# Digital Transformation of Transfer in Universities

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Abstract: The digital transformation encounters not only industry and society, but also universities. Universities have to address the digital transformation in several ways: Digital transformation must be integrated into the curricula of their study programs. Additionally, they might want to establish own research programs in this area. Finally, universities have to digitally transform their own organization and administration. Universities are nowadays increasingly confronted with transfer or the so-called third mission, which manifests itself in growing social interest and the transfer of knowledge and technology. To be able to successfully withstand this transformation, a structured model was created. In order to pass through this process and to apply digital transformation as a university, internal conditions like the digital infrastructure as well as external conditions, such as higher education acts play a major role.

## 1 INTRODUCTION

Alongside teaching and research, transfer embodies the so-called Third Mission of universities. So far, the two other missions of universities, research and teaching, have been the main focus of public attention for many years (Roessler et al. 2015). Nowadays, knowledge and technology transfer is gaining increasing attention and for example, in Germany, the new amendment of the Bavarian University and College Act emphasises the need for transfer, in particular the responsibility for technical progress to the economy as well as ecology and society as a whole (Bavarian Ministry of Science and Art 2021). In the area of teaching, MOOCs (Massive Open Online Courses) have been a cornerstone for many years and although a conversion from face-to-face lectures to online lectures requires some effort, a basic structure is already in place in most universities. Despite ongoing digitization and increased activities in the area of research and transfer within universities, a progressive digital development is still far away. Furthermore, it is surprising that although many universities are active in research on issues of digitalization, they have only partially or not at all

digitized own processes, documents and procedures within their respective university administration (Doering and Timinger 2020).

The transfer of analogous to digital content, to maintain or convert it electronically, can be characterized as digitization (Loebbecke 2006). The term digitalization describes the usage of electronic or digital technologies, which can be used to transfer to a digital business (Bloomberg 2018). Digitalization can have effects on economy and society, which are described by the concept of digital transformation (Schallmo et al. 2018).

The advantages of a digitized research and transfer departments are obvious: a target group-specific and resource-efficient publication of technology and knowledge gained in research is possible. Also a digital transformation can enable a faster and customer-oriented transfer (Doering and Timinger 2020). Especially, due to the ongoing Covid-19 pandemic, it is necessary to publish research findings regarding this topic to society and industry. Accordingly, digitalization is an enabler for subject-specific knowledge and technology transfer to society via digital channels in a target group-oriented manner. As trade fairs and conferences are

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not possible during the pandemic, digital concepts and alternatives must be used. The information needs of society and companies have not changed due to the pandemic. There is a high demand for information from society and industry, especially from SMEs (small and medium enterprises), as they often hesitate to contact universities or even pursue collaborative research projects. Studies have shown that the frequency of cooperation between companies and universities is also related to the physical proximity of the locations (Blume and Fromm 2000). These cooperations are therefore dependent on collaboration through workshops and therefore physical proximity, which is currently and in the near future not possible. However, these obstacles of cooperation, research and transfer can be achieved by means of digitalization. Digitalized processes are necessary to enable the continuous dissemination of knowledge and technology transfer in a target group-oriented manner. Transfer can be divided not only in terms of the type of object, such as knowledge transfer and technology transfer, but also according to the way in which the transfer of knowledge and technology is carried out. A distinction can be made between transfer "via heads" and the specific transfer process (Roessler 2015). Transfer via heads means that, for example, the knowledge of a university is carried into the economy through a thesis or graduates. Conversely, knowledge from companies can also find its way into a university through practical cooperation, as well as through industrial semesters by academic staff. The specific transfer processes, on the other hand, is not person-related; it manifests itself through patents, the founding of spin-offs, or science communication (Roessler 2015).

This paper therefore proposes a model for digital transformation of the initiation and execution of transfer within and out of universities. Therefore, the following research questions arise:

**RQ1.** How can the processes of knowledge and technology transfer initiation and execution be displayed in a structured framework?

**RQ2.** Does the model display the clear objective of digital transformation in universities?

The goal is to propose a further development and evaluation of the digital transformation of transfer in order to enable faster and costumer-oriented services.

This article is divided into the following sections: To achieve the research goal, the design science methodology was applied, which is described in the next chapter. Then, the created framework is presented with pointing out the reasons for digital transformation within universities. To illustrate the practical relevance, an example of a specific transfer tool is shown. Finally, the evaluation of the framework is carried out by expert interviews. Their findings form the outlook and future work of this framework.

## 2 RESEARCH DESIGN

A comprehensive research method is needed to ensure the quality of research. HEVNER describes two general approaches (Hevner and Chatterjee 2010). The "design science" approach focuses on the creation and evaluation of IT artefacts, whereas the "behavioral science" approach aims at the construction of a hypothesis and its empirical validation. In the context of this research the proposed model for digital transformation in universities represents the IT artefact. To follow the proposed guidelines by HEVNER, the relevance for the research is given by the need to carry out a digital transformation within universities to sustainably support the transfer of knowledge and technology to and from these institutions.

The context project TRIO (Transfer and Innovation in Eastern Bavaria) serves as a means in giving the necessary evaluation, as it focuses on the transfer between six collaborating German universities and external partners.

Expert interviews, with experts from different departments of the collaborating universities were conducted to provide feedback on the model for digital transformation (Meuser and Nagel 2009). In this context an expert is defined as a person who has expert knowledge, which is special knowledge that is socially classified as necessary. This special knowledge is often related to the profession of the expert. For expert interviews guidelines according to MEUSER AND NAGEL (Meuser and Nagel 2009) were applied, as well as the quality criteria defined by MAYER (Mayer 2013). All interviews were carried out as semi-structured interviews. Objectivity ensures independence of the results from the researcher, reliability guarantees same results when repeated under same conditions and validity ensures a suitable research design for the research questions. Objectivity is the prerequisite for reliability and reliability for validity. Objectivity ensures that the results are independent of the researcher, reliability ensures the same results under the same conditions in the context of a repetition and validity assures a suitable research method for the research question.

To spread information about this model, it will be published in this conference as well as in an accompanying doctoral thesis.

A literature search based on the principles of VOM BROCKE was conducted to ensure the scientific rigorousness and to support the research as a search process (Vom Brocke et al. 2015).

# 3 FRAMEWORK FOR DIGITAL TRANSFORMATION IN UNIVERSITIES

Universities rely on digital services for competing for the best projects, students and employees in research and administration (Gilch et al. 2019). Reasons for the digital transformation of transfer within universities may vary, but they mostly include the following points:

- Improvements of the availability of services: The provision of digital services can improve the initiation and implementation of transfer projects due to faster and more reliable services, processes and procedures. This may also create an image of digital competence of a university for all external stakeholders.
- Speed of services: With the digital transformation of the administrative efforts, which are needed to pursue transfer projects, the whole process from the initiation, implementation to the completion of a transfer project could be supported digitally. This could result in a faster process time for the single administrative departments, as they could have all necessary information always at one's disposal. This would eliminate time consuming enquiries and coordination.
- Sustainability of processes and services: digital transformation can enable the sustaining usage of implemented processes and services.
- Security of data: with the digital capturing and usage of processes and data it can be facilitated that all necessary requirements for transfer are always taken into consideration.
- External image of the university: the digital transformation of transfer may create a positive external image for potential stakeholders in transfer projects as universities can show that there are not only teaching those principles, but also living them. This can enable a profile building and radiance of a university towards a greater focus on transfer.
- Social responsibility and transformation: an internal digital transformation may enable a better response on the ongoing digitalization of the industry and society as needs and requirements may be received addressed.

These reasons may vary according the size of universities, their research and transfer focus and of course their target in cooperation projects.

Therefore, the four-Phases Model of Digital Transformation in Universities was created (Figure 1). This framework is an artefact of the Design Science Research and represents a previous development of a framework which was published earlier (Doering and Timinger 2020). It acts as a means in enabling the digital transformation in universities and represents four main steps, which a university can pass through. The axes of the model are described by the timeline and the hierarch of meanings.

The model consists of three main phases for digital transformation. The first phase, the "Enabling Phase", acts as a starting point, in which digital structures and data exits within universities, which are not captured and modelled yet. The initiation or rather the purpose for the digital transformation of this data and structures derives from the top of the model. Here the strategy of university, the higher educational act and the social mission of a university are displayed. These factors do not only contribute immensely to the transfer of a university, but also shape and direct them. The second phase of the model consists of the "Development and Implementation Phase", which contains the definition of processes and their owners, as a necessary prerequisite for process automation. Only with a digital process management it is possible to roll out automatized work flows to support transfer. Process Automation may lead to new business models, which can derive in the last phase of the model, in the so-called "Sustaining and Systematic Change" Phase. Here, a change in the university system can take place as through the digital transformation new possibilities and ideas for the transfer and the university itself may arise. These results and ideas can have longer-term consequences and scaling as for example, the framework for digital transformation is taken up by others and is widely disseminated.

Within the phases and their processes three setbacks (arrows) were integrated to illustrate the recursive influence, which digital transfer processes could have on digital transformation. Thus, the phases can be passed in chronological order from left to right, if the corresponding requirements are fulfilled. However, if changes to previous process steps are necessary, preceding phases have to be repeated. For example, when automatizing processes, it may be necessary to return to an earlier phase in order to adapt process descriptions in order to facilitate optimal process automation.
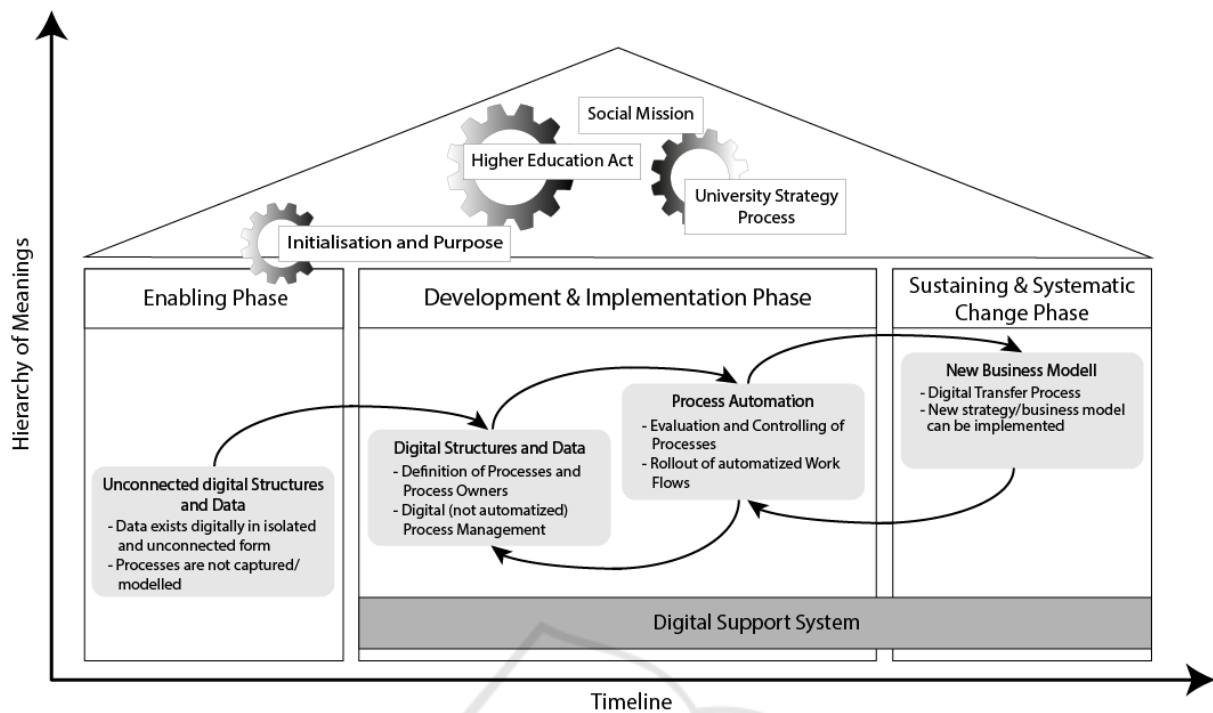
Figure 1: Framework for Digital Transformation in Universities (cf. **RQ1**).

A digital support system may act as a foundation and support system of the digital transformation (Figure 1). Depending on the used system, it allows different functionalities, which can be seen as enablers for further research activities and possibilities for shaping the processes of digital transformation, presented as successive stages. The first phase of the framework is characterized by unstructured and non-digitised data exiting within several places of university administrations. Basic functionalities of many digital support systems, like for example a research information system, create a common baseline, so that all data is available in a digital form, regardless of department, location and time. Activities of a single research institution, as well as activities of other research institutions can be published through a digital support system and thus be made available cross-organizational. Furthermore, automation can be enabled by a Digital Support System. As many research institutions are accountable to the government or other grant providers, reports on research projects, publications, staff numbers or similar, must be published periodic. Through automated collection and processing of data, such reports can be generated automatically. Processes can thus be controlled and evaluated. With automation and automated processes, universities can grant that all information are up to date, such as official gazettes or current research projects.

The digital support system acts therefore as a baseline and enabling factor of the "Development and Implementation" and "Sustaining and Systematic Change" phases of the framework.

To support and enable the digital handling of transfer, a digital transfer platform, as a form of a digital support system, could be beneficial. The proposed platform is a result of the transfer project TRIO and is used to initiate and execute transfer projects between universities, industry and society (Figure 2). The transfer platform aims to drive forward the expansion and further professionalization of knowledge and technology transfer between the universities and their external partners to initiate and further develop regional innovation processes.

The scientific competencies and transfer potentials of the universities are systematically recorded in order to bundle these together in the transfer platform and to compare them with the needs of business and society. Companies and social institutions are given the opportunity to contact researchers through the transfer platform. Concrete cooperation requests from companies do not have to be addressed to a university individually, as was previously the case, but can be requested via the transfer platform to multiple universities. If one university cannot offer a scientific cooperation partner for the specific request, for example because it does not conduct research in this area or lacks capacities, this requirement is recorded
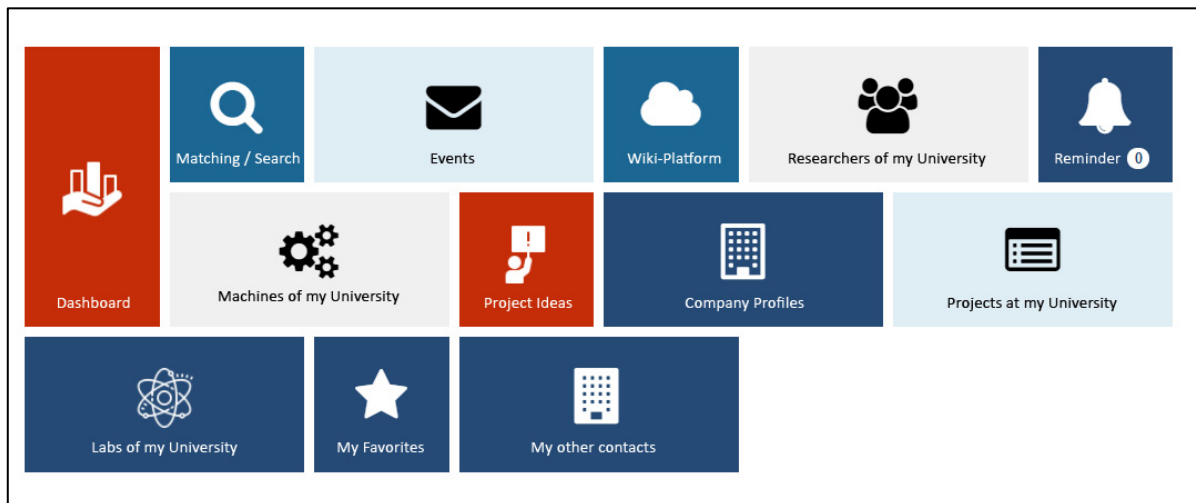
Figure 2: Work Space of Transfer Platform from Project TRIO.

via the transfer platform and thus passed on to all universities, institutes and research facilities in the network. The likelihood that one of the universities in the transfer platform will be able to provide support is therefore many times higher. Furthermore, the platform is able to support companies in their search for cooperation partners in the simplest form, that of providing information and disseminating the conditions of research cooperation. This ensures that potential partners are fundamentally informed about cooperation possibilities. Studies on this topic have shown that SMEs in particular have a lack of information about the possibilities of cooperation with universities (Blume and Fromm 2000).

The transfer platform can be used as a platform for interdisciplinary and cross-university networking for scientists at the universities in the network and thus also serve to identify potential cooperation partners from science, industry and society. The transfer offices act as intermediaries and support interested parties in establishing contacts.

## 4 EVALUATION

The digital transformation of transfer in universities addresses mainly internal processes and structures within the universities. To adequately assess this situation, expert interviews were conducted. The experts were chosen due to their experience and responsibility in transfer projects and their possession of advantaged data (Meuser and Nagel 2009). In total seven expert interviews were conducted, with an average length of 30 minutes each. All chosen experts are employees of universities and work in the field of research and transfer. The interviews were conducted within March 2021 using the online platform Zoom and recorded for evaluation reasons with the permission of the expert. To gather meaningful information the interviews were conducted in a partly structured manner, so that the experts were asked five main questions but also new questions were possible to arise during the interview. This approach was chosen to allow for the generation of interpretive knowledge (Przyborski and Wohlrab-Sahr 2014). The analysis of the interviews was conducted according to the qualitative content analysis by Mayring with a transcription of all interviews (Mayring and Fenzl 2014).

The first questions of the interview dealt with the background and experience of the experts in transfer in universities. All of them had strong experiences within their different roles in transfer. Five experts are employed in the administration (technology and knowledge transfer offices and research funding departments) of both technical and generalist-oriented and public-funded universities. One expert is a researcher, who works in a research institute in different transfer projects and one expert is a vice president for research and transfer of a university (Figure 3). Most of them never had any experiences or were involved in the digital transformation within a higher education institution.

Then, deeper questions concerning the applicability of the proposed framework were asked. It was found that all of the experts assessed the applicability of the model positively (**RQ2**), with making compromises in the effective realization of new business models in universities. Business models often come along with the preconception of a
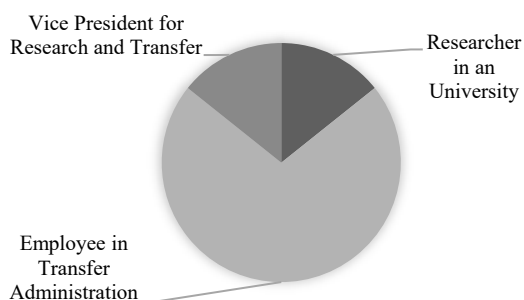
Figure 3: Role of Experts in Universities.

commercial usage, which is not intended with the framework. Nevertheless, all proposed phases and processes were seen as feasibly by the experts.

The role of the digital support system was described rather as an enabler, which offers new opportunities, than a simple software for the administration of research and transfer. The opinions concerning the point, at which a digital support system can or should be applied were not consistent, but the majority of the experts voted for starting with the "Development and Implementation" phase, because in previous phases the data is only available in an unstructured and unconnected form. Some of the experts postulated a digital support system as one of the main prerequisites for the digital transformation of universities.

Further development of the framework named on request by the experts, were additional phases or different points of view like corporate cultural aspects.

The iterative approach, including the three setbacks between the different processes, was described as very intuitive and highly relevant in practice. The question of further jumps back was negated due to the generic character of the model.

The influence of University Strategy Processes or the Higher Education Act were assessed differently, but the experts were united in their assessment of the influence as a framework condition. Furthermore, the Social Mission and Social Responsibility were described as important and can be seen as a main part of the purpose of universities and their digital transformation.

## 5 CONCLUSION AND OUTLOOK

In this paper a structured approach on the digital transformation of transfer within universities is presented. The target of the research was to design a model, which can be applied to different scenarios in the execution of transfer of universities. For this,

relevant processes and connections within universities were identified, modelled and associated with the necessary surroundings of transfer.

A major benefit of this approach is, that it not only supports the digital transformation of transfer but it also enables the creation of new business models and ideas which can derive from this process.

In this paper two research questions have been answered. The proposed framework acts as a means in displaying the processes of transfer initiation and execution in universities (**RQ1**). To elevate whether the framework displays the reality of digital transformation, in depth expert interviews have been conducted, which also provided additional ideas for a further development of the framework (**RQ2**).

A possible further development of the model includes the creation of different scenarios of the process. This could open up new possibilities in the achievement of new business models, as the different statuses of the universities could be taken into consideration.

The integration of an exploration/ideation phase as a first step of the model also seems to be relevant for most universities, as often it is simply not clear which data is available and relevant in the process of digital transformation.

Moreover, the issue of cyber security needs to be taken further into consideration as recent cyber-attacks on universities have shown (Chapman et al. 2018). These kind of security issues could be of great harm to the core activities of a university.

Furthermore, another dimension, that of culture, could be integrated within the framework. The culture in a university, like the corporate culture in business, plays a major role in processes and internal structures, especially in change management and digital transformation. As transfer is only possible with integration and acceptance of the involved employees, this new dimension will be included in a further development of the framework.

As the creation evaluation took only part within the dimensions of German universities, a more inter-national approach should be taken into consideration to allow for a more generalist view of the model.

Furthermore, limitations and challenges for the implementation of the proposed framework need to be taken into consideration (such as political, legal, bureaucratic factors).

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