Empowering smart regions:
addressing challenges and leveraging enabling factors in municipal digital transformation

Bonny Brandenburger, Andrea Hamm, Caroline Krohn,
Felix Sühlmann-Faul, Manuel Atug, Nicole Döpp, and André Ullrich

Abstract: The advancing digital transformation of society creates a wide range of opportunities for improved access to information and resources that contribute to ensuring the availability of public services and the development of sustainable living spaces. This underlying potential does not only apply to urban areas; digitalisation projects are also being implemented in rural municipalities in order to exploit the potential of digital transformation. Nevertheless, the field of so-called smart regions has yet to receive substantial focus in research. To understand the specific challenges and enabling factors of digital transformation activities in urban-rural areas, a workshop was organised with the cooperation of municipal representatives of a model region in Schleswig-Holstein, Germany. Therein, specific technical, economic and social challenges as well as enabling factors of municipal digitalisation projects aimed at developing smart regions were identified. The results show that the success of digital transformation measures in urban-rural areas is not only determined by the expansion of a corresponding technical infrastructure but in particular by the acceptance of citizens and municipality employees, as well as economic viability. This research further informs municipalities and future researchers on the critical factors required to effectively conduct digitalisation projects in the smart region context.

Keywords: digital transformation, smart region, challenges and enabling factors, sustainable regional development

1. Introduction

When it comes to fully exploiting the potential of digital transformation (DT), municipalities are faced with numerous challenges, mainly due to

limited resources (Fila et al., 2023). DT creates opportunities to improve and guarantee access to public services (van der Hoogen, 2024) and expand smart living spaces while maintaining a focus on ensuring the greatest possible added value for citizens (Heuser et al., 2020, p. 15; Sahu et al., 2020). In this respect, we understand DT as a holistic organisational approach to using and providing digital technologies within and for municipal administrations, emphasising the imperative for ongoing adaptations of processes, services and products to meet external demands (Mergel et al., 2019, p. 10). Thus, DT shall improve relationships between public administrations and their stakeholders, increase citizen satisfaction and foster a shift in organisational culture (Mergel et al., 2019, p. 10). To understand and cope with the challenges of DT, Lafioune et al. (2023) developed a framework based on a systematic literature review that included an investigation of multiple concepts concerning DT and the implications for municipalities. Applying this framework enables the identification of predominant issues hindering municipalities' DT.

While the relationship between the challenges and enabling factors of smart city projects has already been researched thoroughly (Andejany et al., 2023; De Guimarães et al., 2020; Kogan & Lee, 2014), research focusing specifically on **smart regions** and their prerequisites for a successful DT is still in its infancy (Geisberger, 2023, p. 31; Matern et al., 2020). Municipalities with lower-density populations and less infrastructure have even fewer human and financial resources (Fila et al., 2023), which makes DT measures more difficult to implement (Jakob & Krcmar, 2018). Usually, a critical mass of users is required in order to establish and maintain existing and new technical and social infrastructure (Ruscheinski, 2023, p. 19). Against this background, this paper is guided by the following research question:

How can the challenges for municipalities on their way to smart regions be tackled and suitable support measures be designed?

Lafioune et al.'s (2023) framework was developed by focusing on larger urban contexts, so we sought to determine to what extent the framework model is applicable for planned and promoted DT in urban-rural areas, where initial conditions are different. We accessed the field by approaching municipal administrators currently realising DT in their day-to-day practices. We conceptualised and held a workshop with municipal representatives from a model region and discussed their most recently implemented DT projects. The framework developed by Lafioune et al. (2023) served as the theoretical and conceptual basis used to identify the challenges. The

workshop results were then analysed in the context of the existing academic discourse on DT. This article will provide two main contributions: first, we will identify the challenges of DT in urban-rural areas based on the conducted fieldwork and examine how these challenges can be addressed by identifying enabling factors and suitable support measures. Second, the applied theoretical framework will be tested and discussed in terms of its possible utilisation in further studies on urban-rural contexts. DT is not just a matter of solving urban problems through technology, and because cities cannot be pictured as isolated entities (Amin & Thrift, 2002), we believe that the identified factors and presented measures can guide future **smart region** projects.

2. Towards a deeper understanding of smart regions

For more than twenty years, concepts centred on digital technologies for the design of urban spaces have been discussed under the umbrella of **smart cities** (Geisberger, 2023, p. 27). This term not only refers to the possibilities of information and communication technologies (ICT) but also increasingly focuses on the economic, ecological and social aspects present in the course of the DT. With the beginning of the 21st century, cities are no longer understood as isolated entities but rather as regionalised spaces (Amin & Thrift, 2002; Brenner and Schmid, 2015; Soja, 2000); urban and rural areas do not constitute two distinct territories that can be considered separate from one another (Delgado-Viñas & Gómez-Moreno, 2022). On the contrary, the classifications of **urban or city** and **rural** are to be replaced with the term **smart region**, and their existing interdependencies are to be examined. In recent years, there has been an increasing amount of literature on DT strategies within the political and administrative boundaries of cities (Ben Letaifa, 2015; Masik et al., 2021; Shamsuzzoha et al., 2021; Slavova & Okwechime, 2016;), while in contrast, concepts for **smart regions** are still in their infancy (Geisberger, 2023, p. 31). Matern et al. (2020, p. 2064) define **smart regions** as:

> diverse **urban-rural areas** that are spatially reframed by digital technologies and the respective social practices in a variety of fields (citizenship, governance, economy, environment, mobility, infrastructure) on a discursive, implemental and regulative level. The concept of **smart regions** follows a relational and social constructivist understanding of spaces and

emphasi[z]es an integrated approach towards the social (re-)construction of **smart regions** by actors and their networks.

Thus, the concept of a **smart region** bridges urban and rural environments and has a wide conceptual overlap with **urban-rural municipalities**. A fundamental aspect lies in fostering a collaborative approach so individuals impacted by DT are empowered to actively shape their communities through ICT. Central to the notion of a **smart region** is the deliberate and thorough integration of various sectors, institutions, themes, administrative bodies and diverse social groups through ICT infrastructure (Will, 2021, p. 459). Here, the essence of **smartness** transcends mere technological solutions, encompassing a broader capacity for integrating diverse stakeholders into a region's innovation ecosystem instead of thinking only within urban boundaries (Markkula & Kune, 2015). This holistic perspective not only leverages the potential of ICT but also increasingly emphasises the sustainable economic and social dimensions within the framework of DT.

a) Challenges for digitalisation projects in smart regions

The increasing dynamics of peripheralisation in rural areas and centralisation in metropolitan areas are reducing the economic performance of rural regions (Ruscheinski, 2023, p. 12), resulting in fewer companies choosing to settle there. This, in turn, can lead to structural economic weakness; furthermore, an ageing society due to declining birth rates is also characteristic (Statistisches Bundesamt, 2023) that results, among other things, in a declining capacity of technical and social infrastructure. Krishnan et al. (2020) identify the following aspects as specific challenges in the DT of municipalities: a lack of control over sustainability activities, a lack of methods and processes to promote the participation of citizens and insufficient knowledge about structures and value creation through ecosystems. In municipalities with a low population density, the question is not only how systematic and highly integrated networking using ICT can contribute to ensuring public services, but also to what extent the associated expansion costs are profitable (Geisberger, 2023, p. 37). The functional, financial and personnel requirements in rural areas therefore confront decision-makers with challenges different than those they would face in a solely urban context (Ruscheinski, 2023, p. 14). Nevertheless, rural regions in particular represent a special opportunity, as they can function not only as places to work and live but also as recreational areas and cost-effective business loca-

tions (Geisberger, 2023, p. 31). Against this background, research into **smart regions** is particularly complex. A large number of heterogeneous initial conditions (such as population growth versus migration, public transport infrastructure versus individual mobility) must be taken into account when implementing DT projects to ensure the provision of general-interest services in urban-rural municipalities.

b) Enabling factors for municipal digitalisation projects

In the context of municipal digitalisation projects, citizen participation, regulatory framework conditions, funding and stable telecommunications infrastructure are grouped under the category of environmental enabling factors (Jonathan, 2020); this approach can also be found in more recent works (cf. Gudmundsdottir et al., 2024; Lafioune et al., 2023). In the information technology category, interoperability, data security, IT architecture and data-driven agility are emphasised (Jonathan, 2020). Organisational and management factors include a sufficient degree of business IT alignment, management commitment, further training opportunities for employees or an organisational culture geared towards change. Gudmundsdottir et al. (2024) emphasise the significance of managers and middle managers in actively shaping and taking responsibility for municipal DT processes. Furthermore, the critical nature of sustainability in resource management and the innovation in service provision associated with DT were identified as important determinants (Gudmundsdottir et al., 2024). Access to the internet independent of time and place is also emphasised as an essential prerequisite for success, as it creates individual, social and economic development opportunities, as well as possibilities for participation (Geisberger, 2023, p. 37). A tangible added value for the local population is also required for the successful implementation of digital processes or solutions (Heuser et al., 2020, p. 15). In this regard, identifying relevant social groups is necessary for the social construction of technology. Different social groups attribute different meanings to technology depending on its perceived usefulness or ease of use (Davis, 1985; Pinch & Bijker, 1984). Thus, during a participatory negotiation process between these groups, the design of the technology continues until a consensus is reached, which occurs when the negotiation process has ensured that the technology works for all groups involved (Bijker, 1995; Pinch, 1996; Pinch & Bijker, 1984, p. 411ff.;). Based on this understanding, it is clear that the success of

DT in terms of digital artefacts stands and falls with the participation of all affected groups in the process of creating the technologies. This means that the perspectives of providers and users are incorporated into the creation process, which significantly increases the subsequent acceptance of the technology.

3. The Süderbrarup case study and methodological approach

To identify challenges and enabling factors in digitalisation projects, group discussions were held in December 2023 as part of a half-day workshop. In addition to the two researchers who acted as moderators, a total of 12 participants took part. The participants were representatives from the rural municipality of Süderbrarup (individuals from the Süderbrarup Smart City office and two mayors) and representatives from the areas of the smart border region, regional development and digitalisation offices (Chief Digital Officer, IT and Digitalisation Department) in the district and from an independent city in the region. This group of participants specifically invites a view of DT processes beyond the urban context. The Süderbrarup model region has already published a Smart City strategy[1][2], launched a wide range of digitalisation projects and thus taken the first steps towards becoming a digital pioneer (Office Süderbrarup, 2021). Both the rural structure and the transformation impulses make the Süderbrarup model region a particular object of investigation in relation to the realisation of digitalisation projects towards a **smart region**.

After collecting information on the participants' expectations at the beginning of the workshop, their views on the specific challenges of digitalisation projects were gathered. Current digitalisation projects were discussed first. The key questions were 'Which project are you currently working on?' and 'Which digitalisation projects are taking place in your area of work?'. Challenges were then determined by asking, 'What are the specific challenges in the respective projects?' In Block 2 of the workshop, enabling factors for digitalisation projects were identified. Based on the key question, 'What makes a digitalisation project actually successful?', the participants had the opportunity to make various suggestions using moderation cards.

---

1 https://smartcityamtsuederbrarup.de/wp-content/uploads/2021/05/Finale_Strategie.pdf

2 The use of the term Smart City was prescribed by the funding guidelines of the state of Schleswig-Holstein, with no distinction made between city and region.

Individual suggestions were illustrated using examples from the aforementioned projects and discussed during the presentation so that a common understanding and agreement could be reached. The participants then evaluated the identified enabling factors. Each participant had the opportunity to award three points so that the factors could be ranked according to their perceived relevance.

During the event, the two moderators recorded their general observations as well as the content developed during the discussions; the data were then collected, modified, synthesised and discussed thematically using whiteboards. Following the workshop, the participants' responses were consolidated and deductively categorised using Lafioune et al.'s (2023) framework for the DT of municipalities. The framework consists of 22 elements that are clustered into six overarching categories: strategy, process management, organisational culture, policy, network and digital information ecosystem. This categorisation of challenges is also in line with recent research on challenges at the municipal level (van der Hoogen et al., 2024). For example, municipal representatives have reported that they lack an overview of the individual digitalisation measures in the administration. These challenges were assigned to the third category – *Organisational culture* and *3.2 Lack of communication* – in the DT framework.

4. Results

The interviewees identified a total of 11 different *inter-* and *intra-organisational digitalisation projects*. The term *inter-organisational projects* describes projects that aim to create a network of relationships among municipalities, civil society and the economy that extends beyond any one organisation (Zundel, 1999, p. 19). In contrast, *intra-organisational projects* encompass network-like patterns of relationships within an organisation or community. This section describes the challenges and the enabling factors identified in the course of the discussions on digitalisation projects and then explores the connections between them.

a) Challenges of municipal digitalisation projects

The participants identified the processes for administrative digitalisation and the establishment of a central database as well as an electronic doc-

ument management (EDM) system for the municipality of Süderbrarup as challenges in the context of *intra-organisational digitalisation projects*. These projects aim projects to convert workflow and communication channels into digital technologies within the administration, thereby improving access to information and increasing the effectiveness of decision-making processes. For example, in August 2020, a project implementing the EDM system in the Süderbrarup region was completed. The primary goal was to store all documents digitally within one system. The system includes forgery-proof file storage and the application of an automated stamp on documents. In addition, a dynamic filing system for managing the lifecycle of documents before electronic archiving is integrated. Thus, every change to a document can be retraced; this is intended to prevent forgeries. Furthermore, minutes of meetings and dates are made available or are announced to citizens via the council information system. An additional feature of the EDM system is the creation of electronic files that consolidate information gathered from diverse sources, meaning that various documents relating to a citizen can be collected in one folder, even if the responsibilities within the municipal administration (e.g. the tax office or civil engineering office) are different.

Acceptance of change by administrative staff turned out to be a decisive factor when facing challenges while implementing the three *intra-organisational digitalisation projects*. Technical change requires a cultural flux in terms of individual willingness to change. The simultaneous nature of these two transformation endeavours was described as particularly challenging. This aspect can be found in Lafioune et al. (2023) under 3.1 *Lack of organisational change management*. One participant reported that some old administrative processes continued to exist alongside new ones, leading to unnecessary additional work. In the specific example with the EDM system, participants reported that there were administrative employees who still tended to use the analogue document filing system while others used the new system and thus experienced the associated simplification of administrative processes. In addition, interviewees mentioned that administrative staff lacked an overview of the particular digitalisation measures in the municipality in order to be able to assess what was already running successfully (3.2 *Lack of communication*). The lack of personnel (5.3 *Lack of human resources*) in municipal administrations was also emphasised as another major challenge in the course of DT. In the eyes of the interviewees, the implementation of transformation projects often depends on a few

64

people who frequently have to perform other tasks that are not a part of the implementation of **smart region** projects.

In the area of *inter-organisational digitalisation projects*, software-based applications for communication between the administration and citizens were mentioned most frequently by the participants. These include the *MensaMax*[3] (a digital application for organising school lunches), a booking platform, a data platform for exchanging and sharing data and information with citizens and a mobility app called *smartes DorfSHUTTLE*[4]. Local public transport in Süderbrarup is currently designed primarily for the transportation of schoolchildren. Outside of school hours, there are very few connections between municipalities. The mobility app seeks to mitigate this problem by supporting demand-oriented transportation in the form of a ride-pooling-on-demand service. In addition, general administrative services, such as applying for an ID card, are to be digitalised as part of the Online Access Act (OZG), thereby simplifying the process for citizens.

The workshop participants identified challenges in both social and technical aspects of DT projects; these areas are often interlinked. For example, the issue of technical interfaces was raised (6.2 *Incompatibility and/or inadequacy of existing information systems*) in the context of the need for cross-service software solutions that make it easier for citizens to use different areas of general-interest services (e.g. the financial or citizens' office). There are often different applications and standards that, from the perspective of municipal representatives, lead to conflicts between administrative staff and citizens. The usability of these digital applications is often unfriendly to consumers (6.1 *Inadequate technologies and tools*), resulting in acceptance problems among the population (5.2 *Resistance to change* and 5.4 *Perception by the citizens*). This social challenge is exacerbated by the issue of data protection and security (2.2 *Absence of data management*). Citizens do not recognise the exact purpose for which data are collected and what added value and danger this poses. There is no explanation of the benefits of data acquisition and analysis for local civil society (3.2 *Lack of communication*). The municipal representatives emphasised the need for the participation and early involvement of citizens in the development of digital applications, such as data or booking platforms. Thus, both internal and external communication were mentioned as major challenges in the realisation of software-based digitalisation projects.

---

3 https://mensamax.de/schule/
4 https://smartes-dorfshuttle.de/

Another major digitalisation project in the municipality of Süderbrarup is the *makerspace*[5], a smart city lab that opened in 2022. It serves as a physical meeting place and a space for development and experimentation for citizens and businesses, where digital tools for prototyping, crafts and IT are available and can be tested. Additionally, the lab is used for training courses to promote digital skills (Amt Süderbrarup, 2021, p. 49). In order to be able to present *makerspace* in a decentralised manner and to bring its offerings to surrounding areas, the project aims to create digital hubs, e.g. through a temporary version of the entire offering. The extracurricular activities available through *makerspace* and the youth centre are communicated via social media channels to reach young people.

It can be emphasised that these physical places – *makerspace* and the youth centre – do not sufficiently address the needs of the local population; for example, the added value of *makerspace* is hardly appreciable for older people. In the local population, a lack of communication gives rise to fears. Another central challenge is the funding logic, which is associated with a limited project duration and dependence on third-party funding. The lack of financial sustainability can also be emphasised in the context of the other digitalisation projects (1.6 *Funding problems* and 4.1 *Insufficient policy and support from elected officials*). Moreover, the participants reported that digitalisation projects require time beyond the funding period for people to recognise the added value for themselves (5.4 *Perception by the citizens*).

b) Enabling factors of municipal digitalisation projects

The participants repeatedly brought up social and organisational issues when discussing enabling factors. With a score of five, the two highest-ranking enabling factors were (1) 'making life easier by creating added value for citizens' and (2) 'economic viability'. These two factors coincide with the challenges described above, in which the perceptions of citizens and sustainable funding problems were also strongly emphasised. In addition, 'pride in the project' on the part of those involved was underlined, receiving four points. This goes hand in hand with the importance of an organisational culture in which all participants see themselves as part of a successful project. With three points each, respondents mentioned 'high usage figures', 'the fulfilment of project objectives' and 'the subsequent use

---

5 https://www.diz.digital/ueber-das-diz

of infrastructure' even after the end of the project as important for determining its success. These factors were applied both to internal digitalisation projects within the administration and those with external interest groups. In addition, 'user satisfaction', 'quick decisions' and 'good design and planning of the project' were emphasised as key factors for success, receiving one point each. All in all, the participants described the importance of bundling needs in order to demonstrate added value, ensure acceptance among the citizenry and guarantee that technical measures, such as the MensaApp, are also used.

c) Connecting challenges and enabling factors

In order to demonstrate the connections between the *intra-* and *inter-organisational projects*, the identified challenges and enabling factors were transferred into a superordinate systematic structure (Figure 1) utilising Lafioune et al.'s (2023) six categories. For example, the participants discussed the lack of sufficient clarity necessary for citizens to understand what happens to their data in the newly introduced data platform; this challenge was categorised under 2.2 *Absence of data management* and 3.2 *Lack of communication*. The enabling factors are highlighted in grey at the bottom of the figure. In order to meet the challenges mentioned regarding the data platform, for example, improvement at the planning stage of the digitalisation project by involving various user groups ('good design and planning of the project') was suggested. The superordinate systematic structure therefore illustrates the relationships between the challenges and enabling factors, which can help enable decision-makers to identify the most frequently mentioned challenges within various digitalisation projects by means of a systematic presentation and thus develop initial solutions using the identified enabling factors. The example of the Süderbrarup municipality shows that a lack of communication, especially with citizens, is a major hurdle in the implementation of digitalisation projects.
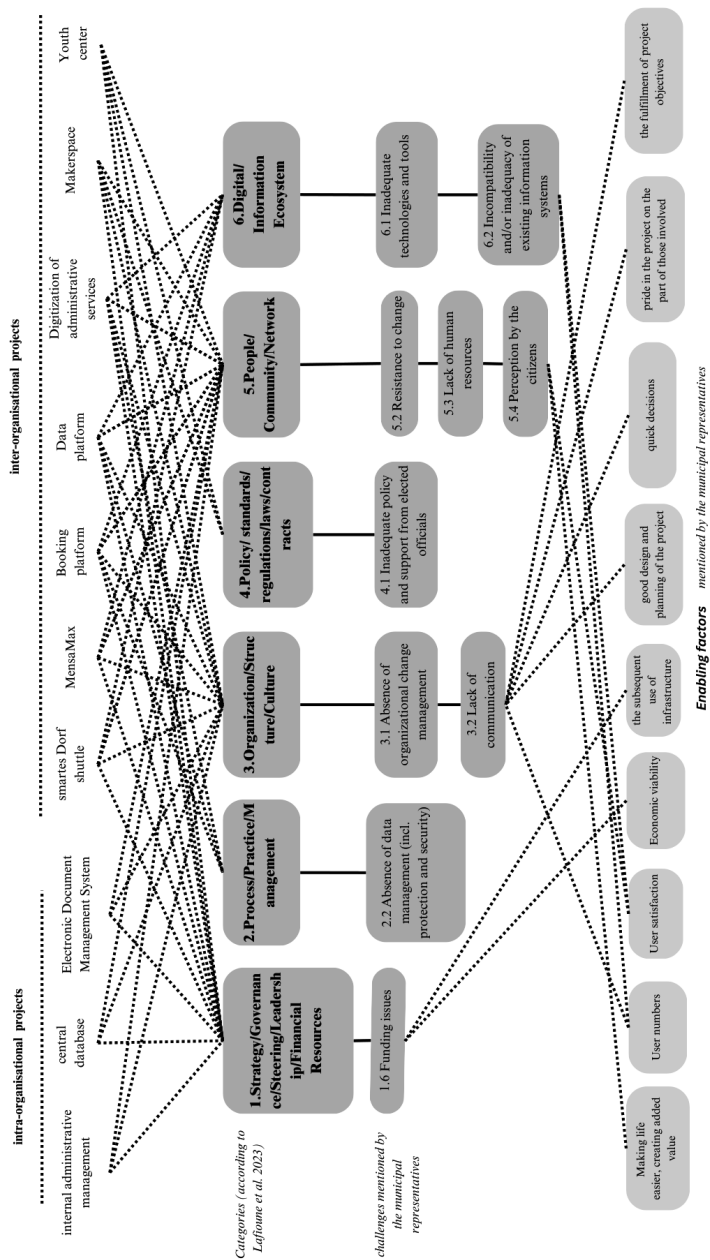
Figure 1: The relationships between digitalisation projects, challenges and enabling factors in Süderbrarup.

5. Discussion

The participants provided many responses in the subcategories of financial issues, the lack of communication and resistance to change. The Süderbrarup municipality should therefore pay particular attention to these challenges when implementing digitalisation projects. However, these aspects relate more to structural and inter-organisational problems that can only be solved to a limited extent at the project level. The challenges highlighted by the representatives of the municipality should thus be discussed not in isolation among project members but from a systemic perspective involving various interest groups. Linking the challenges with the enabling factors represents a first step in exploring how challenges can be met in the course of implementing digitalisation projects. However, these factors remain very general in their wording, as seen in the example 'making life easier, creating added value'; it remains unclear what 'added value' means for each individual. Moreover, some of the enabling factors mentioned contradict one another; for example, the participants mentioned 'quick decisions' as an enabling factor while also claiming that projects should be well-planned and involve a diverse user group at an early stage. In this regard, it remains questionable whether the involvement of citizens in the design and decision-making processes of digitalisation projects can lead to quick decisions. Thus, the proposed presentation not only provides a systematic overview of DT measures but also reveals the contradictions in the statements made by the municipal representatives.

The example of Süderbrarup demonstrates the applicability of Lafioune et al.'s (2023) framework for urban-rural regions. The proposed categories and subcategories were suitable for systematising the challenges described by the participants for each digitalisation project. The framework thus allows for the systematic analysis, framing and comparison of the challenges posed by DT in both urban and rural municipalities. For instance, differences can be found when comparing this research with the results from a survey of Canadian communities (cf. Lafioune et al., 2023). Respondents in the urban Canadian context referred to 2.2 *Absence of data management*, 2.3 *Misalignment of current practices and management* and 6.2 *Incompatibility and/or inadequacy of existing information systems* as particularly major challenges in DT. Comparing the results of the challenges of DT in the urban and rural contexts can assist in the development of **smart region** strategies. The DT framework is also valuable because it incorporates elements for sustainable digitalisation under the second category, *Processes,*

practices and management, such as data protection (Herlo et al., 2023; Sühl-mann-Faul, 2024, p. 141). Furthermore, the perception of the citizenry is emphasised under the fifth category, *People, community and network*. From the perspective of municipal representatives, citizens should be involved in the design process of municipal digitalisation projects from the beginning in order to promote the acceptance and long-term use of these applications (Hamm et al., 2023). **Smartness** is therefore understood not only in terms of what is technically possible but also what is useful for citizens in the long term. The applied framework has so far only enabled a systematic presentation of the challenges faced in the course of the DT of municipalities. This article proposes an extension by adding enabling factors for digitalisation projects to the framework.

However, the identified enabling factors remain very general and, to a certain extent, even contradictory. Among other issues, it remains unclear how the economic viability of projects can be measured in concrete terms. It would therefore be useful for future researchers to add additional items to the list of enabling factors. Furthermore, connections between projects and enabling factors could be investigated to map the relationships between digitalisation projects, challenges and enabling factors more clearly. This means that each person responsible for a respective project can develop specific strategies to overcome challenges such as the *incompatibility of existing information systems* (6.2). However, some of the challenges mentioned cannot be solved at the project implementation level. Factors such as a lack of sustainable financial and personnel resources must be addressed at the organisational level. In addition, further case study investigations in the context of **smart regions** with both municipal representatives and citizens are necessary in order to increase the generalisability.

These results can be used as a first step towards developing a holistic model that allows for the understanding of the necessary prerequisites for the successful implementation of digitalisation projects at the regional level. Other municipalities can thus acquire a concrete idea of which projects are being implemented in other areas on the way to becoming a **smart region** and reflect on the applicability and usefulness for their own case. The findings also provide insight into the challenges of the still-young research field of *smart regions*, offering a basis for future researchers to compare the challenges and enabling factors in the course of the DT in different regions.

6. Conclusions

By applying the framework developed by Lafioune et al. (2023), the prevailing challenges that hinder the DT of municipalities in urban-rural areas could be identified. The example of the Süderbrarup municipality shows that a lack of communication, especially with citizens, is one of the major hurdles in the implementation of digitalisation projects. In order better bring about the enabling factors mentioned, such as higher usage numbers, user satisfaction and subsequent use of (digital) infrastructure like the *smartes DorfSHUTTLE* app, the people who are affected must be involved in the planning of the projects at an early stage. The acceptance hurdles mentioned by the workshop participants – problems at the organisational level and social change processes as well as user problems in dealing with software products – clearly point to a necessity that coincides with theories concerning the social construction of technology: users need to be involved in the design process from the outset. For users of internal software, this will address the enabling factors ('pride in being part of the change' and 'having been involved in a successful project'), and for end users outside of the organisational levels, a product will be created that reflects the needs and requirements of future users. Acceptance can also be increased by increasing clarity and transparency concerning, for example, how software handles user data. All in all, only when the problems described are understood as social problems can socio-technical support help to overcome them.

Acknowledgements

References

Amin, A., & Thrift, N. (2002). *Cities: Reimagining the Urban*. Wiley.

Amt Süderbrarup (2021). *SMART CITY STRATEGIE*. https://smartcityamtsuederbraru p.de/wp-content/uploads/2021/05/Finale_Strategie.pdf

Andejany, M., Malik, A., Ahmad, W., Alhabri, A. M., & Umar, S. (2023). Transformation of Urban Cities to Sustainable Smart Cities – Challenges and Opportunities faced by Saudi Arabia. *Journal of Theoretical and Applied Information Technology*. Vol.(No.), Seiten. evtl. doi fehlt

Ben Letaifa, S. (2015). How to strategize smart cities: Revealing the SMART model. *Journal of Business Research*, *68*(7), 1414–1419. https://doi.org/10.1016/j.jbusres.2015.01.024

Bijker, W. E. (1997). Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change. *Science, Technology, & Human Values*, *22*, 127–130. http://www.jstor.org/stable/689970

Bradley, S., & Mahmoud, I. H. (2024). Strategies for Co-Creation and Co-Governance in Urban Contexts: Building Trust in Local Communities with Limited Social Structures. *Urban Science*, *8*(1), 9. https://doi.org/10.3390/urbansci8010009

Brenner, N., & Schmid, C. (2015). Towards a new epistemology of the urban? *City*, *19*(2–3), 151–182. https://doi.org/10.1080/13604813.2015.1014712

Davis, F. D. (1985). *A Technology Acceptance Model for Empirically Testing New End-user Information Systems: Theory and Results* [Massachusetts Institute of Technology, Sloan School of Management]. https://dspace.mit.edu/handle/1721.1/15192

De Guimarães, J. C. F., Severo, E. A., Felix Júnior, L. A., Da Costa, W. P. L. B., & Salmoria, F. T. (2020). Governance and quality of life in smart cities: Towards sustainable development goals. *Journal of Cleaner Production*, *253*, 119926. https://doi.org/10.1016/j.jclepro.2019.119926

Delgado-Viñas, C., & Gómez-Moreno, M.-L. (2022). The Interaction between Urban and Rural Areas: An Updated Paradigmatic, Methodological and Bibliographic Review. *Land*, *11*(8), 1298. https://doi.org/10.3390/land11081298

Fila, D., Fünfgeld, H., & Dahlmann, H. (2023). Climate change adaptation with limited resources: adaptive capacity and action in small- and medium-sized municipalities. *Environment, Development and Sustainability*, *26*(3), 5607–5627. https://doi.org/10.1007/s10668-023-02999-3

Geisberger, M. (2023). Smarte Regionen – Ländlicher Raum als Chancenraum? In D. Ahrens (Ed.), *Smart Region: Angewandte digitale Lösungen für den ländlichen Raum* (pp. 25–41). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-38236-0_3

Gudmundsdottir, S., Sigurjonsson, T. O., Hlynsdottir, E. M., Fridriksdottir, S. D., & Ingibjargardottir, I. S. (2024). Sustainable Digital Change: The Case of a Municipality. *Sustainability*, *16*(3), 1319. https://doi.org/10.3390/su16031319

Hamm, A., Ullrich, A., Rehak, R., Becker, K., & Nölting, B. (2023). Municipalities' digitalization and sustainability transformations: A network approach for designing a transdisciplinary knowledge community. *The 11th International Conference on Communities and Technologies (C&T)*, 174–179. https://doi.org/10.1145/3593743.3593780

Herlo, B., Ullrich, A., & Vladova, G. (2023). Sustainable Digital Sovereignty - Interdependencies Between Sustainable Digitalization and Digital Sovereignty. *WEIZENBAUM SERIES (32) working paper \ June 2023*. https://doi.org/10.34669/WI.WS/32

Heuser, L., Illigmann, K., Kassyda, C., & Kliesch, M. (2020). *DIN SPEC 91387:2020-08, Kommunen und digitale Transformation_- Übersicht der Handlungsfelder*. Beuth Verlag GmbH. https://doi.org/10.31030/3181316

Jakob, M., & Krcmar, H. (2018). Which barriers hinder a successful digital transformation in small and medium-sized municipalities in a federal system? *Central and Eastern European EDem and EGov Days*, *331*, 141–150. https://doi.org/10.24989/ocg.v331.12

Jonathan, G. M. (2020). Digital Transformation in the Public Sector: Identifying Critical Success Factors. In M. Themistocleous & M. Papadaki (Eds.), *Information Systems,* (*381*), 223–235. Springer International Publishing. https://doi.org/10.1007/978-3-030-44322-1_17

Kogan, N., & Lee, K. J. (2014). Exploratory Research on the Success Factors and Challenges of Smart City Projects. *Asia Pacific Journal of Information Systems*, *24*(2), 141–189. https://doi.org/10.14329/apjis.2014.24.2.141

Krishnan, B., Arumugam, S., & Maddulety, K. (2020). Critical success factors for the digitalization of smart cities. *International Journal of Technology Management & Sustainable Development*, *19*(1), 69–86. https://doi.org/10.1386/tmsd_00016_1

Lafioune, N., Poirier, E. A., & St-Jacques, M. (2023). Managing urban infrastructure assets in the digital era: challenges of municipal digital transformation. *Digital Transformation and Society*, Vol (No), pages. https://doi.org/10.1108/DTS-02-2023-0010

Markkula, M., & Kune, H. (2015). Making Smart Regions Smarter: Smart Specialization and the Role of Universities in Regional Innovation Ecosystems. *Technology Innovation Management Review*, *5*(10), 7–15. https://doi.org/10.22215/timreview/932

Masik, G., Sagan, I., & Scott, J. W. (2021). Smart City strategies and new urban development policies in the Polish context. *Cities*, *108*, 102970. https://doi.org/10.1016/j.cities.2020.102970

Matern, A., Binder, J., & Noack, A. (2020). Smart regions: insights from hybridization and peripheralization research. *European Planning Studies*, *28*(10), 2060–2077. https://doi.org/10.1080/09654313.2019.1703910

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, *36*(4), 101385. https://doi.org/10.1016/j.giq.2019.06.002

Pinch, T. J., & Bijker, W. E. (1984). The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology might Benefit Each Other. *Social Studies of Science*, *14*(3), 399–441. https://doi.org/10.1177/030631284014003004

Ruscheinski, T. (2023). Herausforderungen ländlicher Räume – das Ziel gleichwertiger Lebensverhältnisse. In D. Ahrens (Ed.), *Smart Region: Angewandte digitale Lösungen für den ländlichen Raum* (pp. 9–23). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-38236-0_2

Sahu, A. K., Padhy, R. K., & Dhir, A. (2020). Envisioning the Future of Behavioral Decision-Making: A Systematic Literature Review of Behavioral Reasoning Theory. *Australasian Marketing Journal*, *28*(4), 145–159. https://doi.org/10.1016/j.ausmj.2020.05.001

Shamsuzzoha, A., Nieminen, J., Piya, S., & Rutledge, K. (2021). Smart city for sustainable environment: A comparison of participatory strategies from Helsinki, Singapore and London. *Cities*, *114*, 103194. https://doi.org/10.1016/j.cities.2021.103194

Slavova, M., & Okwechime, E. (2016). African Smart Cities Strategies for Agenda 2063. *Africa Journal of Management*, *2*(2), 210–229. https://doi.org/10.1080/23322373.2016.1175266

Soja, E. W. (2000). *Postmetropolis: critical studies of cities and regions*. Blackwell Pub.

Statistisches Bundesamt (2023). *Bevölkerung nach Altersgruppen*. https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/bevoelkerung-altersgruppen-deutschland.html

Sühlmann-Faul, F. (2024). *Der goldene Käfig des Digitalkapitalismus: nichts kostet mehr als kostenlos*. oekom.

Van Der Hoogen, A., Fashoro, I., Calitz, A. P., & Luke, L. (2024). A Digital Transformation Framework for Smart Municipalities. *Sustainability*, *16*(3), 1320. https://doi.org/10.3390/su16031320

Will, O. C. (2021). Smart Regions: Elemente einer Transferagenda. In A. Mertens, K.-M. Ahrend, A. Kopsch, & W. Stork (Eds.), *Smart Region* (pp. 457–474). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-29726-8_25

Zundel, P. (1999). Inter- und intra-organisationale Netzwerke. In P. Zundel, *Management von Produktions-Netzwerken* (pp. 19–74). Deutscher Universitätsverlag. https://doi.org/10.1007/978-3-663-08712-0_2