Models and Capabilities for Supporting Transformation based on Enterprise Dimensions with Enterprise Engineering

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Abstract: In response to changes in the environment surrounding an enterprise, many occasional To-Be models like IT Governance models and IT service management models have been proposed. Recently, digital enterprise model has attracted attention. The concepts, frameworks, and methodologies dealing with the enterprise have also changed in response to the movement. While we are leading enterprises to the transformation to the To-Be model and/or ambitious picture from various perspectives, and it is difficult to promote transformations that maintain interoperability across them, while viewing the enterprise from various perspectives. It seems that we are working on the closed framework of individual frameworks and methodologies that deal with the same enterprise. The purpose of this position paper is to propose the commonly available dimensions related to the enterprise and ET-CMF. The mechanism will aim to analyze the influence of the change based on those dimensions collaborate with the concept of enterprise engineering on enterprise transformation as connectors. The mechanism, currently in development, could be a holistic management framework to support the transformation by using Enterprise Engineering.

1 INTRODUCTION

In the enterprise transformation (Purchase et al., 2011), there are so many ideal models, blueprints and situations (Goerzig and Bauernhansl, 2018). The ideal pictures are provided by practitioners and researchers one picture by one change is predicted or occurs on business environment, for example, “digital enterprise transformation (Weill and Woerner, 2015)” by “business model at digital age”, etc. Indeed, a variety of approaches were proposed in the literature concerned with the solution for treating those transformation. Various ideal frameworks and/or big pictures are drawn but transformation has failed (Flyvbjerg and Budzier, 2011) (Kotter, 1995) (Westerman, 2018) (Davenport and Westerman, 2018) (Bughin et al., 2018). Rather than promoting change with ad-hoc way blindly, we think that we should incorporate ideas to support the practice of enterprise transformation (Labusch, 2017) capability based on multi-dimensional impact analysis.

On the other hand, under our preliminary literature survey, existing management frameworks are addressing one specific perspective of enterprise management and focusing on one kind of improvement. There is no significant adoption in state of the enterprise transformation management systems based on relationship between architecture and transformation practices yet. Companies try to improve and transform in silos according to individual frameworks and concepts. Evaluate As-Is in assessments and interviews based on previously created ideals, and highlight To-Be and Ambition. Close to the frameworks and concepts used at that time, it seems that the assessment and subsequent plans have been successfully done. However, isn't there a situation where the enterprise transformation that should be achieved does not progress because the enterprise's interoperability with other related things is lacking or not? Even if individual frameworks have formed completed forms, I thought that frameworks that can be transformed and transformation operation platforms that embody them would be necessary while maintaining their interoperability.

The goal of this work is, therefore, to propose a holistic management framework to support the transformation based on enterprise dimensions by using enterprise engineering (EE) (Dietz and Hoogervorst, 2017) thinking-frame. All the

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dimensions, analysis perspectives, impact analysis of those change practices together support among adaptable enterprise architecture world and real transformation world. In our research, Enterprise dimensions is defined as "A collection of elements related to enterprise that cannot be reconstructed as a whole if one is missing".

This paper is structured as follows: section 2 presents the context of this research alongside the related work and the problem state. section 3 puts down background theory, hypothesis and the objectives. In section 4, we describe the models we propose for supporting enterprise transformation based on enterprise engineering. Lastly, section 5 includes the conclusions and some reasoning about our work.

2 RESEARCH CONTEXTS

2.1 Current State of Enterprise

In a nutshell, enterprise is reforming towards digital transformation. We can find five major states of the transformation that we found out through paper research.

- Management scope is shifted from IT to digital (business technology)
- Management perspective is shifted from IT organization to customer
- Focus point is shifted from solo Function to extended enterprise
- Strategy scope is shifted from IT strategy to digital strategy
- There are so many blueprints for the transformation

In these cases, enterprise has faced major issues described below.

- Nobody knows right direction for To-Be blueprint,
- No right steps for transformations,
- There are so many tools and methods for supporting the transformation,
- There are different perspectives and dimensions for describing the transformation,
- There is no unified way to design and manage each blueprint and the transformation,

As the state of enterprise transformation project, we can summary the target for transformation management is complicated and mysterious. It is difficult to control and lead enterprise transformation with fully orchestrating each activity. Now, many enterprises are applying existing frameworks to siloed and/or specific enterprise elements, separated by architecture, process, model, capability, HR, etc. Around enterprise transformation projects, we cannot be done without considering various things, which requires a lot of time and effort. We think there are no inter-solution, inter-framework and/or inter-operability for managing enterprise transformation.

2.2 Related Research Activities

EAM (Enterprise Architecture Management) has the holistic perspective of enterprise architecture management (Labusch, 2017). It is a framework for successful implementation of ETM, and it is effective for capturing activities to be implemented. From a program and project management perspective, ETM sees the following as a summary of how to proceed with change in enterprise. ACET (Architectural Coordination of Enterprise Transformation) (Proper et al., 2017) (de Kinderen, 2017) is one of the practices to coordinate enterprise transformation.

Adaptive Enterprise Architecture (Korhonen et al., 2016) has four perspectives derived from the need for and underpinnings of a reconceptualization of enterprise architecture from the enterprise ecological adaptation (i.e. adaptive enterprise) point of view. It is considered to be the latest among the existing EA forms. At the beginning of the history of enterprise model, the model formed like a pyramid separated with several layers, for example infrastructure layer, technology layer, data layer, information layer, business process layer.

(Korhonen, 2018) has proposed "enterprise transformation capability". The proposal is to associate the CIO's capability with the enterprise's capability in transformation. The CIO's capability mainly focuses on skill dimension. This model has lined up the patterns of capabilities that organizations and individuals should have during enterprise transformation. There is no mention of the capability maturity framework model that we propose.

2.3 Problem Statement

At the research area of enterprise modelling, the formation of the capturing the enterprise has influenced by the change of business environments. For example, at the digital age the form of enterprise has shift from traditional pyramid style to networked ecosystem style. At the scene, several research activities have proposed each sophisticated and specific framework for representing the structure of ideal enterprise structure.

Those frameworks mentioned above has hard barriers between each thinking methodology. We are thinking the combination those method and theories

at the management scene. At the management activities of those transformation, we must clarify the mechanism that how to influence the activities for the transformation to enterprise model at each transformation scenario. It is important to connect various frameworks and theory about enterprise through enterprise dimensions (Bernus et al., 2012) for supporting the transformation.

3 BACKGROUND CONCEPTS AND ASSUMPTIONS

3.1 Background Concepts

Enterprise Transformation Management.
According to (Purchase, 2011), enterprise transformation concerns change, not just routine change but fundamental change that substantially alters an organization's relationships with one or more key constituencies, e.g., customers, employees, suppliers, and investors. ET management (ETM) is concerned with the establishment and coordinated development of EA in order to consistently respond to business and IT goals, opportunities, and necessities (Labusch, 2017).

Enterprise Engineering.
Enterprise engineering (Dietz, 2011) (Dietz and Hoogervorst, 2017) is conceptual thinking methodology to apply engineering approach to enterprise architecture management by describing the model of enterprise, governance model and business model. Enterprise engineering have the potential for solve those problems describer in Section 1 between enterprise model and enterprise transformation activities on the real business world and/or physical enterprise. For example, we can use enterprise engineering concept to clarify the influenced area of enterprise on ETM activities.

Enterprise Capability.
The definition of "capability" is published by past research papers and books. In (Wißotzki, 2018), the definition is focus on "perform a set of coordinated tasks, utilizing organizational resources, for the purposes of achieving a particular end result". In (Wißotzki, 2015), the types of capability are already summarized by literature review. Those capabilities have individual perspective and organization perspective. In our research activities, the target is organization perspective. In (Michell, 2011), the capability is linked with enterprise resources and processes. In (Teece, 2010), dynamic capabilities are based on "the skills, procedures, organizational structures, and decision rules that firms utilize to create and capture value". We think that the dynamic capability will be the core engine in enterprise transformation management because transformation is not to mature but to change the company's routine business processes to other suitable ones.

Dimensions of Enterprise.
According to (Bernus et al., 2012), "Structure", "Behaviour" and "Value" are illustrated as the major dimensions of architecture. Bernus et al. also pointed out "all of which are interrelated and understanding these should improve the enterprise". At (Bernus et al., 2012), the focus was on how to subdivide the enterprise model for improvement in the company's performance. It has not been defined in anticipation of relationships or impacts in line with transformation or other elements.

Foundation for Execution and Operating Model.
In (Ross et al., 2006), J.Ross has defined the foundation for execution model for traditional enterprise. They say that an organization's operating model should determine its enterprise architecture, which, in turn, should guide the building of its foundation for execution (i.e., the operating platform). As with other concepts and frameworks, the operating model has also changed in response to changes in the environment surrounding the enterprise, such as digital transformation (Goerzig and Bauernhansl, 2018) (Weill and Woerner, 2015). In this study, although the relationship between EA and capability is illustrated, but dimensions on enterprise transformation has not been mentioned. In (Hafsi and Assar, 2016), Hafsi, M. etc. pointed out that execution model should be changed align with causing digital transformation at enterprise.

Enterprise Transformation Lifecycle.
According to (Giachetti, 2016), the enterprise life-cycle describes the history of the enterprise from the initial concept of a business in the mind of an entrepreneur, through a series of phases as the enterprise grows, until the business venture ends. The enterprise life-cycle consists of three generals, distinct stages: development, deployment, and operation. Enterprise lifecycle is strongly focusing on "Enterprise System". Development covers the engineering phases to create an enterprise system, deployment is the change management process to implement the enterprise system, and operation is the management of the enterprise system and its continuous improvement. In our work, it is necessary to form an enterprise transformation lifecycle in relation to the existing life cycle definitions.

3.2 Assumptions

Based on the preliminary paper research, we define the following main proposition:

Main Proposition.
Improvements in enterprise capability maturity has a positive impact on the outcomes of all the components associated with enterprise transformation with less effort and faster.
Based on above, we formulate the following hypotheses for conducting our research:

Hypothesis 1 (H1).
There are relationships between enterprise transformation capabilities and others concerned with enterprise.
Hypothesis 2 (H2).
There are unified enterprise dimensions and influencers for enterprise transformation.
Hypothesis 3 (H3).
Capturing the influence between dimensions is what we are trying to bring about enterprise transformation to success.

3.3 Our Goal

At the end of this work, we will establish the framework for supporting platform and solution as a service (Figure 1). At the scene, the start point of the solution will be definition the requirements for a transformation activity (Labusch, 2017) by using requirements engineering think-frame (Ivarsson and Gorschek, 2009), etc (Figure 1).

The solution will take next steps for supporting the enterprise transformation management;
(Step-1) Clarify requirements of the transformation
(Step-2) Co-create expectation tree of the transformation
(Step-3) Target IT/business capability for the transformation based on enterprise engineering think-frame
(Step-4) Visualize the value network
(Step-5) Take an impact analysis
(Step-6) Execute ETM.

We will divide the main goal into the following three parts: (i) Targeting method for transformation with enterprise engineering, (ii) Perspectives and dimensions for ET, and (iii) ET-CMF model. In (i), we expect to use EE for clarifying the difference between before transformation and after transformation. We also expect to see to what extent the dimensions expressed in other perspectives are affected. In (ii), we expect to use enterprise perspectives and dimensions to identify related perspectives and/or dimensions. For example, capability maturity framework has practices for capability improvement. Those practices are related to some artefacts for the improvement. Other perspectives and dimensions related to enterprise has some artefacts. Now we are thinking that some of the artefacts will be able to connect related perspectives and dimensions. In(iii), we expect to use enterprise transformation capability maturity framework model to lead and support the transformation with low cost and lightspeed.

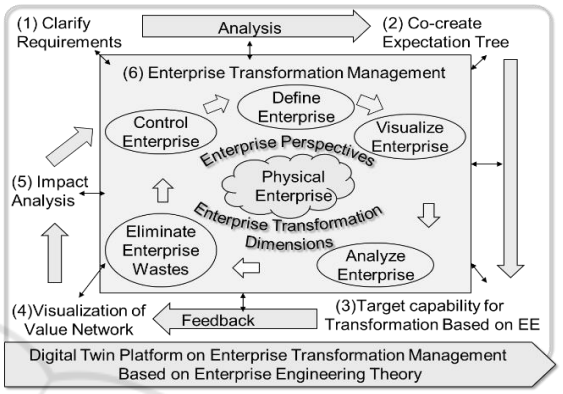

Figure 1: Our Goal.

Ultimately, we aim to design, develop and provide a platform for digital twin on enterprise transformation management realized on the own framework proposed in this work. This will reduce costs and labours on achieving various types of transform from the traditional ETM world to the new fully digitally ETM world. We think that the core components of the platform are to have the ability to connect with change capability, business model, architecture and so on.

4 ENTERPRISE ENGINEERING FOR TRANSFORMATION

4.1 EE for Transformation

In this research, we will apply enterprise engineering think-frame to enterprise transformation management. Rather than promoting modelling and governance focused on a single point of view, we need enterprise engineering theory that can take into account the hidden interoperability, interdependence, and impact of change. As a core engine of the transformation, we will extend EE collaborate with enterprise transformation capability maturity framework model to make the transformation more

effective. We propose to support ET at the following points with EE:

- Govern from single enterprise to virtual extended enterprise,
- Support for various style of business with lightspeed,
- Support business innovation rather than control,
- Visualization of business value and information stream,
- Interoperable modelling and management rather than siloed and limited.

4.2 Perspectives and Dimensions

As first step, we summarised the candidate of enterprise transformation dimensions (Figure 2):
Enterprise Model: models related enterprise, like business models.
Enterprise Capability:
capabilities related enterprise, like IT capability/business capability.
Enterprise System: systems related enterprise, like "System of Record/Engagement".
Enterprise Formation: organic styles of enterprise, like hierarchy/networked/ecosystem/…
Enterprise Resource: resources of enterprise, like platform/infrastructure/staff…
Enterprise Architecture: architecture of enterprise, like traditional/…/adaptive.
Enterprise Execution: capability and competency, like IT-CMF/IT management competency.

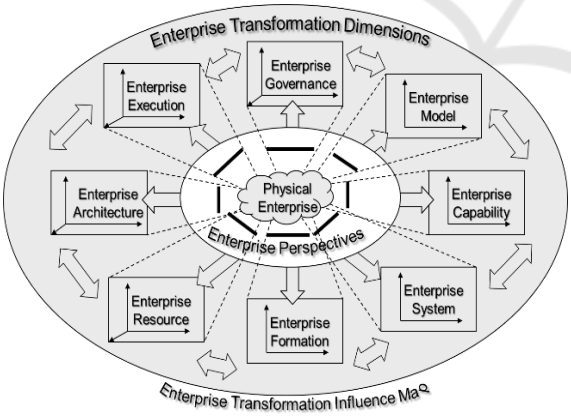

Figure 2: Enterprise Perspectives and Enterprise Transformation Dimensions.

Based on the preliminary historical literature review (Kotusev, 2016), we can describe the history of the transformation in the real business world. We will extract the characteristics of each representation for clarifying what dimension is changing by transform the shape (Rigdon et al., 1989) (Halley and Bashioum, 2005) (Ferronato, 2007) (De Vries and Van Rensburg, 2008) (Fritscher and Pigneur, 2011) (Lazarov et al., 2015) (Korhonen et al., 2016).

According to (Korhonen and Halen, 2017), traditionally enterprise architecture has focused on process standardization and integration, not on continuous adaptation to the changing business, information, social and technological landscape. Furthermore, (Haffke et al., 2016) has described about "changing role of EA and technological catalysis along different phases of the adaptive loop".

We define the characteristics of each enterprise formation by referring (Chui et al., 2012) (Srivastava, 2015) (Moreira et al., 2018). In (Hay, 2011), enterprise model patterns have summarized. Those patterns are focused on data centric descriptions of enterprise activities by using some predefined parts. We think this work is not suitable for our research because there are no specific patterns on enterprise transformation. In (Gassmann et al., 2013) and (Fleisch, 2015), business model patterns have summarized. As you can see the model patterns, wet think those patterns are depends on the requirements for enterprise transformation. In (Agostinhoa, 2014) and (Santa and Nurcan,2016), we can find the patterns of organization model. We think the organization model is similar with "Types of Enterprise Organizational Formation" in this paper.

We will define the dimensions related enterprise governance based on (DeLone et al., 2018) as business-IT alignment (BITA) perspective. In the paper, they described it as stages of governance model, do not mention dimensions in the context of transformation among business-it alignment focus point. In our future study, we will define the details of those dimensions' specifications.

In (Kapoor et al., 2015), they described the difference between SoR (Systems of Record), SoE (Systems of Engagement) and SoI (Systems of Insight). Based on the description, we can define the as enterprise systems innovation dimensions. SoR is a traditional business support system like an ERP package for recording the DIK (Data, Information, Knowledge) of the activities on the enterprise. In next innovated system world, SoE is the key infrastructure in a connected world like IoT. SoE has different system architecture and characteristics between SoR and SoI. The transition from SoR to SoE will influence to EA, models, capabilities and so on related to enterprise transformation will be changed. SoI is one of cutting-edge architecture based on analytics function like AI (Artificial Intelligence) and cognitive computing. SoI must take a collaboration

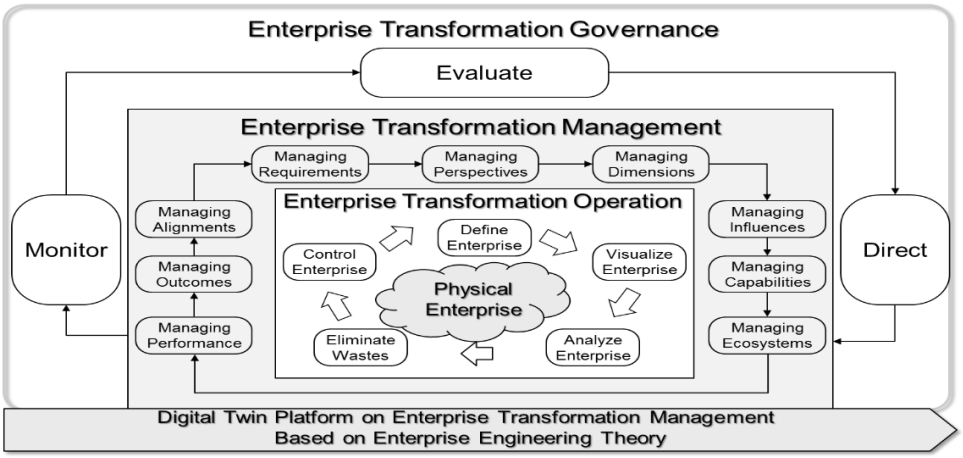

Figure 3: Overview of Enterprise Transformation Capability Maturity Framework.

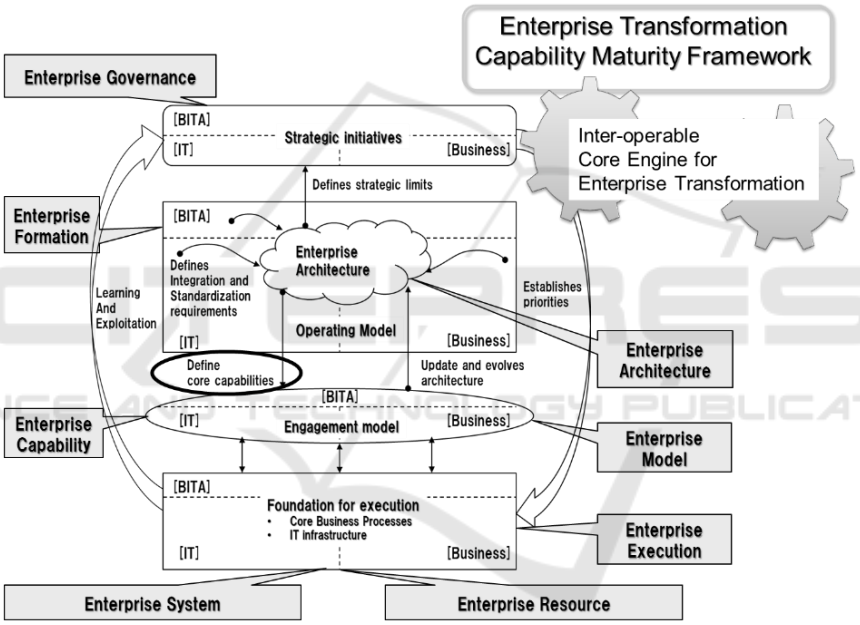

Figure 4: Relationship between Ross's Execution model and our ET-CMF and dimensions.

with SoR and SoE, closely. In the case of transition from SoR and SoE, the direction of the transformation is "Business Value" centric.

We will define the dimensions related enterprise transformation based on existing several dimensions and models. From some literature review concerned with enterprise transformation, there are so many styles of representation for figuring out the characteristics of To-Be picture of future enterprise. We think the dimensions is key role among enterprise transformation management with multi-directions connected influencers. The influencers will be derived from several theories, frameworks, existing dimensions and models referred in this paper.

In Figure 2, "Enterprise Governance" represents the high-level dimension for decision-making style. The detailed dimensions will be defined in our future study. Same as "Enterprise Governance", we can define the relationship between each high-level dimension with specific perspective on enterprise transformation. From the recognition that there is confusion of viewpoints, perspectives and dimensions, we will formulate our enterprise transformation dimensions.

4.3 ET-CMF

As the concept of IT capability maturity was introduced by (Ross et al., 1996) (Curley, et al., 2016). We select IT-CMF as the material to consider practices for enterprise transformation. IT-CMF is representing maturity model with two axes, vertical axis is divided into five levels of the transformation from initial state to optimizing state and horizontal axis is divided into four key strategic areas for the management of IT. The perspective of IT-CMF is business and IT alignment. By referencing that framework, we will clarify what is necessary to consider practices with our dimensions in the future, based on the relationship between artefacts treated at each capability and another dimensions. Finally, we will propose ET-CMF model (Figure 3).

ET-CMF consists of three layers, (i) ET Governance, (ii) ET Management, and (iii) ET Operation. ET Governance will be based on It Governance EDM model. ET Management will be established based on enterprise dimensions and related models. Management issues will be changed flexibly due to the increase or decrease of dimension. ET Operation will be conducted like a lifecycle management of enterprise. Those activity will be "Define", "Visualize", "Analyse", "Optimize" and "Control" on physical enterprise.

5 CONCLUSIONS

As summary message, we describe the relationship Ross's "foundation of execution" (Ross et al., 2006) and our ET-CMF and dimensions in Figure 4. We believe that the models described in this paper promote strategic transformation of complex entities, such as digital enterprise transformation.

Many companies are focusing digital transformation at all industries around the world. On the other hand, many existing issues concerned with current business model and/or enterprise formation are still remain. This paper provides overview of ongoing research results and plan the remaining steps. It aims to enable the framework to be used in state-of-the-art enterprise change environments.

As future work, we intend to (i) accelerate literature review on perspectives and dimensions related to enterprise transformation based on the related frameworks and models; (ii) propose full scope of ET-CMF in detail; (iii) examine the clarifying the relationship on influencing between architecture world and transformation world by using common dimensions and influencers for leading the transformation; and finally, (iv) formalize the prototype management support tool for the transformation.

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