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Addressing the Green and Digital Transition in Third Mission Projects

The European Green Deal emphasises and reinforces the use of digital technologies to solve problems related to energy use, implementing the circular economy, and improving environmental damage monitoring (European Commission, 2019). However, a critical discourse involving policymakers, businesses, community groups and government stakeholders has begun to highlight troublesome aspects associated with digitalisation, such as increased resource consumption, energy waste and risks to the right to privacy. Knowledge transfer is therefore fundamental in addressing the complexity of the green and digital transition.

Higher education institutions (HEIs) are key players in the dissemination of sustainable and digital innovations. The so-called third mission of universities,¹ which is to disseminate new knowledge to society, has been extensively discussed as a tool to improve and accelerate the availability of relevant knowledge (Bernert et al., 2016; Compagnucci and Spigarelli, 2020; Trencher et al., 2014). More recently, the discussion has focused on the need to improve inter- and transdisciplinary collaboration (Scholz, 2020). In particular, it is evident that the reflexive governance of transfer, which requires bidirectional communication and transformative formats of knowledge transfer, is necessary to improve the availability of knowledge not only to stakeholders in traditional collaboration projects between universities and industry but also to broader audiences, including societal stakeholders and civil society organisations (Carayannis and Rakhmatullin, 2014; Carayannis et al., 2018). Research to date has often focused single-

mindedly on one of the current challenges, with emphasis either on digitalisation or sustainability.

Knowledge transfer has endowed digital technologies with an important role in increasing sustainability (Hilty and Aebischer, 2015). In particular, in the transitions of sociotechnical systems with technologies such as smart meters in housing, digital grids in renewable energy and autonomous driving for mobility, digital technologies can theoretically have a positive impact on sustainability transitions (Andersen et al., 2021). Nevertheless, most of the time, digital technologies have led to an increase in material use and emissions through rebound effects, for example. With this in mind, the third mission needs to deal with the ambivalence between the interplay of digitalisation and sustainability (Gossen et al., 2021).

This article analyses the problems arising from the twin green and digital transition in third mission projects. The role of directionality is crucial for knowledge transfer to support the sustainable development and diffusion of digital technologies (Edler and Boon, 2018; Lindner et al., 2016). For this reason, this article addresses the need for institutional redevelopment to change the roles of the third mission and the university in the twin transition, particularly the distinction between knowledge transfer focused on general innovation and that focused on innovation for sustainability. Transition scholars have recently begun to analyse the interplay between sustainability and digital transitions (Andersen et al., 2021; Gossen et al., 2021).

The article builds on the interdisciplinary research project IreWiNE – indicators on regional knowledge transfer structures for sustainable development – which analyses the role of directionality in third mission projects in four different German regions: Augsburg, Darmstadt, Eberswalde and Göttingen. The project focuses specifically on the role of third missions' impact on sustainable development in the regions. The interdisciplinary (history, law and economics) research team has conducted interviews with stakeholders inside and outside the university. This article synthesises project insights into the challenges for sustainable digital projects and focuses on the interplay between digital technologies and sustainability. What challenges arise from these projects and what implications can be derived for institution building?

¹ This article analyses the third mission in terms of the functions of technology transfer and innovation, scientific education, and social engagement of HEIs (Roessler, 2015).

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Twin transition and the directionality challenge for the third mission

Traditionally, as part of the third mission, HEIs have focused on promoting the dissemination of knowledge that influences culture, society and the economy in the regions (Puente et al., 2021; Sánchez-Barrioluengo and Benneworth, 2019). Sustainability and digital transitions bring new challenges for the third mission and the role of HEIs. Markard et al. (2012) have defined sustainability transitions as “long-term, multi-dimensional, and fundamental transformation processes through which established sociotechnical systems shift to more sustainable modes of production and consumption.” Incorporating digital transitions into this concept, emerging digital technologies impact sociotechnical systems by changing innovation processes, labour demand and business models (Nambisan et al., 2019). The twin transition increases the complexity for the third mission due to the uncertainty of its outcome, multi-dimensional challenges and non-linear interconnected processes. Recently published calls and policy briefs suggest the fruitful complementarities of the twin transition and the need for further research (Andersen et al., 2021; European Commission, 2021). Very little analysis is available on third mission projects on digitalisation and sustainability (Ferraris et al., 2020), hinting at the extra value that digital technologies can offer for enabling sustainable solutions.

Why is little known about the influence of sustainability and digital transitions on third mission activities? Firstly, to date, most understanding about knowledge transfer, in theory and practice, has been geared towards increasing the economic value of academic knowledge. The traditional third mission stems from the idea of linear transfer processes commercialising the knowledge produced in academia. Publications in innovation economics, in particular, have focused on codified knowledge diffusion of intellectual property rights, such as patents. HEIs function primarily as intermediaries in making new services and products available to companies. Secondly, the orientation towards normative goals, such as the UN Sustainable Development Goals, is a recent trend related to the emerging idea of transformative innovation policy (Schot and Steinmueller, 2018), which aims to redefine and structure systemic interdependencies and system innovations. Thirdly, third mission projects have often focused on incremental, smaller-scale problems in the regions. The call to positively influence transitions has been made precisely in the context of emerging attention to transition research (Nölting et al., 2020; Schneidewind, 2016). Rethinking systemic change and the need for system innovation changes the overall picture for the third mission.

In case studies, the twin transition has influenced the activities of knowledge transfer actors. Both green and digital

transitions serve as umbrella themes to promote transfer and two-way communication in regional networks. Aware of the problems posed by the transitions, the research concerning these transitions shape the direction of the HEIs' strategy. In this context, the orientation defines the focus of activities and the implementation of the project structure, objectives and collaboration with regional stakeholders. Knowledge transfer intermediaries from universities can help develop strategies to address the challenges ahead (Hirschmann et al., 2022).

Digital and sustainability-oriented innovation in third mission projects

Innovation plays a critical part in achieving third mission goals in the twin transitions, particularly in realising political aims as well as shaping societal development. Accordingly, radical innovation is at the heart of understanding systemic changes driven by the twin transition.

Different characteristics of digital and sustainability-driven innovation pose challenges for third mission projects. On the one hand, digital innovations seem to add to existing knowledge only incrementally and are seen as difficult to diffuse in regional innovation systems. Internal and external knowledge transfer actors deal with the challenge of disseminating academic knowledge and inventions within the regions and establishing solutions that are only used by a small number of the stakeholders within the regions. Concepts for the introduction of digital products and services in the regions exist, but access to their implementation in small and medium-sized enterprises remains an obstacle. In this context, communication and direct interaction are essential for projects aimed at supporting digital products, services and business models. On the other hand, sustainability-oriented innovations, as described by Klewitz and Hansen (2014), require a higher degree of complexity on the part of knowledge transfer actors due to their difference from conventional innovations. Traditional transfer concepts, which are mostly focused on the commercialisation of academic knowledge, do not function effectively in this context. The need to align innovation with systemic change also affects the processes of development, prototyping and collaboration. In particular, there is a need to discuss how innovation affects sustainability in the regions. In addition, it is not fully understood how solutions that contribute to sustainable change in sociotechnical systems can be applied. The main challenge is to coordinate the actors involved, e.g. researchers, administrators, companies and societal stakeholders.

For the daily work in third mission projects, the differences between prioritising digital and sustainability-oriented

innovations influence project structures. On the one hand, a large proportion of stakeholders are familiar with the use of digital technologies in research, education and knowledge transfer. On the other hand, sustainable innovations with the explicit goal of influencing sustainability transitions change the perspective on third mission projects. Often, these projects need to deal with new approaches, incorporating reflection on technology use, consumer interests, and the consequences of the innovation, such as rebound effects. Digital solutions are used as triggers to motivate actors to participate in sustainability-oriented innovation projects. Moreover, a broader range of actors beyond businesses participate in third mission projects. Here, actors such as the church, non-profit organisations and local public administrators influence the shape of the projects conducted.

Network building to identify change agents

Third mission activities shape university networks and transdisciplinary collaboration at the regional level. Hence, the state of regional innovation systems for exploiting knowledge sources and researching innovations has an impact on sustainability and digital transitions. In particular, the availability of actors responsible for systemic change is critical for influencing established regime actors in regional innovation systems. The presence of a critical number of actors willing to collaborate is essential for knowledge transfer actors to expand and refine their networking activities. The central challenge is to identify the change agents. Differences between urban and rural regions shape the availability of actors for third mission projects, particularly suitable actors for knowledge transfer for sustainability-oriented projects. Rural innovation systems offer inherently fewer opportunities to engage actors willing to invest time and financial resources in projects, whereas urban regions with larger populations offer more interested actors.

Furthermore, the influence of actors contributing to change processes varies between the regions and the strategic orientation of the respective universities. While longer-term networks on the topic of sustainability-oriented innovation have been initiated in Eberswalde and Darmstadt since the mid-1990s, the universities and knowledge transfer offices studied in Augsburg and Göttingen are more loosely involved in sustainability-oriented networks. The reorientation of public programmes at the federal and EU level also helps to promote a focus on topics related to digitisation and sustainability.

The size of the university also plays a role in the coordination of the various actors among university members. While smaller, often application-oriented universities, such

as the Eberswalde University for Sustainable Development, began to focus their strategy on sustainability in the 1990s, the University of Göttingen, traditionally focussed on prominent research on relevant topics such as development studies, forestry and biology, only recently started to implement a knowledge transfer strategy that also targets regional sustainability transitions.

Strategic alignment and the transformation of the knowledge transfer system

The shift of academic knowledge transfer systems requires a strategy on the part of universities that changes the perspective of knowledge transfer from narrow technology (often a patent- and commercialisation-based view) towards a broader attempt at incorporating wider aims and actors in connection with sustainability and digital transitions. Strategic realignment has been a challenging process for HEIs due to the multiple layers of decision-making and varying interests of stakeholders within the organisations. Knowledge transfer is also often not among the primary goals of universities because the organisations focus on research and teaching. In addition, targeted knowledge transfer entails more stakeholder involvement, a higher degree of uncertainty about the outcome and greater complexity for clients compared to problem-oriented knowledge transfer projects. Commercialisation of knowledge is imperative as a mechanism to diffuse sustainable solutions. Knowledge transfer activities are oriented primarily towards clients who require cooperation with HEIs.

Although it is not yet common in Germany for universities to formulate and communicate knowledge transfer strategies to include the twin transition, in the regions studied, the Darmstadt University of Applied Sciences and the Eberswalde University of Sustainable Development have committed to directed transfer strategies (HNE Eberswalde, 2016; Hochschule Darmstadt, 2019). Specifically, contributing to sustainability is the focus of the transfer activities. Sustainable development is an imperative in both analysed universities' strategies and exploits innovation to contribute to different aspects of sustainability. Both strategies emphasise the need for change theories in socio-economic systems and the need for reflexive processes to monitor whether innovation leads to the necessary changes.

As they explicitly deviate from traditional innovation models, the need to understand the impact of innovation and the direction of change plays a major role in the third mission. For example, this strategic approach includes the role of vetoing innovations in case the solution negatively influences sustainability. As a result, reflexivity is practiced, particularly in the phases of problem formulation,

testing system innovation and diffusion across a broader scale. By establishing strategies in knowledge transfer from universities that implement prerequisites for funding programmes, a closer connection with sustainable goals can help to professionalise the field of third mission projects with a view towards sustainability (Nölting et al., 2020).

Digital transition is only partially included in the two sample strategies analysed. There is a need to understand and benefit from digital innovation in knowledge transfer as a strategic element of transfer, but also to recognise the challenges of digital innovation, especially in relation to the novel characteristics that arise from digital technologies, such as the role of data power, accessibility and data literacy.

Although strategies can be the first profound step towards sustainable transfer, implementation is proving to be difficult for the stakeholders involved. While the impact of the twin transition has led to discussions at the regional level in all cases, the realignment and transformation of the knowledge transfer system has been described as difficult. Lack of political support, hierarchies in academia, and time constraints were identified as prevalent issues hindering the renewal of third mission activities. Regionally active change agents are essential to cooperatively fostering change processes.

Establishing participation for dealing with transitions

The shift in knowledge transfer from general innovation to sustainability requires defining the institutional framework of who interacts and participates in third mission projects. Third mission projects involving transitions require a broader but more specific selection process of actors in the interaction between academic researchers and knowledge transfer and actors from government, business and social sectors. The inclusion of sustainability as an explicit goal of these projects changes the weighting of the relevance of the actors. Creating an institutional framework that considers this adds a broader participation approach to the traditional top-down approach and integrates bottom-up approaches. This means a more intensive exchange within the academic institution and a higher level of engagement between stakeholders. In addition, during the knowledge transfer processes, consideration is given to how sustainability can be achieved.

Digital technologies help to improve participation. One example of participation occurred during the coronavirus pandemic. With the rise of video conferences and other digital formats, knowledge transfer was able to incorporate a larger variety of actor groups. Moreover, online sur-

veys became a tool for empirical studies to identify needs and demands from civil society. In Darmstadt, a citizen panel regularly asks its citizens to identify regional problems and test solutions, which is useful for prospective and current third mission projects. Its aim is to contribute to improving sustainability in Darmstadt and the region by redefining what is needed from academic knowledge (Hochschule Darmstadt, 2022).

Concluding remarks

Redirection of the third mission towards the multi-dimensional challenges of sustainability requires incentives from public policy actors. Traditional knowledge transfer is concerned with demand orientation, which explains why the search for the right recipient is often at the heart of knowledge transfer challenges. In driving change processes, a shift of perspective can be seen in the analysis of the projects. Aiming for system innovation requires a shift of focus from the demand groups towards impact. In this context, impact means the streamlining of processes that think not just of knowledge transfer as a linear chain of command but also as systemic and reflexive processes, including feedback loops and discussion about the role of unintended consequences, such as rebound effects.

Policy programmes, regulatory requirements and policy actors are ways to redirect participation. This means that participation can help in a more focused way to direct knowledge sourcing from heterogeneous actors. The need to direct federal and national policy programmes to incorporate ideas from political actors will support the interests of actors inside the knowledge transfer system since many of the activities are funded by public funding agencies.

This article contributes to an increasing range of literature streams that discuss the double challenges of the green and digital transition. Generalisations cannot be drawn at this stage and from these case studies, but as the topic is so new, knowledge about practices is fundamentally necessary. In particular, the process of HEIs in reorienting knowledge transfer towards sustainability, including the challenges of digital transformations, needs insight from the real world. The presented case studies can be used to exemplify the different stages of HEIs dealing with digital and sustainability transitions and how they locate themselves in innovation systems. More knowledge is particularly needed to understand the challenges of adapting the institutional framework. This article can contribute by showing the relevance of reflexivity and of integrating change agents as crucial challenges missing on a systemic level. Prospective research can build on this to

tackle sustainability and digital transformative processes while incorporating a variety of new models of third mission systems, since different stages of transfer approaches were identified despite the small sample size.

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