

Industry-oriented Digital Transformation in Universities to Facilitate Knowledge Transfer

Claudia Doering^a and Holger Timinger^b

Institute for Data and Process Science, University of Applied Sciences, Landshut, Germany

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Abstract: The industry faces nowadays major challenges in creating new and innovative business models. Especially small and medium-sized enterprises (SMEs) lack own research departments and qualified personnel for new technologies and business models. Simultaneously, SMEs are often unsure, if their needs are understood and addressed by universities and hesitate to contact them. Actually, many universities do have very relevant technologies for such companies and strive for an increase in joint research and transfer activities. However, universities must change and simplify their inner structures in order to accomplish a structural embodiment of transfer and become more customer-oriented and quicker.


1 INTRODUCTION

The last decades have been characterized by a strong shift in the way of how universities interact with their environment. Besides their mission to teach and to conduct research, a third mission is gaining importance: knowledge transfer (Roessler et al. 2015). This transfer is described in multiple theoretical frameworks, like the concept of “entrepreneurial universities” (Clark 1998), the “Triple Helix” (Etzkowitz and Leydesdorff 2000), “Mode 2” (Gibbons et al. 1994) or the “Quintuple Helix” (Carayannis and Campbell 2012). All of these concepts comprise the idea that research, which is conducted within universities, should be communicated and transferred to the society and the economy. In this way, universities are no longer seen as “ivory towers” in which research is cut off from the rest of the society, but rather as institutions with a distinctive knowledge transfer (Doering and Seel 2019). Knowledge transfer has to be related to the transfer of tacit knowledge, which is an important function of universities (Ritesh Chugh, Santoso Wibowo and Srimannarayana Grandhi 2015). Tacit knowledge was first described by Polanyi (1958), but nowadays this concept is of fundamental importance

for multiple knowledge management approaches (Firestone and McElroy 2003). Tacit knowledge cannot be codified, is generally implicit in its nature and difficult to access (Busch 2008).

The mission to transfer expertise out of the universities into to society relates mostly to a pronounced knowledge transfer. The transfer of knowledge has traditionally been defined as an interface between science and economy (Froese 2014). Nowadays, it can be seen as all forms of communication between an expert (sender) and a layperson (receiver), whereby the transfer partners can be individuals or collectives (Pircher 2014; Thiel 2002). Various definitions of knowledge transfer constitute it as a synonym to the third mission of universities (Henke et al. 2017; Noelting et al. 2018). Currently, this third mission as knowledge transfer between universities and the society is gaining increasingly relevance due to the ongoing digitalization of all areas of life. Digital transformation has been an issue to many publications and research as it has become a major research and engineering challenge worldwide (Wolan 2013). Nevertheless, the economy is experiencing a continuing pressure to act because of the digitalization and strong technological developments of mainly all business sectors. The speed of

^a  <https://orcid.org/0000-0002-3727-8773>

^b  <https://orcid.org/0000-0001-7992-0392>

technological change and an increasing international competition requires also smaller or medium-sized enterprises (SMEs) to engage in digitalization. Especially these companies face the challenge to develop new business models and/or products, as they often lack own research and development departments. Unfortunately, SMEs often hesitate to contact universities, because of their preconceptions that universities do not take their needs seriously or do not have solutions, which are applicable for SMEs. They typically need quick answers to urgent challenges, which can be implemented with very limited resources.

Universities have understood this need and are now engaging even more in knowledge transfer activities than prior to the digital transformation. However, transfer has to be seen as a bidirectional process, as also universities have to understand the issues and needs of the companies and therefore can also learn from the digital transformation of the economy and the society.

Universities often have a deep understanding of the processes of digitalization due to their experts and research activities. Simultaneously, their own inner structure still lacks digital work processes. Internal work processes within universities are often only modelled roughly to define and not to digitize work procedures. The need for digitalization of universities therefore arises not only from the constraint to conduct third mission activities and the demand from companies to engage in a deeper knowledge transfer, but also from the need to digitize their inner work procedures.

Digitization can be defined as the transfer of analogous extends to discrete (digital) values, in order to safe or process this data electronically (Löbbecke 2006). Digitalization goes even further and can be describes as the use of digital technologies which can even change a business model. Therefore, it can be seen as the process of moving to a digital business (Bloomberg 2018). Recently also concepts of a "Digital Revolution" or "Digital Transformation" arise, which describe the process of change in society and economy caused by digitalization (Schallmo et al. 2018). There are multiple benefits of digitalization, which not only apply to companies, but are also relevant to universities. Digitalization requires the extraction of tacit individual, interpersonal or organizational knowledge from universities to support external partners in the digitalization activities. Therefore, the universities themselves have to conduct a digital transformation within their own organization. This article distinguishes between the *digital transfer product* and the *digital transfer*

process of universities, which is needed to facilitate collaboration between them and external partners. Although the *digital transfer product* (e.g. the support of universities for society/economy in digitalization) is of great importance, this article focuses on the *digital transfer process* of universities.

Therefore, a framework for digital transformation within universities will be proposed to enable these institutions to engage in knowledge transfer activities with external partners, who face digitalization challenges on their own.

Therefore, the following research questions arise:

RQ1. What are the needs for digitalization of knowledge transfer as part of the third mission of universities?

RQ2. How can the process of digitalization in universities be presented in a structured framework to facilitate knowledge transfer?

The goal is to propose a systematic process for digitalization at universities in order to qualitatively and quantitatively increase knowledge transfer with the economy and society.

This article is divided in the following sections: at first, the relevant research methodology is outlined. RQ1 is then answered in the following section *Reasons for Digitalization in Universities*. The next sections covers RQ2 and demonstrates the process of digitalization in universities in a structured framework. An overview of the evaluation of the results and an outlook completes this contribution.

2 METHODS

A research methodology is determined by the chosen research questions and the research aim. As the research questions of this article aim to create new methods and artefacts, the research methodology follows the design science research paradigm by HEVNER et al. (2010). To ensure that the proposed process for digitalization at universities displays the reality adequately, expert interviews were conducted (Meuser and Nagel 2009). The experts were chosen because of their responsibility and experience in knowledge transfer projects. To follow the guidelines of Design Science, the iterative search process will be ensured through the comparison of deductive and inductive research findings (Hevner and Chatterjee 2010). The purpose of this article is to present the research findings and to communicate them in this way to the target audience.

3 NEEDS FOR DIGITALIZATION IN UNIVERSITIES

Digitalization at universities addresses mainly the internal processes and structures within these institutions. As mentioned above, the impulse for digitalization arrives both from the inside of universities, but also from the outside (economy/society). To adequately assess this situation, the external and internal needs for digitalization are shown in table 1. The list was created as a result of expert interviews and research within the project TRIO (Transfer and Innovation East-Bavaria), without making claims in being complete. The interviews were conducted in this cross-university initiative of six universities in Germany (TRIO). These universities have initiated a joint alliance in January 2018. All chosen experts are employees in technology and knowledge transfer offices, research funding departments, finance and legal departments. The experts were chosen due to their responsibility and experience in knowledge transfer projects and their possession of privileged information (Meuser and Nagel 2009). The interviews were conducted in a partly structured manner, to allow for a generation of interpretive knowledge (Przyborski and Wohlrab-Sahr 2014). In total 8 expert interviews were conducted with a length of 40min each. The expert interviews started with a preliminary talk and a self-presentation of the expert. Then the area of interest was introduced by an open question (e.g. *“Please explain to me, why your department in this university should engage more in the process of internal digitalization?”*, *“What do you think could improve within your department in regards to internal digitalization?”*). To generate deeper insights, the experts were asked to name examples for e.g. internal needs for digitalization.

To not only ask for facts, the experts were requested to interpret their statements (e.g. *“Why can internal digitalization in universities improve the handling of transfer projects?”*). Finally, the experts were asked to theorize their statements and to show on a meta level, what needs for digitalization the whole university could have. The results of the expert interviews are displayed in table 1.

External needs for digitalization arise mainly in the economy and the society. When collaborating with universities, these stakeholders can demand support in digitalization issues. Although this relates in the first place to the *digital transfer product*, it can lead to a digitalization process within the universities, as they can learn from the digital transformation of the economy and the society. This digital change

opens up new potential for universities to develop their offerings and structures.

There are various internal needs for digitalization as well. They include the need for a faster and easier managing of transfer projects. This is mainly due to the institutional inertia of the universities, which results from their governance and administrative structure. Strategy and development processes are often too long-winded and innovative ideas from students and staff are often not heard.

Table 1: Needs for digitalization of knowledge transfer as part of the third mission of universities (cf. **RQ1**).

<p>External Needs (from economy/society)</p>	<ul style="list-style-type: none"> • Pull for digitalization from external partners • Faster and easier knowledge transfer • Understanding and handling of needs
<p>Internal Needs (within universities)</p>	<ul style="list-style-type: none"> • Faster and easier knowledge transfer • Improvement of internal services • Structured documentation and simplified reutilization of processes • Streamlining of processes • Rationalization • Reduction of errors • Improvement of quality • Lower process costs • Improvement of transparency • Up-to-date teaching contents • Up-to-date teaching methods • Safeguarding the future of research and transfer at universities

A faster and easier handling of transfer projects can be realized with the usage of a structured documentation and streamlined processes for the realization of transfer projects. This can lead to an improvement of the services of universities, as the quality and transparency of these processes will increase through a digital handling of transfer projects. A quick reply to external inquiries regarding new transfer activities is also an important success factor for the future. Universities are more and more competing for external funding, which often is related to transfer activities. Thus, a quick response, which is facilitated by digital processes and workflows, can be considered to be crucial to increase speed.

The digitalization can also lead to lower process costs for the universities, as the rationalization of the processes may lead to a reduced amount of errors. To persist as a competent partner for the economy and society, universities have to keep up with the times and incorporate a digital transformation to safeguard their own future of research and transfer.

4 DIGITAL TRANSFORMATION IN UNIVERSITIES TO FACILITATE KNOWLEDGE TRANSFER

Attractive digital services are a central prerequisite for universities competing for the best projects, scientists, students and employees in research and administration (Gilch et al. 2019). Due to the high complexity of the digital transformation, the framework shown in figure 1 (cf. RQ2) was created. This framework represents an artefact of the Design Science process. The intended purpose of this framework is to facilitate digitalization of knowledge transfer in universities.

The *digital transfer process* within universities begins with the usage of isolated digital structures and data. Processes in the administration are not captured or modelled and all data just exists in an isolated digital form, which is not linked to workflows, yet. To reach the next stage of digital transformation, these processes and data need to be transferred into a comprehensive digital structure. The information is converted over several stages into a digital signal.

Yet, there is no content related change within the data or processes. This allows for a process management, which is digital but not automatized. At this step the processes need to be newly defined, modelled and responsibilities have to be assigned. The previous isolated processes and procedures are not necessarily transferred into the next stage. Instead, they need to be rethought and potentially completely implemented from scratch in order to meet the requirements of digitalized processes and their customers. This is often accompanied by a restructuring of the organization of the university: responsibilities and the roles of employees are being changed in the course of the digital transformation. Old areas of responsibility are being automated and new areas of responsibility arise. For example, the calculation of a standard transfer projects can be automatically be generated. This leaves more time for project support and the initiation of new transfer collaborations. The comprehensive digitization requires standardization of the processes, to simplify their automation. At this stage also a digital evaluation and controlling of the processes is possible. As processes and procedures are increasingly being mapped by digital, automatized workflows, the content work can now be carried out digitally. To no longer just react to the digital transformation, but to actively shape it, it is essential that all processes are matched through clear responsibilities, sustainable decision-making structures and participation opportunities. In addition to the commitment of the university management by actively shaping strategic development, the university must also establish sustainable decision-making structures between the university management and

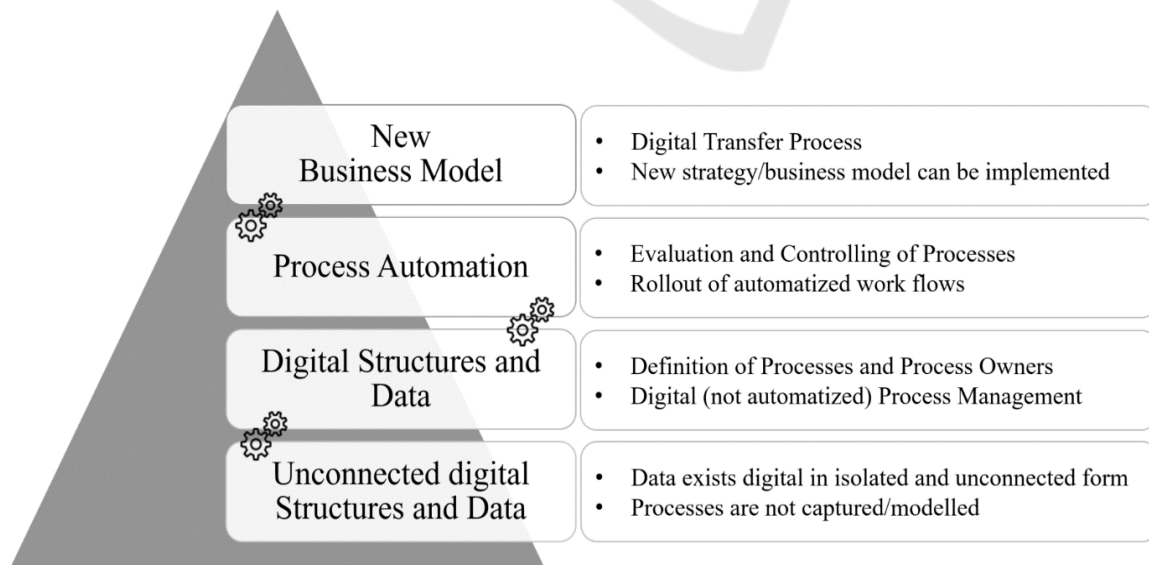


Figure 1: Framework for digital Transformation in Universities (cf. RQ2).

the faculties/departments and define responsibilities at the various levels. Obviously, this point can be hard to implement in practice, as faculties/departments and researchers have a high degree of autonomy, whereas university administrations are generally hierarchically structured with clear procedural approaches. Nevertheless, this internal collaboration can be simplified through digital workflows, as communication between the administration and the knowledge carriers can be facilitated. This can also help to overcome the silo mentality, which exist in some universities (Bolden et al. 2009; Friedman and Weiser Friedman 2018). Also, competences and responsibilities can be displayed more transparently. It is important that a viable continuation of the digital development and implementation is also ensured in the case of personnel changes, especially in the university management, by means of role descriptions that are detached from people. In addition, all stakeholders as well as the central institutions and the administrative bodies responsible for transfer and teaching must be involved in the digital development as far as possible.

As a final step in the digital transformation in universities, the digitalization can enable an occurrence of new business models or strategies for universities. Digitalization can not only support universities in safeguarding their future in research and transfer, but also reinforces them to understand and handle the needs from external partners better to allow for faster and easier knowledge transfer.

5 EVALUATION

The design science process aims to create artifacts to solve practical problems (Hevner and Chatterjee 2010). One of the core activities of the Design Science Process is the evaluation of the key findings and the proof and justification of the artifacts. The evaluation of the framework for digital transformation of universities is going to be conducted in a collaboration of six German universities, which have merged to enable deeper knowledge transfer with society and economy. As the digitalization process is going to last over a long period of time, the evaluation of this model will be conducted in the meantime. Although the process of digitalization is already initiated within those six collaborating universities, it will take a serious amount of time to fully implement it. Therefore, a preliminary evaluation of this model was conducted. The aim of this evaluation was to find out, whether all identified external and internal needs are displayed

correctly through the framework for digital transformation in universities.

5.1 Evaluation of External Needs

The needs from economy and society refer mostly to an easier and faster handling of transfer projects and their preconception that universities do not take their needs seriously or do not have solutions, which are applicable for SMEs. Especially, SMEs tend to hesitate to contact universities, as they often need quick solutions for their urgent problems. A practiced *digital transfer process* within universities can ensure a comprehensive handling of these needs, as defined and automatized workflows allow for a faster internal processing within the administration of universities.

5.2 Evaluation of Internal Needs

The needs from stakeholders within universities are numerous and range from the organization and implementation of transfer projects to the safeguarding of the future of research and transfer. Administrative and organizational issues within universities can be reduced through defined and automated workflows. A *digital transfer process* can improve the internal and external services of universities to make them an even more competent and desired project partner. Process automation can also facilitate the evaluation and controlling of internal processes, which can lead to improved internal services. Another indicator for the correctness of the framework is that it provides a general overview of the *digital transfer process* and acts as a means for the rationalization and streamlining of administrative processes. As processes need to be defined and modelled very clearly to automatize them in workflows, the framework also allows for lower process costs, a structured documentation and a higher process transparency.

6 CONCLUSIONS AND OUTLOOK

In this article, the two research questions RQ1 and RQ2 have been answered. The first question dealt with the needs for digitalization of knowledge transfer as part of the third mission of universities. With the help of expert interviews, multiple external and internal needs could be identified and structured (cf. RQ1). It was found that the *digital transfer*

process needs to be displayed in a structural and procedural framework. The created artefact, the framework for digital Transformation in Universities, shows the *digital transfer process* (cf. **RQ2**). The framework was developed in a cross-university initiative of six universities in Germany. In the past, each university developed its own best practices and resulting processes. The framework helps to reflect the own degree of digitalization maturity and facilitates the improvement of the own process map regarding digitalization and automation.

However, the digital transformation is a challenge, which holds true also for heterogeneous and diverse organizations like universities. On the one hand, the competition for research grants, transfer projects, industry contacts, and students is increasing. On the other hand, universities are used to manual and at least partly long-lasting processes.

A structured approach to the digital transformation as presented in this paper can help to compete successfully, to implement reliable and fast-automated processes, which facilitate transfer, and saving resources for tasks which cannot be automatized. Future work will include a deeper testing of the suggested framework to assess its efficacy. Furthermore, practical results of the application of the structured approach to the digital transformation will be presented in detail.

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