide range of organizations.

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