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A Process Model For Managing Business Applications In The Digital Transformation

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Abstract

The digital transformation brings up various new tasks to manage new business application software and integrate them into existing business processes and legacy systems, which are necessary to keep e.g. a production system running. Today, all these tasks are on the one hand not clearly defined and on the other hand, responsibility of these cross-disciplinary tasks is unclear in companies being mostly structured in a function-oriented way. While quality management has developed to a firmly established function of process excellence years ago, IT-application management is still to become an inevitable part of the digital transformation. There are just a few authors trying to define and describe this part, the related tasks, and necessary roles in an organization. In this paper, we show how the business needs of a company can influence the ideal adaptation of the digitization solutions and thus become the success of the digital transformation. We base the paper on a use case in manufacturing companies. We then describe how companies deal with business application systems today. Based on the framework Aachen Digital Architecture Management we describe how a company can holistically improve the management of business application systems.

Keywords

Business Applications; Digital Transformation; Digital Architecture Management; Process Management

1. Introduction

Digital transformation affects all companies in all industries and describes the influence of digital technologies on the change of value creation of companies [1]. The SARS-CoV-2 pandemic showed that processes can change in a flash when external influences exert so much pressure to change [2]. Manufacturing companies have not only felt this pressure since the pandemic; transformation was also important beforehand in order to remain competitive [3]. As early as 2016, many companies began to stimulate this change by introducing Chief Digital Officers (CDOs). This new role was expected to drive digital transformation from within the management board and drive it with commitment. To be sure, a CDO was capable of partially prototyping smart products and digital services and sometimes even launching them on the market. However, the CDO was only able to steer a complete digital transformation in exceptional strategic cases. The challenge lies in the fact that a CDO cannot control IT. This is because an IT manager is often assigned to a Chief Financial Officer (CFO). So, unlike digitalization, IT is not represented on the board. The obvious solution would be to appoint a Chief Information Officer (CIO) to the board. But this variant has not regularly led to the goal in the past either. Research and industry must understand that IT is more than just an IT topic [4]. Every company needs IT capabilities to run processes robustly and to test prototypes in different infrastructures. IT continues to be an enabler for innovation and efficiency. However, this should not be confused with the IT department. One of the most important digitization projects is the

use of business applications such as Enterprise Resource Systems (ERP) systems not only for planning processes but also order tracking and tracing. Such systems are an inherent part of process execution so that there cannot be digital transformation without including an ERP system.

In this paper, we show how the business needs of a company can influence the ideal adaptation of the digitization solutions and thus become successful in digital transformation. We implement this introducing the use case management of business application systems in manufacturing companies. We first describe the initial situation in many manufacturing companies and the current handling of business application systems as well as the resulting challenge. Then, we present what support companies lack today based on frameworks that support the design of the architecture and, on the other hand, the IT capabilities of a company. We then introduce Aachen Digital Architecture Management as a structuring framework for digital transformation. Finally, we describe how a company can improve the management of business application systems holistic.

2. State of the art

2.1 The way manufacturing companies deal with business application software

Based on more than 100 projects on the topic of ERP system selection over the last 10 years, we have found that companies often only react instead of acting. Based on this empirical data, we have found that business application systems are replaced by new systems in regular cycles of 10 to 15 years. In most cases, this is because the performance of a system no longer meets the needs of a company. We consciously take into account that both the requirements and the performance of a system can vary. Exemplary for the external pressure of change induced by the pandemic is that a more tasks must be completed remotely, especially in administrative areas. Therefore, the system must be capable of allowing remote work. Technically, this can be solved in many ways. For example, through VPN access or a cloud application. The fact is that a company is constantly changing. Customers, partners and suppliers all have an influence. Companies follow the same process again and again: Unmet requirements create pressure on an existing system. Ultimately, they lead to the decision of implementing a totally new system. But even during the implementation phase of the new system, requirements have evolved again. However, they regularly do not influence the new system after initial completion of requirements engineering. This is exactly what happens afterwards in the next multi-year cycle based on our empirical data, see Figure 1. The benefit of a system is therefore only high in the short term and then constantly decreases over time.

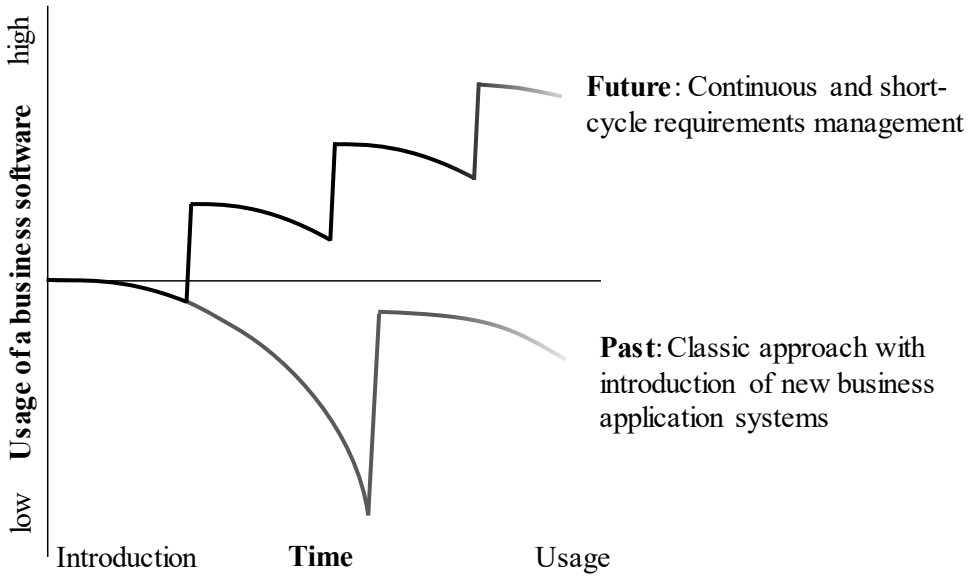

Figure 1: Managing business application systems in the digital transformation era

From this, the need for research can be derived that companies must learn that requirements must have an influence on the adaptation of systems. In companies, there is a strict separation between the procurement, implementation, maintenance and use of a business application system. Companies lack processual and organizational mechanisms for allowing requirements from the usage phase to flow into the further development of the system [3].

2.2 Existing frameworks of enterprise architecture and IT management

In this chapter we describe existing frameworks of EA and IT management and, by consolidating of IT capabilities and processes, show that there are only three relevant tasks to properly manage business application systems.

In general, the ITIL framework describes best practices in managing services [5]. The IT Infrastructure Library (ITIL) aims to form the optimal support of the business processes for the customers of an IT service provider with the help of information technology [6]. IT services are provided that add value for customers and fulfill both the utility (fit for purpose) and warranty (fit for use) characteristics. The core contents of the ITIL framework are the description of processes, functions, possible organizational structures and supplementary methods for implementation. This enables the IT service provider to achieve the stated goals. In order to map the entire life cycle of IT services, the necessary processes and functions are structured in 5 life cycle phases. [7] Companies of large and medium size use ITIL to improve the quality of services [5]. Next to numerous benefits that ITIL offers, some challenges can also be noted. For one, the documentation applications in ITIL are not mature. Likewise, only rough recommendations are given as to which processes should actually be implemented, so that no clear decision support is provided. [6] Other criticisms include the varying levels of detail in process descriptions, inconsistencies and contradictions between processes, barely applicable definitions of key performance indicators, and a lack of processes and procedures for managing processes and projects [7].

The Zachman Framework is a descriptive and holistic representation of an enterprise to gain insight into business processes [8]. The Zachman Framework is suitable for complex systems and incorporates numerous perspectives. These include the Executive (setting the agenda), the Business Management (who runs the organization), the Architecture (who identifies building blocks), the Engineer (who designs the building blocks), the Technician (who implements the database or workflow system), and the Enterprise (physical enterprise offices) as audience perspectives. [9] In the Zachman framework, engineered objects are defined according to the interrogatives *What? How? Where? Who? When?* and *Why?* in combination with the audience perspective [10]. Thus, the Zachman Framework can be described as an enterprise ontology, which has no tooling or process implication [8, 11].

COBIT is based on more than 40 detailed international IT standards, frameworks, guidelines and best practices. COBIT is located at the strategic level and integrates different standards and their regulatory objectives into a common framework. It establishes a link between corporate objectives and IT objectives at the core business and, to this end, provides metrics and maturity models to measure the achievement of objectives. COBIT is process-oriented, with 34 processes and four domains. [12] COBIT defines the domains as Planning and Organization, Acquisition and Implementation, Delivery, and Support and Monitoring [13]. In terms of content, COBIT covers the objectives of IT controls and measures that are intended to ensure the security of information in the company. For this purpose, criteria such as effectiveness, efficiency, confidentiality, integrity, availability, compliance, and reliability are applied to corporate information. [12]

TOGAF is a framework as well as a detailed methodology and provides various supporting tools for developing an enterprise architecture [14]. The standard is developed and maintained by The Open Group, an industry consortium. The framework assists in the acceptance, production, use, and maintenance of enterprise architecture. It is based on iterative process models supported by best practices and real-world

sets of architectural assets [15]. The core content of TOGAF is the Architecture Development Method (ADM), which is used to develop architectures. This method includes creating the architecture framework, developing architecture content, transitioning, and governing the realization of architectures. The ADM is complemented by the Architecture Content Framework (ACF), which is structured according to the content of the metamodel. The metamodel provides single insights into the domains of TOGAF. Where TOGAF consists of the Business, Data, Application, and Technology Architecture domains [16].

All the previously described frameworks contain many processes that are described in detail. While ITIL is very specific in terms of IT processes, the Zachman framework is very generic for the design of a company‘s architecture. All frameworks provide insufficient support for companies to continuously adapt business applications in the utilization phase. We have condensed the IT Capabilities anchored in processes to three essential ones. We show the results of the entire analysis in Figure 2 and describe them below.

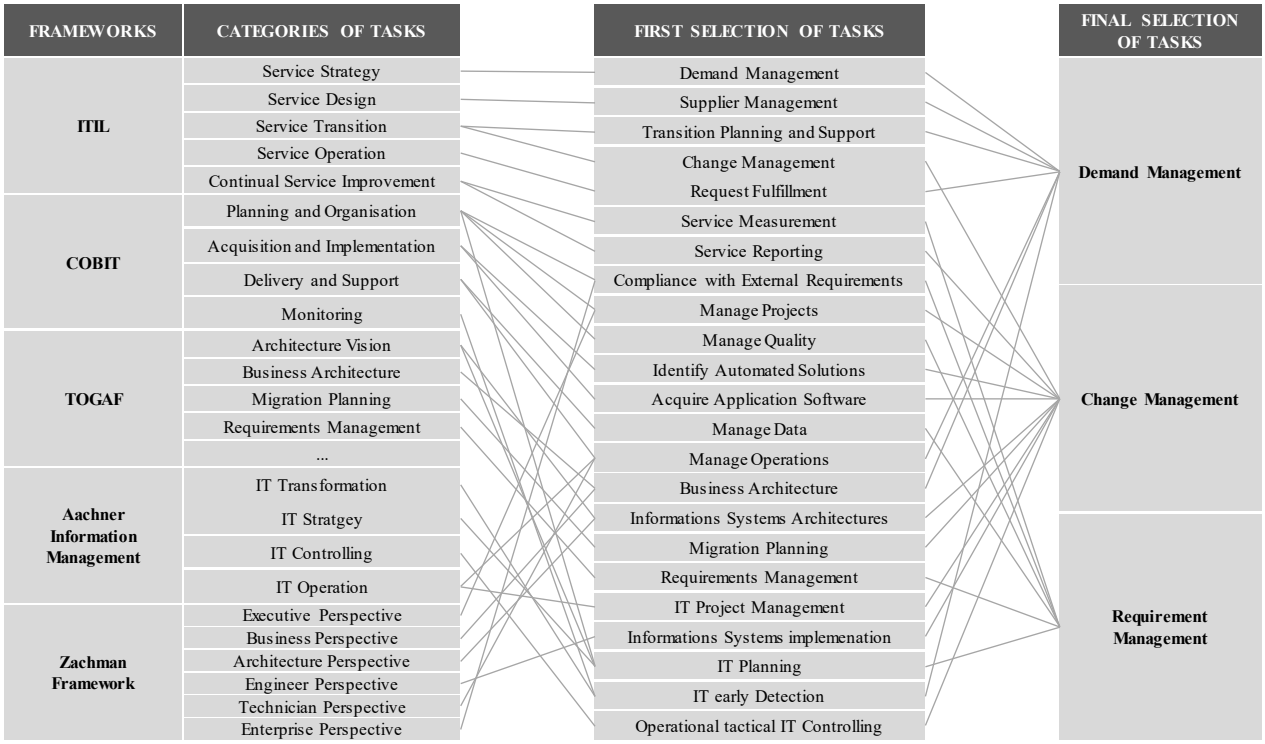

Figure 2: Consolidation of IT capabilities and processes

In the general context of production, demand management is the supply chain management process that balances the customer requirements with the capabilities of the supply chain [17]. In the context of this paper, demand management is understood as the identification of the need for digital solutions e.g., a new business application. The goal is the planning of an optimal range of digital solutions [7].

The goal of requirement management is a common understanding between the business and the IT department about the function to be supported and the framework conditions of the information structure as well as the joint evaluation of the requirements. This results in specific and systematically prioritized requirements that influences adoptions of existing digital solutions [18]. These comprise all the requests that are necessary to fulfil the objectives [14].

The aim of change management is to achieve the optimal design of the path from the starting point to the target point. The goal is thus to implement the optimal adaptation derived in the context of strategic management [19]. In the digital transformation context, change management encompasses the planning, release, coordination and acceptance of changes and additions to digital solutions e.g., business applications.

This is to ensure a clearly structured and controlled implementation of changes to digital solutions and the application landscape [7].

First, we showed that none of the existing frameworks cover the requirements of the digital transformation of a manufacturing company. Second, we described that there are only three relevant tasks to properly manage business application systems and that there is no need for a manufacturing company to dive deep existing and complex frameworks. However, there is a need for an overarching and strategic view of the management of business applications in the age of digital transformation, which we have already noted in the introduction. Therefore, we introduce the Aachen Digital Architecture Management (ADAM) in the following chapter.

3. Introduction of Aachen Digital Architecture Management

The Aachen Digital Architecture Management provides a framework that addresses the weaknesses of existing reference architectures while incorporating their strengths [3]. As a holistic model specifically developed for use by companies, ADAM structures the digital transformation journey of businesses in the areas of digital infrastructure and business development based on customer requirements. Companies are systematically empowered to drive forward the design of their digital architecture under consideration of various fields of action. Those responsible for digital transformation, from the top management team through to the operational innovation drivers in the specialist departments, need a systematic, structured approach that integrates the various digital transformation activities into a dynamic, scalable overall picture [3]. In this paper, ADAM represents the necessary foundation to introduce our model to manage business applications.

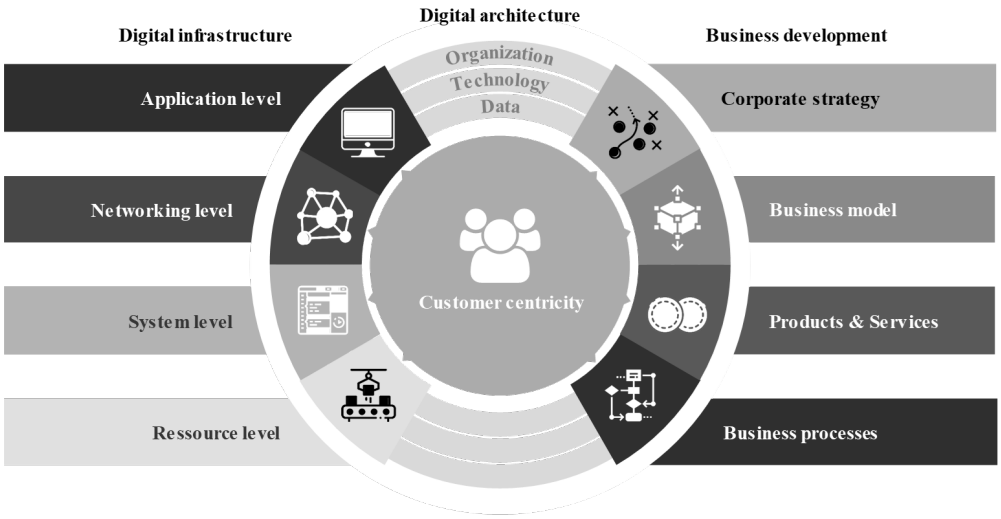

Figure 3: Aachen Digital Architecture Management

The Aachen Digital Architecture Management (Figure 3), considers two areas, digital infrastructure, which is subdivided into four design levels, and business development, which is subdivided into four development levels. The design and conceptualization of these levels, which is based on an analysis of internal and external customer requirements, provides the basis for building the digital architecture. The conceptualization of the four design levels of the digital infrastructure is based on frameworks established in research and practice for the description of interconnected companies, systems, and products. The design of the digital infrastructure enables a company to develop its business with the support of technology [3].

Customer: ADAM's focus is on the customer, whose needs and requirements are essential for the design of the digital architecture. It makes no difference whether it is an internal customer or a customer for physical or digital goods and services. Not only does the digital infrastructure have to be aligned with the specific business transformation fields, but also has to consider the requirements of customers who are to reap the

benefits it provides. Corporate executives must take internal and external interest groups into account in all important decisions [3].

Digital Infrastructure: The structure and content of the digital infrastructure are defined on the basis of four design levels. The application level, refers to all user-centric applications that allow a user to use the corporate resource "information" in a simple and intuitive way as part of their value-creating activities. Due to rapidly changing circumstances, enterprise dashboards are subject to constant change. In order for these dashboards to be valid at all times and to be used effectively in managing the company, they require agile and flexible adaptability. The networking level enables a company to create interdependent, loose couplings of application and other data-providing systems. It ensures the availability of all relevant data and orchestrates the distribution of data between the different levels. Technologically essential components include IoT platforms and suitable communication technologies. Data virtualization is the key enabler, ensuring the user- and developer-friendly provision of data in the long term. The systems level contains static, slowly changing operational core systems e.g. ERP systems that form the information technology backbone of a company and manage and support central value-added processes. In addition to operational core systems, the systems level also contains other, unique data storage solutions, such as databases on the shop floor. Further, the systems level contains the business logic of a company. The resource level is comprised of production and production-related machines, equipment and other physical assets, employees, including their skills and competencies, intelligent products in the field, and software and hardware infrastructure for IT operations [3].

Business Development: The structure and content of business development are defined based on four development levels. Business development represents business activities in the well-known understanding of Business-IT alignment. The corporate strategy development level for business development determines the way in which the value of the company is increased in the long term. Based on clear corporate objectives, such as achieving a strategic position for success in the market, the company’s corporate strategy, digitalization strategy, and IT strategy are formulated in a coordinated, integrated manner. The business models development level determines how companies act on the market to implement their corporate strategy. In all sectors, there is a particular focus on digital business models which make it possible for companies to successfully exploit the potential of digital transformation and open up new business segments. The Products & Services development level deals with the actual design of the value creation process to achieve real competitive advantage. The basis for this are service systems consisting of intelligent, interconnected products, smart services, and digital components. The business processes development level is concerned with the efficient design of business processes both internally within the company and with external process participants. For example, existing business processes must be optimized, designed end-to-end, and digitalized in order to scale digital transformation projects in the company [3].

Three architectural views provide analytical perspectives on the design levels: The organizational view, the technology view, and the data view offer a comprehensive picture of the four design levels of the digital infrastructure. The exhaustive analysis provided by the three views facilitates a comprehensive design of the digital infrastructure.

The organizational view provides the framework for the design of the digital architecture. From a conceptual point of view, the focus is on the development of a suitable management and control system and of the structural and process organization. The organizational view describes how staff interact with each other, with corporate systems, and with digital solutions. The organizational view also defines rights of use, responsibilities, and organizational affiliations. The technology view is characterized, in particular, by the selection of suitable technologies at the four design levels and their integration. Concept development places particular emphasis on deriving the required technologies from the organizational framework conditions, such as existing competencies. Technologies to be implemented include information and communication technologies, e.g. hardware, the operating environment, or the technical implementation of interfaces.

Requirements from the specialist areas and from business development, in particular, serve as input for the activities of the technology view. With the help of models across the different design levels, the data view offers a uniform perspective on the company's data. It describes the data structure, its components, and their interrelationships across the design levels. This ensures that the data and information required at the application level is available in sufficient quality and granularity and in the right structure. To this end, in the concept phase, a comprehensive information requirements analysis must be performed and specific data models down to the resource level must be developed. The data perspective deploys various tools to differentiate between terms like data and information and ensures the standardization of the data used in the company.

ADAM provides a framework for the most important elements in digital transformation. It serves as a framework for breaking down various issues into their components and structuring them. In the following chapter, we show how ADAM can be used to support the management of business application systems.

4. Process model of managing business applications within ADAM

In this chapter we describe how the ADAM framework can support the management of business application systems by embedding the three relevant tasks (Section 2.2) in ADAM.

ADAM first shows which elements are important in the digital transformation. Now we narrow down the consideration of our previously described use case to the system level (Figure 4, left-hand side) and the business development level (Figure 4, right-hand side). In order to deal adequately with business needs, a funnel is required that makes them recognizable in the organization. At this point, we emphasize that business needs represent internal needs on the one hand, but can also be driven by customer feedback and customer requirements.

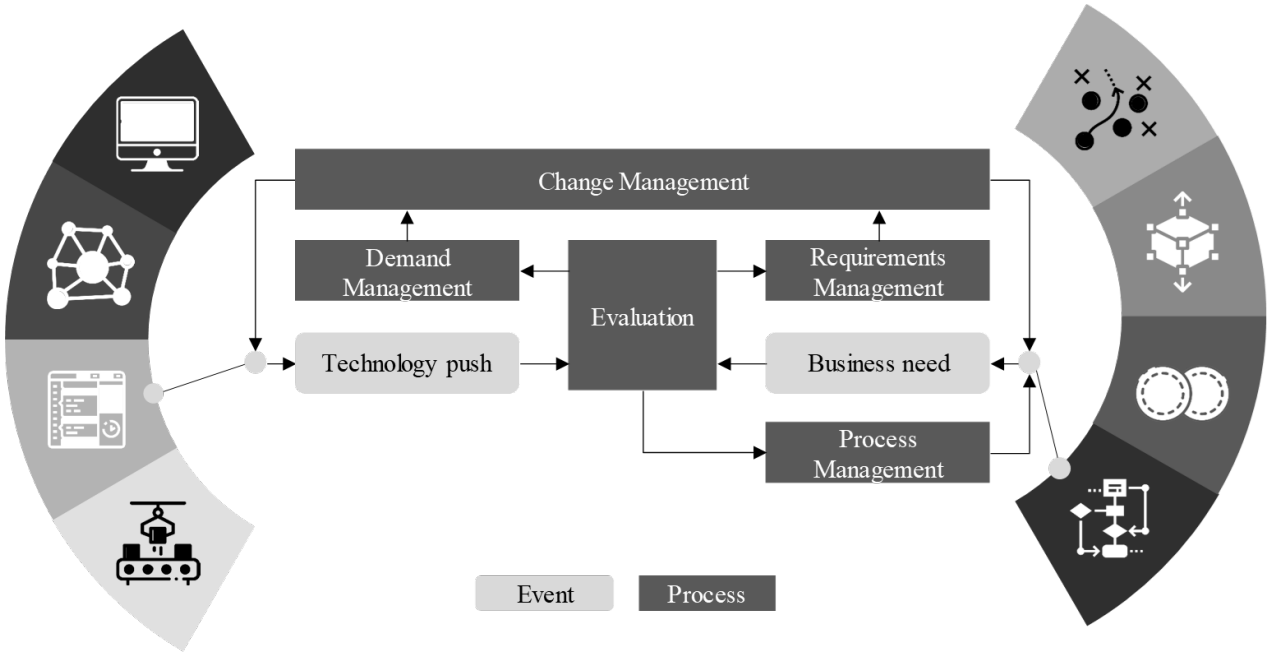

Figure 4: Process model for managing business applications within ADAM

We start by using an event as the input variable to the model. This is either a business need or a technology push. First, once a business need is communicated, it is evaluated by the "evaluation" committee. This committee comprises all relevant stakeholders of a company. There must be at least one representative from each design level and each business development level assigned to ADAM. This ensures that the interests of the entire company are taken into account. However, not only can business needs be communicated, but new

technologies can also be introduced. We call this a technology push, and it means that a new technology is presented to the committee in order to serve as a source of ideas for all those involved. Business needs and technology pushes are regularly discussed in the "evaluation" committee. The committee jointly determines how to deal with the respective input. Three different follow-up processes can be initiated as a result of a committee decision.

First, the committee may conclude that the subject of discussion can be implemented with a simple process adjustment via the process management team. We hereby take up the aspect that not every problem has to be compensated with a technological solution. Process solutions can often be found to be even more effective because they address the root cause of a problem. The process management team receives all relevant information and gets in contact with the counterparts in the company who have reported a business need. Implementation is then initiated and carried out by the process management team in close exchange with the counterparts. If these process adaptions result in a new business need and potential IT demand, the team is encouraged to formulate a new request.

Second, the committee may conclude that the subject of discussion is a simple or complex adaptation of existing business application systems. Regardless of the difficulty and effort of the adaptation, the subject of discussion is passed on to “requirements management”. This works on a solution in accordance with ITIL, COBIT, etc. However, in direct exchange with the committee and the counterparts in the company who have reported the need. The committee also has the task of monitoring the status of an adaptation, whether there are challenges and how satisfied the counterparts are with the progress of the solution. The "evaluation" committee ensures that requests are not simply handed over without comment and either processed somehow or not at all.

Third, the committee may conclude that the subject of discussion is something completely new and unknown. A solution component that does not yet exist in the organization. In this case, the committee helps to hand over the discussion item to “demand management”. This works in accordance with ITIL, COBIT etc. on a solution procurement. However, in this case, too, in direct exchange with the counterparts in the company and the committee. The committee takes into account the fact that there are no existing solution modules in the company when making the decision. In this way, the committee prevents an ineffective accumulation of solution modules.

Finally, the results are continuously discussed with the “change management”. The “change management” has the task of ensuring that, on the one hand, partial solutions are fed back into the organization at an early stage. On the other hand, it must be ensured that the results of “demand and requirements management” are actually accepted by the organization. “Change Management” also evaluates the impact of the results. The entire model thus helps to ensure that the benefits of existing solutions are continuously improved. However, blind spots in the organization are also equipped with digital solutions.

5. Summary and Outlook

In this paper, we have shown how manufacturing companies can improve the management of their business applications by considering process, requirements and demand management in a structured manner. In doing so, we first used the results and findings of many software selection projects to illustrate what many companies regularly fail at. Particularly noteworthy is that due to a lack of communication and transparency, many solutions are introduced twice or are not available to all employees in an organization. Furthermore, we analysed the most common frameworks for enterprise architecture management and IT management. We found that all frameworks contain interesting components but are not effective in their entirety. Both analyses led to the research gap that there are no supporting models for enterprises. We then introduced the Aachen Digital Architecture Management framework. It sets out how the different components of digital transformation can be structured. The model served us to show the connection between technology and

organization. Finally, we described the model to better manage business applications as well as new solutions. The core component is the "evaluation" committee, which helps to ensure that many relevant stakeholders on the side of the design levels and the business development levels jointly decide on important issues. In the future, this model will be used to develop a role model for the “evaluation” committee. This will identify the key digital capabilities in line with ADAM. It will provide companies with even more concrete support in driving forward the digital transformation effectively and transparently. Beside that, we use ADAM in strategic workshops with executives of manufacturing company to structure digital transformation topics and to show its practical applicability and relevance.

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Biography

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