A Method for Identifying Process Reuse Opportunities to Enhance the Operating Model

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Abstract – **Staying competitive in the 21st century requires enterprise unity and integration, allowing for agility to accommodate swift changes in strategy as markets evolve and new opportunities emerge. The *foundation for execution approach* acknowledges the volatility of strategy and suggests the use of an operating model (OM), which is a commitment to a way of doing business. The OM creates a company-wide vision for process standardization and data centralization and guides decisions about how a company implements processes and IT infrastructure. Although the OM provides senior management with a powerful decision-making tool in evolving the current IT landscape, the selection of an appropriate OM requires additional guidance. This article elaborates on current OM deficiencies, requirements for enhancement and a new method, mechanisms and practices to enable an enterprise architecture practitioner to identify the required process reuse opportunities for a specific OM.**

Keywords – **Operating model, business-IT alignment, enterprise architecture, business architecture, process architecture, process modeling.**

I. INTRODUCTION

One of the core reasons for strategic failures in organizations is the lack of coherence and consistency between numerous components of an enterprise [1]. Although still immature in its development and scientific rigor [2], enterprise engineering (EE) is an emerging discipline that recognizes the value of intentional enterprise design. Two important pillars of EE are enterprise architecture (EA) and enterprise ontology (EO) [1]. Although the definitions and scope of EE, EA and EO still indicate overlap [1]-[6], the resulting mechanisms and practices aim towards alignment and integration of the enterprise at various levels.

In earlier research we suggested that a business-IT alignment framework (BIAF) provides a starting point for understanding and analyzing the intent, scope and accompanying mechanisms and practices used by various business-IT alignment approaches / EA models [7]. The BIAF was used to provide a business-IT alignment context for a popular approach called the *foundation for execution* approach [8],[9]. The *foundation for execution* approach reveals two key artifacts: the operating model (OM) and the core diagram (CD), which are used in combination with four stages of operating maturity. The OM and CD communicate the enterprise-wide vision for process standardization and data centralization, with the aim to define long-term process and data rationalization decisions that may be implemented enterprise-wide. Although these decisions need to direct the evolution of the entire IT landscape, our research identified several deficiencies, especially in terms of the OM [8],[10]. Whereas the OM needs to provide a vision for both process standardization and data centralization, we specifically highlighted the deficiencies pertaining to *process standardization*. A set of requirements were subsequently developed to improve the rigor and practical use of the OM in identifying process *standardization/reuse opportunities* at an organization [8].

The contribution of this paper is to suggest a *new method*, including mechanisms and practices, which address the set of requirements we have identified.

The paper is structured as follows: Section 2 provides background on the Business-IT Alignment Framework (BIAF), the *foundation for execution* approach and a contextualization of the approach in terms of BIAF. Section 3 highlights the deficiencies that were identified in our earlier research and concludes with a set of requirements that could address deficiencies pertaining to *process reuse opportunities*. Section 4 discusses the research approach that was followed to develop the *new method* according to the identified requirements, whereas Section 5 conveys details of the proposed method. Section 6 concludes by highlighting managerial implications and follow-up research in validating the *new method*, mechanisms and practices.

II. BACKGROUND

According to a survey performed in 2007, Business-IT alignment has been one of the top two IT management concerns since 1994 [11]. Although numerous alignment approaches and EA models aim towards alignment and integration of the enterprise, a framework was required to contextualize the different approaches/EA models in terms of their alignment intent, alignment scope and supporting mechanisms and practices. Using an inductive research approach, we suggested a business-IT alignment framework (BIAF) to unpack different alignment approaches/EA models [7].

BIAF consists of three main components: a *value-creation paradigm* that defines the alignment intent; three alignment *dimensions* that are used to define the scope of alignment; and supporting *mechanisms and practices* that are used to ensure alignment across the alignment dimensions [7].

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The foundation for execution is "the infrastructure and digitized processes automating a company's core capabilities" [9]. The rationale for a foundation for execution is that an enterprise needs to digitize its operational processes to free up management time for focusing on strategic issues.

In terms of BIAF, the *value-creation paradigm* (foundation ellipse in Fig. 1) of the *foundation for execution* approach is that an enterprise requires a foundation for execution to digitize operational processes. In addition, [9] believe that a company needs to articulate a vision (future view) of how the company will operate, called the operating model (OM). This vision needs to provide direction for building a foundation for execution.

Ross et al. [9] do not explicitly demarcate the main BIAF *dimensions,* i.e. design domains, concerns or organization scope (panes of the cube in Fig. 1), hence the Zachman Framework for Enterprise Architecture [12], has been used as guideline for defining design domains and concerns [8]. Using Zachman's demarcation terminology, the foundation for execution approach emphasizes two main *design domains* (data (WHAT: inventory sets) and process (HOW: process transformations)), *concerns* of strategists, and the ability to share data and replicate processes across different business units, i.e. *organizing scope* (see shaded bars in Fig. 1).

In terms of *alignment mechanisms and practices* (bottom-triangle in Fig. 1), [9] refer to a method used in combination with key artifacts to create the foundation for execution.

The first step of the method requires the *selection of an OM*, which depicts the required level of data sharing and process standardization/ replication across the organization. Ross et al. [9] identified four stereotypical OMs based on different levels of data sharing and business process integration: diversification, replication, coordination and unification. Each stereotype has its own set of characteristics.

In the second step, business and IT leaders use the required OM to *define key architectural requirements* of the foundation for execution, which may be communicated via a CD.

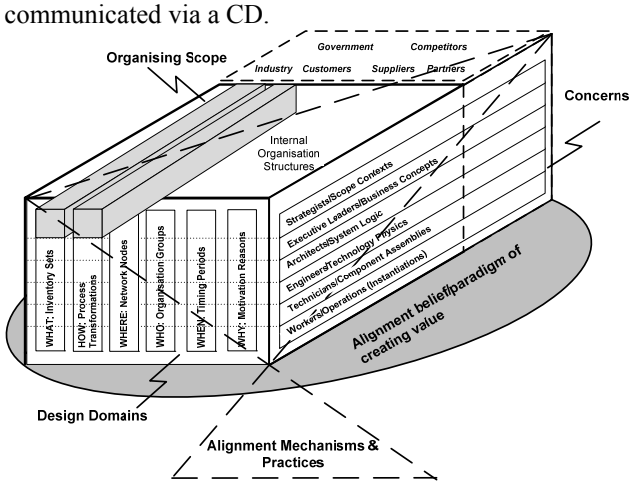

Fig. 1. The *foundation for execution* alignment focus, using BIAF

The OM and CD are used in combination with four stages of operating maturity to elevate an organization to a higher level of operating maturity. The four stages of operating maturity are:

1. *Business silos architecture:* where companies maximize individual business unit needs or functional needs.
2. *Standardized technology architecture:* gaining IT efficiencies through technology standardization and increased centralization of technology management.
3. *Optimized core architecture:* providing companywide data and process standardization, appropriate for the OM.
4. *Business modularity architecture:* where companies manage and reuse loosely coupled IT-enabled business process components to preserve global standards while enabling local differences [9].

The final step of the method requires the *use of an IT engagement model* that consists of a number of governance mechanisms that should implemented to ensure that new business initiatives contribute to the foundation for execution.

III. DEFICIENCIES AND REQUIREMENTS

A. OM Deficiencies

Although the selection of the OM is a critical decision for a company, several deficiencies were identified in our earlier research, two of which were specifically highlighted: (1) the *method* for deriving the OM and (2) using the OM to *elevate to a fourth level of operating maturity* [8],[10].

The deficiency pertaining to *method* was identified during a critical evaluation of the OM characteristics associated with the four stereotypical OMs. The characteristics of the OM may be classified according to different categories, which imply different timings [8]. An implicit method / process is thus suggested to derive a required OM. The organization needs to analyze certain business architecture parameters to establish rationalization opportunities. Rationalization opportunities could be identified within two main areas: (1) data (sharing data across organizational entities) and (2) process (replicating / reusing processes across organizational entities).

Once rationalization opportunities have been established, an organization needs to derive a future OM that would exploit these opportunities. The future OM then needs to direct the design of appropriate governance mechanisms [8].

The deficiency pertaining to *elevating to the fourth level of operating maturity* was discovered while re-visiting the role of the OM in transforming an organization through different levels of operating maturity. The OM is only required to elevate a company from a *second* level of operating maturity to a *third* level of operating maturity – standardization objectives (e.g. data sharing or process replication) are defined for each type of OM. Whereas the *third* level operating maturity

objectives are derived from the OM to exploit rationalization opportunities across the enterprise, the *fourth* level of operating maturity acknowledges the unique needs of business units and need to be supported via IT-enabled process components. The use of process components refer to a different level of process granularity – the OM however does not facilitate the identification of process components that may be IT-enabled and reused across the organization [8].

B. Requirements to Address Deficiencies

The deficiencies discussed in section III-A require the identification of opportunities to (1) share data and (2) reuse processes. As many companies have already seized the opportunity of implementing centralized data management systems (sharing data) [13], we only highlighted the deficiencies pertaining to the identification of process reuse opportunities and proposed a set of requirements in defining the scope of a supplementing method, mechanisms and practices [8]. Seven requirement categories were identified, of which a summary is provided in Table I. The rationale behind each requirement is stipulated in [8].

TABLE I
REQUIREMENTS FOR ADDRESSING DEFICIENCIES HIGHLIGHTED IN [8]

No	Category	Requirement Detail
R1	User(s) of the practices and related mechanisms	Any EA practitioner who wants to use the OM specified by [9] and needs to collaborate with other stakeholders in defining the required level of process standardization/replication.
R2	Generality	The practices and mechanisms should be generic in their application to different types of industries. An EA practitioner should be able to apply the practices and mechanisms to either a profit-driven, not-for-profit/government organization within any industry, in combination with the foundation for execution approach.
R3	Process categories included	The practices and mechanisms may be applied to all processes in the organization however; practices and mechanisms will be most effective when applied to the primary activities of an organization.
R4	Current architecture capabilities	The practices and mechanisms need to take current work in terms of Enterprise Architecture, Business Architecture and Process Architecture into account, but also need to provide sufficient detail if none of these architectures have been explicated.
R5	Process representation	The practices and mechanisms should encourage consistent process representation to ensure reuse. The extent of reuse includes the following: 1. It should be possible to add process measures if required for the purpose of performance measurement and/or process improvement. 2. The process representations should support end-to-end views of processes. 3. Process representations should not hamper the transition from the third to fourth levels of operating maturity, i.e. it should allow for modular process design. 4. The representations that are used to communicate process replication opportunities should be understandable to business users (from the contextual and conceptual viewpoints).
R6	Replication identification	The mechanisms and practices should enable the identification of operational similar organizing entities.
R7	Feasibility analyses	The mechanisms and practices should not suggest the means for assessing or measuring the feasibility of process replication/rationalization. Feasibility analysis, e.g. operational, cultural, technical, schedule, economic and legal feasibility ([14]) that may be associated with process rationalization solutions are therefore excluded.

IV. RESEARCH APPROACH

This research forms part of a larger research project for which design research was used. The design research cycle specified by Vaishnavi & Kuechler [15] were followed and consists of five steps: (1) awareness of the problem (a survey and critical analysis are used to identify deficiencies in terms of the practical use of the OM); (2) suggestion (a literature survey is performed to identify a set of requirements for a suitable method, mechanisms and practices that will address some of the OM deficiencies); (3) development (a method, mechanisms and practices are developed against the set of requirements that were suggested in step 2); (4) evaluation (the usability of the method, mechanisms and practices are evaluated – future research); and (5) conclusion (production of research results – future research).

The development of the method was derived from the sequential process implicitly defined by the characteristics of the OM and by investigating relevant process architecture languages, following an iterative (and creative) design research approach.

V. RESULTS – NEW METHOD

This section discusses the resulting method and supporting mechanisms and practices (see Fig. 2, 3, 4) to address the requirements identified in Table I.

A. Phase I: Gain Approval

The first phase involves gaining approval within the EA responsibility framework, principles and guidelines and consists of three steps:

Step 1: Fig. 2 presents mechanisms and practices that address the requirement that the EA practitioner needs to collaborate with other stakeholders in gathering evidence for identifying the process standardization/replication requirements in defining an OM (Table I - R1). The mechanisms and practices also acknowledge that current architecture work needs to be taken into account (Table I, R4).

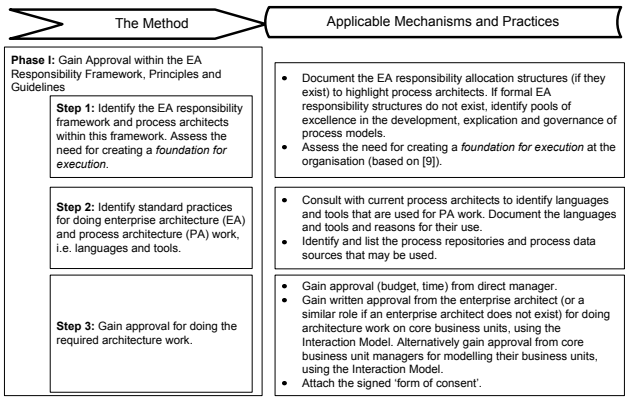

Fig. 2. Phase 1 of the *new method*

Steps 2 and 3: The mechanisms and practices presented in Fig. 2 once again ensures that current architecture work is taken into account (Table I - R4) by identifying current languages and tools that are used by the company to do process architecture (PA) work. In addition, execution of the method requires that architecture work is performed, which will have resource implications and consequently needs management approval.

B. Phase II: Provide Organization Scope Context

The second phase provides organization scope and context and consists of three steps:

Step 1: The identification of certain organization parameters (presented in Fig. 3) provides an indication of industry-type and size, and conforms to the requirement (Table I - R2) of accommodating different types of organizations (e.g. manufacturing / services and profit-driven / not-for-profit).

Step 2: The mechanisms and practices demonstrated in Fig. 3 still adhere to the requirement (Table I - R2) by accommodating organizations that produce tangible products (categorized by product types) and/or immaterial products (service types). In addition, a graphical technique is proposed whereby operational similar organizing entities are identified (Table I - R6). The graphical technique that is proposed in Step 2 refers to core business units that are responsible for the primary activities of the business in addressing the requirement (Table I - R3). The list of packaged software applications that are identified in this step is used later on in the method.

Step 3: The mechanisms and practices demonstrated in Fig. 3 extend the analysis effort in the previous step by identifying similarities between core business units, which may have different geographical locations, but are similar in their production of product types / contracted service types and/or delivering their products/services to similar customer groups. Similar organizing entities (core business units) are thus identified according to the requirement (Table I - R3) and hypotheses are created about possible business unit types (i.e. several core business units may conform to the operation of a business unit type).

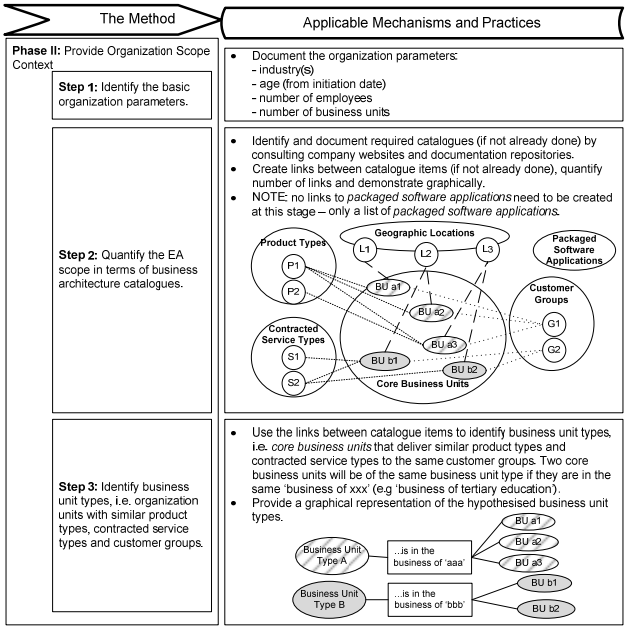

Fig. 3. Phase 2 of the *new method*

C. Phase III: Identify Process Standardization Opportunities

The third phase identifies current process standardization and opportunities for standardization and consists of three steps:

Step 1: Current architecture work (e.g. process models) are used as information sources (Table I - R4) to develop Interaction Models for each business unit type (see mechanisms and practices in Fig. 4). Two recently-developed process-architecting languages were considered as candidates for addressing the requirements of Table I – R5: BPMN (Business Process Modeling Notation) and the DEMO (Design and Engineering Methodology for Organizations) models and notation.

Whereas both BPMN and DEMO complies with the requirements stated in Table I – R5, the authors favor the use of DEMO due to the following reasons: (1) the ability to distinguish between the ontological, infological and datalogical actions – the Interaction Model only includes the essential/ontological transactions; (2) the Interaction Model is the most compact ontological model of an enterprise that incorporates units of logic (transaction types) that are consistent in the detail embodied in the underlying transaction patterns – this characteristic contrasts with other process modeling techniques that are inconsistent in the aggregation of process logic for different levels of detail; (3) the Interaction Model encourages the identification of ontological units of competence, authorization and responsibility, which also assists the practitioner of the *new method* when comparing different business units that may be of the same business unit type [2].

Steps 2 and 3: The last two steps of the method conclude with the identification of transactions that have already been standardized across different business units via the implementation of shared software applications. In addition, ontological transactions that seems to be similar across different business units, but implemented with different software applications, may have the potential for standardization. The method thus excludes the means for assessing or measuring the feasibility of process replication/rationalization as stated in the requirement Table I – R7.

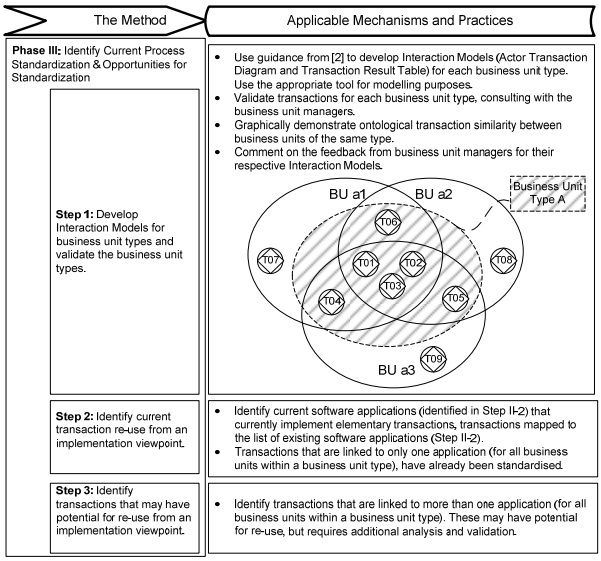

Fig. 4. Phase 3 of the *new method*

VI. CONCLUSIONS AND FUTURE RESEARCH

A. Key Findings and Managerial Implications

Senior managers need to debate and select an appropriate OM to establish a vision for how a company will operate. The OM is also a "choice about what strategies are going to be supported" and may drive the implementation of a whole set of strategic initiatives [9]. Each OM enables different strategies for achieving growths and profits [16] and should be used to direct IT principles / decisions [17], [16].

The OM indicates what should be shared in terms of data and process. Unfortunately no guidance is provided in validating the proposed sharing objectives that are defined by the OM [8]. This paper acknowledges the OM as a powerful instrument in providing senior management with a vision for how a company could operate. Two key deficiencies of the OM have, however, been identified that led to the development of a set of requirements that should address the stated deficiencies, but only pertaining to the identification of *process reuse* opportunities [8]. The proposed set of requirements was used in defining a *new method*, mechanisms and practices that would enable the EA practitioner to identify process reuse opportunities in an enterprise. Management will now be able to make decisions based on the method-results – they could now exploit the reuse opportunities by changing the opportunities into reuse objectives that should drive future decisions about software application and IT infrastructure rationalization.

B. Future Research

The *new method* has already been communicated to a group of research participants who will be using the method at their own organizations. The research participants received extensive training on the *new method* and underlying theories, and were each requested to complete a survey to evaluate the ease-of-use of the *new method*, as well as the usefulness of the *new method*, mechanisms and practices to identify process reuse opportunities in their organization.

REFERENCES

[1] J. A. P. Hoogervorst, *Enterprise Governance and Enterprise Engineering*: Springer, 2009.
[2] J. L. G. Dietz, *Enterprise Ontology*, Berlin: Springer, 2006.
[3] J. Martin, *The Great Transition: Using the Seven Disciplines of Enterprise Engineering to Align People, Technology, and Strategy.*, New York: American Management Association, 1995.
[4] F. B. Vernadat, *Enterprise Modelling and Integration - Principles and Applications*, London: Chapman & Hall, 1996.
[5] ISO/IEC JTC 1/SC 7. (2011, April 5). *Systems and software engineering - architectural description*. [Online]. Available: http://www.iso-architecture.org/ieee-1471/docs/ISO-IEC-WD3-42010.pdf.
[6] EA Research Forum, "Enterprise architecture definition," Enterprise Architecture Research Forum, 2009.
[7] M. De Vries, "A framework for understanding and comparing enterprise architecture models," *Management Dynamics,* vol. 19, no. 2, pp. 17-29, 2010.
[8] M. De Vries, Vd Merwe, A., Gerber, A., Kotze, P., "Refining the operating model concept to enable systematic growth in operating maturity," in *Proc. 24th SAIIE Conference*, Glenburn Lodge, Gauteng, 2010, pp. 32-46.
[9] J. W. Ross, P. Weill, and D. C. Robertson, *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*, Boston: Harvard Business School Press, 2006.
[10] M. De Vries, and A. C. Van Rensburg, "Evaluating and refining the 'Enterprise Architecture as Strategy' approach and artefacts," *South African Journal of Industrial Engineering,* vol. 20, no. 1, pp. 31-43, 2009.
[11] J. Luftman, and R. Kempaia, "An update on Business-IT alignment: 'A line' has been drawn," *MIS Quarterly Executive,* vol. 6, no. 3, pp. 165-177, 2007.
[12] J. A. Zachman. (2009, November 19). *The Zachman Framework for Enterprise Architecture™: a primer for enterprise engineering and manufacturing.* [Online]. Available: http://zachmaninternational.com/index.php/home-article/15#maincol.
[13] H. Smith, and P. Fingar, *Business Process Management: The Third Wave*, Florida: Meghan-Kiffer Press, 2003.
[14] J. L. Whitten, and L. D. Bentley, *Systems Analysis and Design for the Global Enterprise*, 7th ed., New York: McGraw-Hill/Irwin, 2007.
[15] V. Vaishnavi, and W. Kuechler. (2009, December 11). *Design research in information systems.* [Online]. Available: http://desrist.org/design-research-in-information-systems.
[16] P. Weill, and J. W. Ross, "Implementing your operating model via IT Governance", Center for Information Systems, CISR, USA, Research Briefing 8(1D), 2008.
[17] P. Weill, and J. W. Ross, *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results*, Boston: Harvard Business School Press, 2004.