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Planning for Digital Transformation: Implications for Institutional Enterprise Architecture

Research-in-Progress

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Abstract

Enterprise Architecture (EA) and its management have received considerable attention from the academic and practical audience. Despite a very wide treatment on EA, research on EA in the academic sector has not received similar attention till date. There is also a growing interest on digital transformation with evidences suggesting that academic institutions have increased their investment into digital technology which prompts a need to reflect on how this technology affects these institutions and the educational processes. In the dissertation, we propose to link these concerns based on three research issues, through which we explore the objectives an academic institute wants to achieve in planning for digital transformation and the necessary institutional readiness factors of a digital enterprise architecture, and then propose a design framework to support the endeavour. The dissertation employs both qualitative and quantitative research methodologies. Implications for research and practice are also delineated at the end.

Keywords: Digital transformation, enterprise architecture, academia

Introduction

In the past two decades Enterprise Architecture (EA) and its corresponding management function have gained considerable attention from the academic and practical audience. Lankhorst defines EA, as “a coherent whole of principles, methods and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure” (Penttinen and Isomäki 2010). It presents a collage of several architectural models, such as business architecture, information architecture, information systems (IS) architecture, and technology architecture (Jonkers et al. 2006; Lankhorst 2005). These models describe the current situation of the organization, conceptualize its future vision, and provide a transition plan for how to reach the future vision (Lankhorst 2005). In other words, EA provides a holistic view of the organization and its different components and structures, and thus can be seen as “a kind of city plan that details policies and standards for the design of infrastructure technologies, databases, and applications” (Ross 2009). Despite this high-level conceptualization, there is no single accepted definition of EA (Niemi and Pekkola 2017; Tamm et al. 2011). As it is often understood either as a taxonomy, a methodology, or a master plan, and perhaps even all three simultaneously, EA endeavours are recognized to be challenging (Niemi and Pekkola 2017). The term ‘enterprise’ indicates that EA could be used to consider a company, an institution, or a department within a company or an institution (Guijarro 2007), and the term ‘architecture’ aims at creating some kind of structure of a complex and isolated environment using systematic approaches (Armour and Kaiser

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2001). The EA concept is gaining attention throughout the world because of its numerous benefits (Dang and Pekkola 2017b). Various research endeavours on EA have focused on EA goals (Schöenherr 2008), EA benefits (Tamm et al. 2011), EA implementation (Rouhani et al. 2015) or EA evaluation and assessment models (Andersen and Carugati 2014). Literature reviews are also frequent in the EA literature, either at a disciplinary scope (Mykhashchuk et al. 2011; Rasti et al. 2015; Simon et al. 2013) or exploring concrete research issues as indicated above. EA adds value to organizations either through information availability or through resource optimization and organizational alignment (Kamoun 2013; Pereira and Sousa 2004; Richardson et al. 1990). Kotusev (2015) presents a review of EA practices, approaches, and stakeholders in organizations. EA practices can be seen in large organizations belonging to industries such as banking and financial (Bonnie et al. 2012), defence (Department of Defence, 2010), healthcare (Bradley et al. 2012), telecommunications (Czarnecki and Dietze 2017), transportation (Foorthuis et al. 2010), etc.

The academic sector like any other organization implements information systems to manage its day to day activities and other diversified functions of collaboration, research, strategic planning, globalization and etc. (Silva and Cabral 2010). Evidences of research on EA in academia are rare and scattered. The existing literature address the challenges of EA adoption in academia (Olsen and Trelsgård 2016), instances of EA implementation based on established frameworks, e.g. TOGAF² (Soares and Setyohady 2017) and related design recommendations in the form of reference architectures and reference models (Sanchez-Puchol et al. 2017). The importance of EA in facilitating academic institutions to realize their mission and objectives has been also acknowledged (Ramadhan and Arman 2014).

Digital transformation refers to a process of major change to enhance stakeholder experience and to innovate on business models by leveraging digital technologies like analytics, cloud computing, internet of things, mobile, or social media (Fitzgerald et al. 2014). It indicates a profound transformation of organizational activities, processes, competencies and models to fully leverage the changes and opportunities of a mix of digital technologies and their accelerating impact across society in a strategic and prioritized way, with present and future shifts in mind. While the term has been mostly used in the context of business organizations, it relates to organizations of all forms, for example academic institutes, involved in tackling the existing challenges by leveraging the existing and emerging technologies³. Evidences also indicate that academic institutions have increased their investment into digital technology which prompts a need to reflect on how this technology affects these institutions and the educational processes (Kirkwood 2014). Existing evidences of related inquiries address content digitization strategies and offering models for various target groups (Sandkuhl and Lehmann 2017), the need for digital campus and the necessary support processes (Xu et al. 2017).

The existing evidences on EA suggest mostly a focus on EA itself, not on its use or organizational implementation (Dang and Pekkola 2017a). For example, little emphasis has been put on how EA projects influence organizational change process (Dang and Pekkola 2017a). This ignorance is noteworthy as EA implementation influences organizational practices significantly. Although EA is responsible for change in business, little focus has been given on aspects of EA in digital transformation. Concerning EA, there is also not much emphasis on the academic sector in the available documentations. Academic operations and its efficiency are relevant concerns to both academicians and practitioners. In this connection, the education service and information technology alignment is essential and critical for management through using EA as a tool for designing the current view of organization as well as future state. We propose to link some of these concerns in our dissertation through a set of research questions, which are discussed below.

² TOGAF (The Open Group Architecture Framework) is a framework for enterprise architecture that provides an approach for designing, planning, implementing, and governing an enterprise information technology architecture.

³ <https://www.i-scoop.eu/digital-transformation/>

Research Objective

In my dissertation, we focus upon the following three broad research issues, and discuss these below

1. Understanding digital transformation goals of an academic institute
2. Assessing institutional readiness for implementing digital enterprise architecture
3. Proposing a design of digital enterprise architecture for academic institutes

1. Understanding digital transformation goals of an academic institute

The evidences presented above do suggest an increasing focus on addressing digital transformation issues. In an academic setting, there is also a need to explore the objectives an institute wants to achieve in planning for digital transformation. The existing literature is mostly silent on this issue. In the first research question, we seek to explore the same in order to form an understanding on the digital transformation goals of an academic institution. The investigation is expected to reveal the current status of information systems currently with an institute, the supporting technology and the infrastructure, indicate plans of a digital makeover, and goals and objectives instrumental in the (planned) transformation. We intend to carry out this study on academic institutes in India in order to appreciate the significance of the study context in an emerging economy.

2. Assessing institutional readiness for implementing digital enterprise architecture

We use the term digital enterprise architecture to extend the subject of enterprise architecture management for current digital transformation efforts. With an increasing focus on digital transformation, the benefits of EA continue to grow (Mouaad and Assar 2016). Consequently, the relevance of EA in academia is getting recognized (Sandkuhl and Lehmann 2017). However, there can be several issues impeding the establishment of EA. Not all EA initiatives are successful, and a report based on a survey carried out by Rotterdam University in 2008 indicates failure of 66% EA initiatives in organizations (Gosselt 2012). Lack of institutional readiness for change is one of the failure factors (Donaldson et al. 2015). An appreciation of readiness has not been taken into consideration leading to failure of the establishment itself (Desfray and Raymond 2014). Therefore, in order for EA to act as transformation mechanism, there is a need to plan for the change (Yu et al. 2012). For institutes to change there is a need to assess the readiness towards transformation.

Readiness assessment is necessary for the following reasons. First, readiness assessment has been acknowledged as a procedure for EA risk analysis to identify areas which may create problems during EA implementation (Dani 2015). An identification of the same can also prevent wastage of time and resources in places that lack the readiness (Dani 2015). Second, readiness assessment can indicate the possible alternatives to planning and to successfully implement the EA (Dani 2015; Gartner 2010; Winter and Fischer 2006). Certainly, it is essential for EA practitioners, organizations, and researchers to understand these factors towards establishing an EA for achieving the intended objectives. As such, this can provide further insights into successful establishment of EA to achieve the institutional objectives.

The existing literature does not cite much evidence of similar inquiries in the context of academic institutes. Jahaniet al. (2010) synthesizes some of the key factors into a model to assess the readiness of the organizations in implementing enterprise architecture. A couple of other studies relate to similar investigations in the context of public sectors in Malaysia (Hussein et al. 2017). This research inquiry proposes to explore the institutional readiness factors necessary for planning and implementation of digital enterprise architecture. These factors will be subsequently consolidated into an institutional readiness model for digital EA to facilitate achieving the desired outcome in the stated contexts.

3. Proposing a design of digital enterprise architecture for academic institutes

Excellence in information technology (IT) is both a driver and a key enabler of the digital transformation. Enterprise Architecture Management has established as a governance instrument (Ross et al. 2006) to consistently align both business and IT with strategy and goals, and to ensure adaptability, consistency, compliance, and efficiency.

Research endeavours related to EA design has focused on principles which are rules guiding architecture's design and evolution(Aier et al. 2011; Fischer et al. 2010; Winter and Aier 2011). EA principles are thus integral part of EA definition.Hoogervorst(2004) even equates architecture with principles and defines EA as a set of design principles. Even though the concept of EA principles has been defined as the essential element of EA design (Haki and Legner 2012), the number of publications on this subject is very limited(Haki and Legner 2012) in comparison to the extensive treatment given to the EA domain as a whole.

The current state of art research on digital transformation lacks an integral understanding of enterprise architecture and management(Laartz 2016). Furthermore, investigation into EA design issues in the context of academic institutions is also largely missing from the set of existing evidences. In the third research question, we intend to close this gap and present a design proposal of digital EA in the context of academic institutions. The result of this exploration is expected to contribute to an EA design framework and supporting ontology to facilitate academic institutions direct the resources towards achieving its digital transformation goals.

Proposed Methodology

The dissertation addresses three research inquiries identified above employing both qualitative and quantitative research methodologies. The inquiry into the first research issue follows the grounded theory methodology(Glaser and Strauss 1967), and will involve semi-structured interviews based on an interview guide with stakeholders related to the process (select members of academic committee, information technology committee members, etc). This may be supported by documentation reviews wherever permitted and appropriate. The design of the interview guide will be based on appreciation of digital transformation needs based on review of existing evidences, and the relevance of the same for academic institutions. A codebook will be developed to facilitate coding of the responses. In order to carry out the content analysis of the interviews, we propose to use the constant comparative method (Glaser and Strauss 1967). Data analysis will be inductive as we seek to understand the patterns from the interview content and related to the questions framed in the interview guide. The analysis will proceed in three stages involving open coding, axial coding, and selective coding⁴(Strauss and Corbin 1990)and is expected to delineate the digital transformation goals of Indian academic institutions.

Our exploration into the second research issue is informed by the contributions of Jahani et al.(2010). The authors present an EA readiness model for evaluating the current state of organization's readiness and facilitate attainment of the desirable state (factors and indexes) from the current state. The EA readiness model demonstrates an assessment of the organization's readiness in nine dimensions, each with an associated level of priority. The multi-level model will allow calculation of a composite score thereby demonstrating the extent of readiness of the organization in achieving the desired state.We adopt the EA readiness model as a starting basis for our exploration in the context of academic institutes. We will use the conceptualization of the stated factors of the model and re-interpret them in the context of entities representing an academic institute setting. Semi-structures interviews based on interview guide will be carried out with stakeholders having profiles similar to those shortlisted for the 1st research inquiry (discussed above). To analyze the interview content, we plan to apply the data analysis process by Yin (2015)which consists of familiarization, transcription, organization of data, coding the data, building the description and themes, and finally writing the report. To build the themes and code, we shall follow the framework analysis guideline recommended in Ritchie et al.(2013). This framework will allow the categories and themes to be set accordingly from the beginning of the research. During the coding process, any new themes that emerged may be added in the hierarchical tree of themes. The re-conceptualized dimensions of Jahani et al.(2010) will act as the starting categories in this case to group the interview responses during content analysis. The result of

⁴Open coding is the part of the analysis concerned with identifying, naming, categorizing and describing phenomena noted in the content.Axial coding is the process of combining related codes into categories based on inductive and deductive thinking. Finally, selective coding is the process of choosing one category to be the core category and relating all other categories to that category.

interview analysis will culminate into an institutional readiness model for digital EA. Subsequent validation of the model based on inputs from experts related to academia will facilitate consolidation of the structure (factors and indicators) of the resultant model.

In our exploration of the third research issue, we intend to present a design proposal of digital EA in the context of academic institutions. We shall follow the DSRIS (design science research in information systems) framework (Figure 1)(Kuechler and Vaishnavi 2012) in this specific exploration. Design science research involves the creation of new knowledge through design of novel or innovative artifact (things or processes) and analysis of the use and/or performance of such artifacts along with reflection and abstraction – to improve and understand the behaviour of aspects of information systems(Vaishnavi and Kuechler 2004). The DSRIS framework suggests an evolution and translation of design knowledge from general explanatory or predictive constructs to the design features of an IS/IT artifact. The explanatory or predictive knowledge may originate in kernel theories⁵ or in experience-based insights (evidence-based justification), but it always exists; to suggest otherwise is to imply design is a random process. The ISDTs and DREPTs (both acronyms expanded in the figure) are mid-range theories, conceptual intermediaries between the highly abstract space of potential problem solutions suggested by kernel theories or insights and the concrete problem solution of the implemented artifact. The arrows in the diagram represent logical progression – from highly abstract notions through their progressive concretization to the physical artifacts themselves.

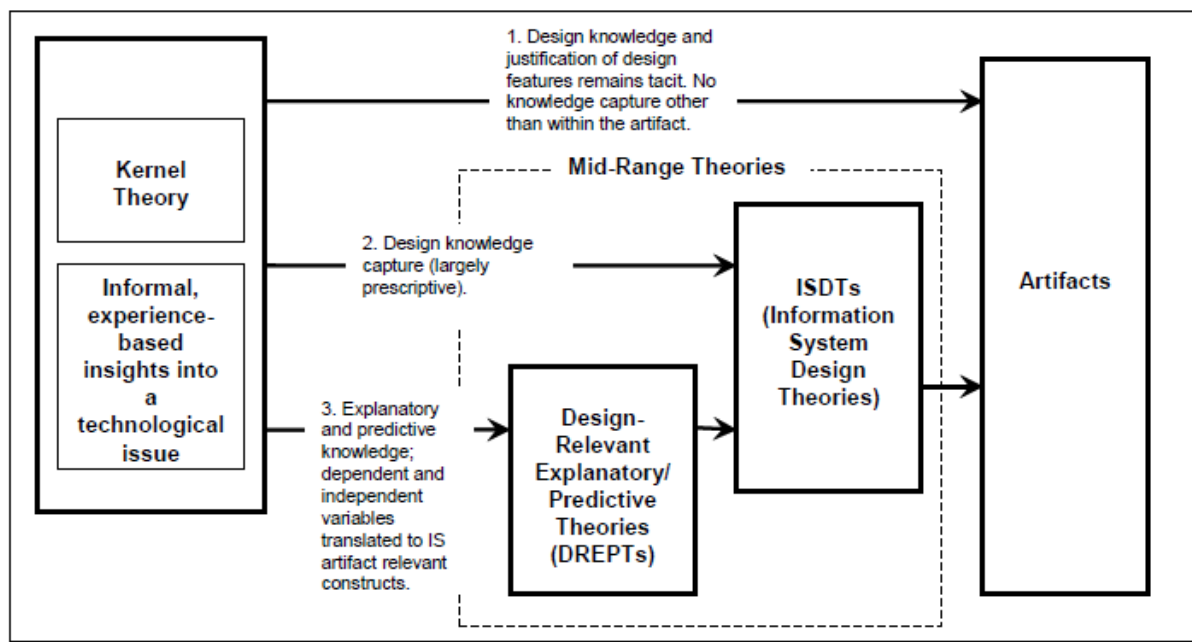


Figure 1. Design Science Research in IS Framework(Vaishnavi and Kuechler 2004)

We shall be carrying out a comprehensive review of EA domain based on the guideline provided by Webster and Watson (2002) to identify the extant EA design meta-requirements proposed in various contexts. This will constitute the design knowledge (Figure 1) for the intended exploration. The list of EA design meta-requirements will be consolidated based on the findings of the first two research issues (discussed above) to constitute the digital EA meta-requirements for academic institutions. These meta-requirements will be subsequently used to propose the digital EA principles and an abstraction in the form of a digital EA framework. Hence the intended contribution artifacts (Figure 1) of this research issue are a specification of design principles and framework of a digital EA design for academic institutions. Both of these artifacts will be subsequently validated based on discussions with domain experts, and supported by structural comparisons with existing systems.

⁵ Kernel theories are theories from natural or social sciences which govern design requirements (Walls et al. 1992).

Significance of Research

The proposed research issues contribute to both theory and practice. In terms of the theoretical contributions of the dissertation, first, the proposed search inquires facilitate formation of an appreciation of the possible role of digital transformation in academia. Of late there has been a lot of emphasis on digital transformation, and mostly in the business context. This research focuses on the academic institutions and plans to outline its digital transformation goals. Second, our assessment of enterprise architecture in academic institutions within India is itself a contribution to the body of knowledge and in absence of similar studies in the Indian context. Third, our proposed assessment of the readiness of academic institutions for implementing digital enterprise architecture culminates into an institutional readiness model as a novel contribution to academia. Fourth, we envisage to outline the design principles and framework of a digital enterprise architecture using the design science research methodology as a novel contribution to the domain.

There are several implications of our proposed research for practice too. First, our study will assist the academic stakeholders to appreciate the nature of the digital transformation goals for an academic institution and necessary expectations. This can have implications in the way resource allocation is done so that the stated goals may be realized by the concerned institutes. Second, the proposed contributions provide a basis to assess the prevailing enterprise architecture in institutions. The stakeholders responsible for overall administration and management of academic institutions, and technical support can use the proposed institutional readiness model to benchmark the present infrastructure and resource capabilities, and identify improvement dimensions. Third, our presentation of the digital enterprise architecture design may act as a technical blueprint to design similar architectures. Fourth, the proposed research inquires also likely to enrich classroom discussions on concerned topics. Learning from the research issues can be incorporated in suitable formats (e.g. cases, group project, etc.) in courses related to digital transformation, enterprise architecture, etc.

Current Progress Status and Completion Plan

I am currently working on consolidating the evidences to facilitate the first research issue. There are specific concerns pertaining to the proposed research inquiries and related to data access. There are no evidences of similar research in academia so the primary evidences are to be obtained from evidences in generic contexts. There is also a requirement of getting approvals from the key stakeholders in universities related to their participation in this research project. Hence clarity on these issues also is required at this stage. My thesis proposal seminar is due soon as per our university mandates. The data collection and subsequent analysis on the three research issues is each expected to take about six to eight months followed by the thesis documentation requirements. Hence I am expected to submit my dissertation by April, 2021.

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