Digital Transformation in Higher Education

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Abstract - Digital transformation is considered as one of the mega-trends in industry and the public sector. One of the sectors with potential for digital transformation is higher education in universities and university colleges. Many universities and schools developed digitization strategies and new kinds of offerings for their traditional target groups and for new, non-traditional target groups. However, digitization and digital strategies often are limited to digitizing the content of lectures and to opening access to education modules by offering them online. We argue that digitization strategies should include a wider focus and propose that enterprise architecture management could provide an important contribution in structuring digitization efforts and that enterprise or knowledge portals could play a role for implementing the strategies. Keywords: Digital transformation, higher education, enterprise architecture, portal.

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I. INTRODUCTION

Digital transformation is considered as one of the mega-trends in industry and the public sector. In general, digital transformation describes the shift from traditional (often physical) creation and delivery of customer value, including the operational procedures related to this, into the massive use of digital technologies which enhance or replace the traditional product or services with digitized ones. According to a white paper of the World Economic Forum [WEF16] digital transformation offers a huge potential of innovation in the magnitude of several trillion US$ and addresses industries (e.g. logistics, healthcare, automotive) and public sector applications (e.g. healthcare, government). One of the sectors with potential for digital transformation is higher education in university and university colleges. Many universities and schools developed digitization strategies and new kinds of offerings for their traditional target groups and for new, non-traditional target groups. However, digitization and digital strategies often are limited to digitizing the content of lectures and to opening access to education modules by offering them online. We argue that digitization strategies should include a wider focus and propose that enterprise architecture management could provide an important contribution in structuring digitization efforts and that enterprise or knowledge portals could play a role for implementing the strategies concerning educational services.

II. ENTERPRISE ARCHITECTURE MANAGEMENT

In general, an EA captures and structures all relevant components for describing an enterprise, including the processes used for development of the EA as such [Ah12]. Research activities in EAM are manifold. The literature analysis included in [WK15] shows that elements of EAM [Bu10], process and principles [Jo04], and implementation drivers and strategies [Sa15] are among the frequently researched subjects. Furthermore there is work on architecture analysis [Jo07], decision making based on architectures [Jo04 and IT governance [Si10]. However, there is no specific focus on the integration of product-IT and EAM. Of specific relevance for digital transformation are EAM frameworks identifying structures and dependencies in EA. In this context, TOGAF [TOG11] is considered by many researchers as industry standard and defines three different architectural levels which are visible in many other frameworks: The Business Architecture defines the business strategy, governance, organization and key business processes. The Information Architecture is divided into two sub-layers: Data Architecture and Application Architecture. The Data Architecture describes the structure of an organization's logical and physical data

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assets and data management resources. Its objective is to define the major types of data, necessary to support the business. Data Architecture is also called Information Architecture. The Application Architecture provides a blueprint for the individual application systems to be deployed, for their interactions and their relationships to the core business processes of an organization. The Technology Architecture describes the physical realization of an architectural solution.

III. DIGITAL TRANSFORMATION IN HIGHER EDUCATION

Our approach to analyse possible digital transformation paths in higher education is based on a general digital transformation model which is presented in section 3.1. Section 3.2 applies this general model and elaborates selected general digital transformation paths in higher education. Section 3.3 investigates which enterprise architecture layers are affected by the different approaches in order to identify tasks to be tackled in enterprise architecture management. 3.1 Digital Transformation In many industrial domains, products and services traditionally are delivered based on physical infrastructures (e.g. shops, bank offices, service centres) or persons (e.g. sales agent, broker). Often, also the products are physical ones and the operational processes 52 Kurt Sandkuhl and Holger Lehmann are using physical support. Customers in many of these domains increasingly expect that apps, mobile services or services accompanying the products offer additional value for them, i.e. the providers of products or services have to decide how to improve the overall customer experience or their products. In this context, digital transformation describes the shift from traditional (often physical) creation and delivery of customer value, including the operational procedures related to this, into the use of digital technologies with the aim to enhance or replace the traditional product or services with digitized ones. In order to further investigate the digital transformation, we used a structural approach for analyzing digitization paths proposed in [BB11]. This approach considers two dimensions of potential digitization, the digitization of the product offered by a company and the digitization of the operational procedures for offering these products. In both dimensions, three steps are distinguished (see figure 1 a). In the product dimension, these steps are to enhance (add

Digital Transformation Paths in Higher Education

Assuming that the overall objective of digital transformation in higher education is to achieve a redefinition of education services and accompanying re-development of operational processes, there are at least three different possible paths which have to be considered: •Service-first transformation focusing on a change and redefinition of services before addressing major improvements and changes in operations. • Operation-first transformation aiming at new and improved digital internal processes as a basis for later redefinition of services. • Service – operation combination attempting an integrated transformation of both aspects. Operation-first would basically require a digitization of all value creation and most supporting services. Value creation in higher education is everything related to the education process of students from admission, registration for programs and courses, examination in courses, the development of programs and their quality assurance, etc. Supporting services include facility management, study planning, scheduling, teacher allocation and much more. All in all this basically requires an integrated campus management functionality including support for mobile workers and for knowledge management. Service-first would have to focus on creating new education products and transforming existing products into digital ones. One aspect of this activity is opening established education programmes for access from outside the higher education institution on national and international level. This is usually connected to making the content of the education digital and to also providing digital means for student – teacher and student – student interaction and collaboration. Internationalization also requires adaptations regarding the applied language. Furthermore, most traditional education programmes need to be decomposed into a smaller level of granularity, e.g. instead of three year study programmes into shorter certificate courses and instead of 6 ECTS teaching modules into smaller but combinable modules. Such decomposition would support to offer them for a wider target group and

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increase flexibility. Service and operation combination would be a systematic inter-relation of both approaches presented before. This could, for example, be a new study format for a new target group of the university in combination with digitization of the operational processes related to the new study format and target group. Many of such combination paths result from pilot project for implementing digitization of higher education.

The concept of enterprise architectures in general and the TOGAF as a standard in the field were briefly introduced in section

In this section, we structure our discussion about the effects of different digital transformation paths (as presented in section 3) on the organization by considering the different enterprise architecture layers according to TOGAF. As a means to illustrate our view, we use an excerpt of the enterprise architecture of Rostock University. This excerpt originates from earlier work in published in a capability management project [Pi13], campus management and an elearning project [Sa15]. The current situation of the enterprise architecture at Rostock University can be summarized as follows: • Business architecture: established catalogue of administrative services for internal research and teaching, human resource management, facility and other supporting services. Coverage of all student lifecycle phases in business processes (from application to issuing exit certificates). Bachelor, Master, and PhD program development and delivery at the facilities of Rostock University. • Application architecture: various information systems providing support for certain functionalities in administrative and supporting services. Partly integrated systems for managing student lifecycle and for planning and operating study programmes. Learning management and training software modules. Multitude of specialized application for specific faculties of the university. Various literature databases and library systems. • Data architecture: no enterprise-wide data model but functionally integrated data models and exchange possibilities (e.g. for student lifecycle management, for administrative purposes, for facility planning, etc.). Teaching content captured digitally but often not integrated with administrative data. • Technology architecture: central IT-infrastructure for the university with additional decentral environments for some faculties and research units.

IV. REFERENCE

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