Digitalization in the Mountains

Digital Transformations and Digital Multilocality in Swiss Mountain Areas

Inauguraldissertation

der Philosophisch-naturwissenschaftlichen Fakultät

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vorgelegt von

Reto Bürgin

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Leiterin und Zweitgutachter der Arbeit:

Prof. Dr. Heike Mayer

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Der Dekan

Prof. Dr. Zoltan Balogh

Abstract

A large part of the Swiss territory is located on mountainous terrain. The mountain areas attract numerous domestic as well as foreign guests pursuing their leisure activities or enjoying the beauty of nature. However, there is much more behind the idyllic mountain scenery. The mountain areas are important living and economic areas that also contribute to the national identity. Digitalization is also not passing by mountain areas unnoticed. It raises numerous questions about broadband Internet access and the use of digital technologies in peripheral mountain areas. In this dissertation, I explore precisely such questions and try to find answers.

The dissertation suggests that digital transformation in mountain areas does not emerge as a uniform process. Rather, the interviews conducted in a case study in the mountain region of Engiadina Bassa/Val Müstair reveal a differentiated picture of individual experiences with digitalization. For some it is a curse, for others it is a blessing. However, it can be derived that digitalization contributes to economic and social change in mountain areas.

Digitalization also provides new opportunities for flexible and multilocal working. Due to the possibility of accessing the Internet in peripheral mountain areas, more and more knowledge workers are deciding to temporarily relocate their workplace to the mountains. Using a new and original methodological approach, pioneers of such work practices were followed closely and their working environment was analyzed. It became apparent that these workers take advantage of self-chosen marginality in terms of remoteness and distance from the urban workplace to pursue their work in a focused and motivated manner. Superordinate, multilocal work practices enable a nuanced view on relationships and connections between cities and mountain areas, with alternating work locations and digital communication providing a relational view on the interconnectedness of spaces in the digital age.

Furthermore, this dissertation is also dedicated to the question of methodological approaches that allow to scientifically explore digitalization and, in particular, multilocal work practices between cities and mountain areas. Using the research designs of a community case study and a mixed methods approach, it was possible to gain deeper insights into the effects of digital transformations and digital multilocality. In particular, the mixed methods approach provides an impetus to address and further think about common methods in social science research against the background of new, digital methods.

Thus, this dissertation takes a nuanced look at digital transformations in mountain areas with a specific focus on digital, multilocal work practices. In doing so, it sheds light on the idea that mountain areas should not be regarded as isolated, but that new points of contact between urban centers and rural peripheries are resulting from digitalization.

Kurzfassung

Ein Grossteil der Schweizer Landesfläche befindet sich auf bergigem Terrain. Die Berggebiete ziehen zahlreiche inländische wie auch ausländische Gäste an, die dort ihren Freizeitaktivitäten nachgehen oder die Schönheit der Natur geniessen. Aber hinter der idyllischen Bergkulisse verbirgt sich weitaus mehr. Die Berggebiete sind wichtige Lebens- und Wirtschaftsräume, die auch zur nationalen Identität beitragen. Auch die Digitalisierung geht nicht unbemerkt an den Berggebieten vorbei. Sie wirft zahlreiche Fragen der Erschliessung mit Breitband-Internet und der Nutzung digitaler Technologien in den peripheren Berggebieten auf. In dieser Dissertation gehe ich genau solchen Fragen nach und versuche Antworten zu finden.

Die Dissertation legt nahe, dass sich die digitale Transformation in den Berggebieten nicht als uniformer Prozess abzeichnet. Vielmehr zeigen die in einer Fallstudie geführten Interviews in der Bergregion Unterengadin/Münstertal ein differenziertes Abbild von individuellen Erfahrungen mit der Digitalisierung. Für die einen ist es Fluch, für die anderen ist es Segen. Es lässt sich jedoch davon ableiten, dass die Digitalisierung zum ökonomischen und sozialen Wandel in den Berggebieten beiträgt.

Die Digitalisierung eröffnet auch neue Möglichkeiten der flexiblen und multilokalen Arbeitsweise. Aufgrund der Möglichkeit in peripheren Bergtälern auf das Internet zugreifen zu können, entscheiden sich immer mehr Wissensarbeitende ihren Arbeitsplatz temporär in die Berggebiete zu verlagern. Mit einem neuen, originellen methodischen Ansatz wurden Pioniere solcher Arbeitspraktiken auf Schritt und Tritt verfolgt und ihre Arbeitswelt erforscht. Dabei zeigte sich, dass sich diese Wissensarbeitenden gerade die selbstgewählte Marginalität als Abgeschiedenheit und Distanzierung vom städtischen Arbeitsplatz zunutze machen, um fokussiert und motiviert ihrer Arbeit nachzugehen. Übergeordnet ermöglichen multilokale Arbeitsweisen eine differenzierte Sichtweise auf Beziehungen und Verbindungen zwischen Städten und Berggebieten, wobei alternierende Arbeitsorte und die digitale Kommunikation eine relationale Sichtweise auf die Vernetzung von Räumen im digitalen Zeitalter eröffnen.

Darüber hinaus widmet sich diese Dissertation auch der Frage der methodischen Zugänge, die es erlauben die Digitalisierung und insbesondere multilokale Arbeitsweisen zwischen Städten und Berggebieten wissenschaftlich zu erforschen. Mit den beiden Forschungsdesigns einer Community-Fallstudie und eines Mixed Methods-Ansatzes war es möglich, tiefere Einblicke in die Auswirkungen digitaler Transformationen zu erhalten. Insbesondere der Mixed Methods-Ansatz gibt Anstoss, gängige Methoden in der Sozialforschung vor dem Hintergrund neuer, digitaler Methoden zu thematisieren und weiterzudenken.

Somit wirft diese Dissertation einen differenzierten Blick auf digitale Transformationen in den Berggebieten mit einem spezifischen Fokus auf digitale, multilokale Arbeitsweisen. Dabei erhellt sie, dass die Berggebiete nicht als abgeschieden oder isoliert zu betrachten sind, sondern aufgrund der Digitalisierung neue Berührungspunkte zwischen urbanen Zentren und ländlichen Peripherien resultieren.

Acknowledgements

This dissertation would not have been possible without the support of many people. I want to thank my supervisor Heike Mayer. She introduced me to economic geography and supported me since the beginning. Heike was a professional mentor during my time as a PhD student. I appreciate the benevolent working atmosphere and I am very grateful for the many conversations and time she spent reading through and commenting on my manuscripts. Heike not only taught me to think like an economic geographer but also supported my personal education by giving me the opportunity to engage myself in university teaching. Thank you for the openness to let me, a geographer and sociologist, expand my thematic horizon and become an economic geographer.

I also want to thank Koen Salemink, who took the time and effort to evaluate my dissertation as a second examiner. Koen's scientific work accompanied me since the beginning of my dissertation and still does today. I got to know him as an inspiring personality and his career as an aspiring scientist has also always motivated me to develop myself further.

This dissertation was funded by the Unit Economic Geography of the University of Bern and the Swiss National Science Foundation (SNSF). I am very grateful to both for their financial support.

Writing this dissertation would not have been possible without this one person. I special thank my wonderful wife Jessica for all the support she gave me every day. She rejoiced with me over every milestone and motivated me ceaselessly when I was at difficult stages of my dissertation. In addition, thank you also that you sometimes told me to stop working in the evening and thus enjoy the other joys of life. I also want to express my great thanks to our daughter Aurelia. Thanks to you, our life became complete and you motivated me even more to give my best in writing this dissertation. This dissertation is dedicated to both of you and whoever may enrich our family in the future.

A big thank also goes to my working colleagues Marcin, Andrea, Pascal, Samuel, Miriam, Sebastian, Arnault, Cédric, Clara, Rahel, Antoine, Sandra, Yasmine, Delphine and Taylor. I cannot count the numerous discussions we had during coffee breaks and lunch (in person or on Zoom). I always appreciated your expertise and motivation. In addition, a big thanks also goes to the research assistants Timo, Marlies, Carmen, Romario and Lorenz. I appreciate the effort you took to help me with the transcriptions of the interviews and your active support during teaching.

I also want to thank Alexander Kashev und Sigve Haug from the Science IT Support (ScITS) of the University of Bern. Due to your openness and programming skills, we were able to create the methodologically innovative project on digital multilocality. Thank you for staying with me and respecting my (numerous) special requests.

I can hardly express the infinite gratitude for my parents. I thank my parents Wanda and Kurt from the bottom of my heart for always believing in me and supporting me at all times. From my mother, I learned the careful way of working and social skills. From my father, I get the unceasing diligence and dedication to do what I love. These qualities have marked me and I always carry these skills in me today and in the future. A big thank also to my sisters Tanja and Laila as well as their husbands Roman and Marc. They always motivated me and forced me to explain my work clearly.

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A big thank also goes to all study participants. Without your willingness to support a PhD student, this dissertation would not have been realized.

Finally, I thank all my friends who always provided a good distraction, so that I could recharge my batteries.

Preface

While writing this preface, I am sitting in my quiet and cozy home office during the second wave of the Covid-19 pandemic. Exactly this minute, the Federal Council of Switzerland has decided for the second time in one year that home office is mandatory for workers who can pursue such a work form. Hence, many things have changed during my last year as a PhD student. The drastic restrictions include a decrease in mobility. This has significantly affected me personally. But why?

Since I was a child and as far back as I can remember, I was always enthusiastic about the Swiss Alps. Despite the fact that the region where I grew up is one of the most distant from the Alps, my family managed to organize day trips and to spend vacations in various Swiss mountain areas. The beauty of the natural environment, the endless expanse of the valleys and the homely culture made all my visits unforgettable. Of course, such views have their *raison d'être*. They are also important, as they build a substantial part of the value added generated by alpine tourism. However, there is more going on in the mountain areas than meets the eye and they are therefore by no means mere outdoor museums for tourists.

Before I started my PhD, I mainly focused on urban studies during my academic education and research. Researching mountain areas seems to be exactly the opposite. From one extreme to the other. One might think so. However, my research and the time as a PhD student in economic geography at the University of Bern taught me otherwise. It taught me to understand the urban as well as the rural and the mountains differently. Differently in the sense that such spatial entities are much more connected and closer than assumed. Differently in the sense that those areas are by no means left out of the modern society. They have an important social and economic function and must therefore be taken seriously. In such a way that urban, rural and mountain areas meet as equals and not only recognize but also acknowledge each other.

It would take much more than a dissertation to explore the mountain areas. However, I tried to make a start for myself somewhere. I decided to explore the mountains from the perspective of digitalization dynamics and processes. Digitalization is omnipresent in our everyday lives and it is now hard to imagine life without it. It simplifies many things, whilst making some things more difficult, but it is leading to fundamental changes both in our private and professional lives. Digitalization makes it possible to overcome distances in the blink of an eye. It connects people and therefore places – near and far. It is changing work processes and, in particular, the location where people do their daily work. New multilocal work practices become increasingly widespread. As such, it is precisely the mountain areas that seem to be being rediscovered as places to work. It is a phenomenon that has gripped me, that has me on the edge of my seat and that sheds new light on the mountains in the context of digitalization.

The home office, to return to the beginning of this preface, is also based on digital advances. Today it would be difficult to write a dissertation without digital technologies. The Covid-19 pandemic gave digitalization a real boost. Communication activities were increasingly shifted

to the digital space. In this context, it is becoming less and less important whether I attend a Zoom meeting from my home office near the city of Bern, in my office at the Institute of Geography or from a mountain chalet. With this in mind, I would like to encourage you, dear reader, to reflect: Are cities and mountains that far away from one another? An answer can be found in this dissertation.

Reto Bürgin, Jegenstorf, January 13th 2021

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1 Introduction

1.1 Background and motivation

Digitalization[1] is fundamentally changing our everyday lives. Digital devices such as smartphones, laptops or tablets became indispensable for both work and leisure. However, digitalization is a megatrend that has spatial implications (Haefner & Sternberg, 2020), also in Switzerland (Council for Spatial Planning, 2019). While cities are considered the powerhouses of digitalization and telecommunication technologies (Luque-Ayala, 2019), rural[2] and mountain areas are often viewed as disadvantaged in terms of insufficient digital connectivity[3]. Nevertheless, digitalization does not seem to pass unnoticed by mountain areas. In Switzerland, for example, this is shown by efforts to connect the mountain areas with fiber optic broadband[4] technology or the increasing interest and emergence of coworking spaces in mountain villages (e.g., miaEngiadina, 2021). However, while there is a growing body of literature by economic geographers on Swiss mountain areas (e.g., Mayer & Baumgartner, 2014; Mayer & Meili, 2016; Meili & Mayer, 2015; Perlik, 2019; Perlik & Membretti, 2018; Tschumi et al., 2020), digitalization in this regard has so far hardly been taken into account.

It is recognized in the literature that digitalization and thus technological advances are key drivers for rural change (Woods, 2019), considering that information and communication

[1] The term 'digitalization' is rarely defined in the scientific literature. In the English language, 'digitization' means the conversion of data into digital formats while 'digitalization' can be understood as the increasing use of digital technologies (Oxford English Dictionary, 2021a, 2021b). In the German language, however, only the single term 'Digitalisierung' (digitalization) exists. In this dissertation and in the articles contained within it, digitalization and digitization are used synonymously and exclusively the term digitalization is used. In doing so, digitalization is primarily understood in this dissertation as a process in which analog data, information and activities (e.g., writing a letter) become converted into digital formats and thus processed and stored by computers (e.g., Bendel, 2021; Oxford English Dictionary, 2021b). Furthermore, in this dissertation, digitalization is also understood as a process of technological development as the increasing use of ICTs as well as the possibility of accessing the Internet based on the development of broadband infrastructure.

[2] I am aware that there are several readings of the terms urban and rural or center and periphery (see for further reading: Kühn, 2015). It is important to note that the literature of urban-rural linkages and marginality are based on different terminologies in this regard. The urban-rural linkages concept is based on the terminology of urban-rural and the marginality concept on the terminology of center-periphery (in some instances also the terminology core-periphery). In this dissertation, both are conceptually considered simultaneous unless otherwise indicated. Thus, the terms urban and center are understood as major urban agglomerations that represent the main growth areas, while periphery is understood as areas that are outside of them, with rural and mountain areas used as synonyms (Mayer & Baumgartner, 2014). Therefore, this dissertation does not distinguish between periphery and rural.

[3] Digital connectivity is understood as the capability to access fast and high quality Internet through the use of ICTs and therefore connect with actors in other and distant locations.

[4] 'Broadband' combines multiple channels in a single medium of communication and stands for high speed Internet connections that exceed bandwidths of traditional telecommunication infrastructure (Czernich et al., 2011; Moseley & Owen, 2008). In doing so, broadband provides high rates of data transmission and can combine hybrid sources such as audio, video and data (Unwin & de Bastion, 2009). Generally, broadband allows high bandwidths for data transfer and can be defined by its speed (OECD, 2008). Fiber optic broadband is a broadband technology that allows high speed Internet with gigabit download speeds (European Commission, 2020a).

technologies (ICTs[5]) and access to the Internet as well as increasing mobility opportunities lead to a closer interconnectedness between urban and rural societies and economies (Atterton, 2016; Freshwater, 2016; Lichter & Brown, 2011; Weber & Freshwater, 2016). Nevertheless, a growing body of literature on digital rural development shows that the reality is (still) different. Scholars found imbalances in digital accessibility and the use of digital technologies[6] between urban and rural areas, which is illustrated by the concept of the 'urban-rural digital divide' (e.g., Blanks Hindman, 2000; Farrington et al., 2015; Pant & Hambly Odame, 2017; Philip et al., 2017; Salemink et al., 2017; Skerratt & Warren, 2003). Thus, the common message from this body of literature is that the digital divide between urban and rural areas resists or continues to widen, leaving rural areas further behind.

Yet it is known that digital transformations[7] can provide new economic opportunities, especially for rural areas (Woods, 2019). This is evident, for example, with regard to novel multilocal work practices, in which knowledge workers can pursue their work outside urban areas (Nadler, 2014; Vesala & Tuomivaara, 2015), for example in mountain areas. In Switzerland in particular, mountain areas are temporarily visited to pursue daily work in coworking spaces or second homes. Such multilocal work practices, called 'digital multilocality' in this dissertation, were already performed before the Covid-19 pandemic, even before many workers had to follow such a work style. However, such multilocal work practices are still largely unexplored in the urban-rural context and little is known about changes in the organization of work using digital technologies in different workplaces. This dissertation addresses this topic from an economic geography perspective, applying the concepts of self-chosen marginality (Grabher, 2018), urban-rural linkages through ICTs (Weber & Freshwater, 2016), temporary proximity (Torre, 2008; Torre & Rallet, 2005) and embeddedness (Bosworth & Willett, 2011; Jack & Anderson, 2002).

Studying digitalization in rural peripheries, such as mountain areas, and in particular digital multilocal work practices requires adequate scientific methodological approaches. So far, the methodological discussion in the field of research on digitalization in rural areas has been scarce. In rural studies, it is evident that, especially in European studies, qualitative methods are preferred and mixed methods still make up a small part of the total number of studies (Strijker et al., 2020). Thus, there are numerous qualitative case studies that deal with the topic of digitalization in the rural context. However, it is precisely the application of mixed methods approaches that seems to generate deeper insights into a phenomenon and should be focused on (Strijker et al., 2020; Tashakkori & Creswell, 2007). The claim for bridging the

[5] The term information and communication technology (in short 'ICT' and in the plural 'ICTs') is often used but its understanding rarely explained. There are several meanings of ICT (Böcker & Klein, 2012). In this dissertation, ICT is understood as a collective term for communication technologies such as smartphones, laptops, desktop PCs, Fax, servers, LAN-infrastructures, fixed telephone networks, Internet access, mobile data services etc. that allow people to share information and also access the Internet. Furthermore, ICTs are also viewed as important drivers of economic growth (Galloway & Mochrie, 2005) and an integral part of knowledge work (Ojala & Pyöriä, 2018).

[6] In this dissertation, the term 'digital technology' (also its plural 'digital technologies') is used as synonym for ICTs and the Internet.

[7] In this dissertation, 'digital transformations' are understood as effects and changes due to digitalization. For example such as the development of new business models or generally the increasing use of digital technologies.

qualitative/quantitative divide is also a desideratum to create better methods for economic geography (Bathelt & Li, 2020). In addition, computer aided digital methods open up new possibilities for research through the use of ICTs, especially for analyses of human interaction with digital technologies (e.g., Brundell et al., 2008; Crabtree et al., 2015; Halfpenny & Procter, 2015).

Such methods might be particularly useful in research on rural areas, which have often been neglected in analyses of digitalization (Dodge, 2019). In particular, there has not been enough research into a deeper understanding of the effects of digitalization on changing rural economies. In addition, not much is found in the literature about what the urban-rural digital divide looks like in a rural periphery that is well served by broadband. Moreover, research into multilocal work practices in the urban-rural context is still neglected.

The overarching subject of this dissertation is digital transformations in mountain areas, which is in addition further contextualized by the subject of digital multilocality. In addition, this dissertation provides a methodological contribution by applying novel research methods. The following research questions (RQx) underlie this dissertation:

- **RQ1:** How do peripheral mountain communities experience digital transformation and how does this affect the realities of changing rural economies?
- **RQ2:** What opportunities does digitalization in mountain areas offer for multilocal work practices and what changes of digital work organization in alternating workplaces does this entail?
- **RQ3:** How does digital multilocality and in particular the use of ICTs affect the relationship between urban centers and rural peripheries?
- **RQ4:** How can digital transformations in rural peripheries, and specifically digital multilocality between urban centers and rural peripheries, be researched in more depth?

To answer these questions, two empirical studies were conducted. The first is based on a community case study on experiences and effects of digital transformations in the peripheral mountain community in the region of Engiadina Bassa/Val Müstair in Switzerland. The second is based on a newly elaborated mixed methods approach that integrates digital and analog methods to analyze novel multilocal work practices between urban centers and rural peripheries. Both empirical studies were conducted pre Covid-19.

This dissertation contributes to recent debates within rural studies that deal with digitalization in rural peripheries focusing on concepts from economic geography. It provides deeper insights on digital transformations and its effects on rural economic change in a digitally connected mountain community, grasps in-depth novel multilocal work practices in the context of urban centers and rural peripheries and provides a more nuanced understanding of urban-rural

linkages through multilocal work practices in the digital age[8]. This dissertation also contributes methodologically to the study of digital transformations and digital multilocality within the context of urban centers-rural peripheries as well as ongoing methodological debates on the application of mixed methods and digital methods in social science research.

Furthermore, this dissertation is based on underlying spatial understandings from literature on digital geographies. In this regard, ontological thoughts on the relationship between physical and digital spaces, Euclidean[9] geographic understandings in the digital age and access to digital space play an important role. These guiding principles were not directly addressed in the focused articles but formed an important starting point for my geographic understanding of digitalization, space and distance since the beginning of this dissertation. In a separate section in the conclusions part, I reflect on them and place them in the context of the findings of my research.

It is my motivation to contribute with this dissertation to scientific as well as public debates. In doing so, this dissertation provides novel insights that might be relevant for scholars who can build on them for future research avenues in this field, but also for practitioners, who might create new recommendations for action for the implementation of digitalization processes in rural and mountain areas.

1.2 Articles overview

This dissertation consists of four articles that have either been published or are in the review process in peer-reviewed journals. Table 1 gives an overview of this dissertation's articles. These articles are embedded in a framing text that encompasses the overall contribution of this dissertation by situating the articles in terms of their theoretical background, research context, research designs and methodologies and conclusions.

Article 1 examines digitalization efforts in the peripheral mountain community of the Engiadina Bassa/Val Müstair region. Using a community-based approach (Salemink et al., 2017), a community case study (elaborated with Heike Mayer) was conducted that analyzes the experiences, chances and pitfalls of digital connectivity in this mountain region. Findings are drawn from 46 interview partners from nine different actor groups within the peripheral mountain community and experts. The results show that becoming digitally connected in a peripheral mountain community is not a uniform process but rather experienced individually. The empirical analysis demonstrates that digitalization indeed affects rural economic change in a peripheral mountain community as it enables new economic opportunities for larger businesses, hotels, schools and health service providers, but this is also accompanied by challenges for financially disadvantaged actors and smaller businesses. This article contributes to the debates on changing rural economies and digital rural development. It helped me to get

[8] The 'digital age' is another term frequently used in the literature but its understanding rarely explained. In this dissertation, I understand the digital age as the current time in which increased use of the Internet and ICTs prevails.

[9] The Euclidean metric space is characterized by the conception of the physical distance between two selected points, which can be quantified and exactly defined (Couclelis, 1999).

closer to the phenomenon of digitalization in mountain areas and to explore the research field. The findings from this study thus formed the basis for the selected in-depth study of the phenomenon of digital multilocality in articles 2 and 3.

Article 2 analyzes the engagement of six knowledge workers in multilocal work arrangements and thus the strategic interplay of workplaces between urban centers and rural peripheries. In particular, the focus is on the differences in how multilocal knowledge workers work in both workplaces, how they interact with digital technologies (laptops and smartphones) and how they use self-chosen marginality for work. The empirical work is based on a mixed methods approach (developed with Heike Mayer, Alexander Kashev and Sigve Haug) that combines heterogeneous quantitative and qualitative data sources collected via digital and analog methods. The results show that there are notable differences of digital work patterns between the central and peripheral workplaces. Furthermore, using marginality for work entails both benefits and disadvantages. In addition, an interesting recurring cycle of digital multilocality was detected, which provides novel insights on digital multilocality between urban centers and rural peripheries. This article contributes to the literature on flexible working and to the literature on self-chosen marginality.

Article 3 is based on the same empirical material from article 2. However, this focused article examines how multilocal knowledge workers create urban-rural linkages through the use of ICTs and thus create temporary proximity between actors in urban and rural areas. In addition, the more general question of the embedding of multilocal knowledge workers in the rural local structure was also explored. The results show that multilocal knowledge workers can work at any rural place as long as they are able to create urban-rural linkages. In addition, an active and a passive form of temporary proximity was detected, which questions the need of physical (face-to-face) interactions. Furthermore, the analysis demonstrates that the embeddedness of multilocal knowledge workers in the rural local structure is principally family-related and not job-related. This article contributes to the literature on flexible working, urban-rural linkages, temporary proximity and embeddedness.

Article 4 is a method article. This article deepens the mixed methods approach and draws from insights of the analysis of the empirical material from article 2 and 3. Thus, article 4 demonstrates how mixed methods combining digital and analog methods allow to analyze work practices in multiple locations, including in the rural setting. The article discusses a selected case of a study participant and shows in detail how the six methods were applied and innovatively integrated with each other to generate different perspectives and thus more in-depth knowledge. In addition, the article reports on selected lessons learned from the experience with the mixed methods approach such as data processing and analysis, recruitment of the sample and ethical considerations. The article shows that research on digitalization in rural peripheries can indeed benefit from mixed methods combining digital and analog methods, but challenges still exist. This article contributes to the ongoing debates on mixed methods and digital methods for social science research.

Table 1. Overview of the dissertation's articles

Article number and title	Authorship	Research questions	Methodology	Geographic context	Status
1 – Digital Periphery? A Community Case Study of Digitalization Efforts in Swiss Mountain Regions[10]	Reto Bürgin, Heike Mayer	• In what ways does the community of the peripheral region Engiadina Bassa/Val Müstair experience digital change as illustrated by the case study? • In what ways does the case study reflect the realities of changing rural economies?	Community case study	Engiadina Bassa/ Val Müstair, Switzerland	Published in: Patnaik, S., Sen, S., & Mahmoud, M. S. (Eds.), *Smart Village Technology: Concepts and Developments* (pp. 67–98). Cham: Springer.
2 – Digital Multilocality: New Modes of Working between Center and Periphery in Switzerland[11]	Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug	• To what extent and why does the use of applications on the laptop and smartphone for work differ between the workplace in the center and in the periphery? • How do multilocal knowledge workers utilize marginality in their work? • What are the benefits and limitations of using marginality for work and why do they decide to work in a multilocal setting between center and periphery?	Mixed methods combining digital and analog methods	Urban centers and rural peripheries (mountain areas) in Switzerland	Status: Submitted to peer-reviewed journal, under review
3 – 'Far away and yet so close': Urban-Rural Linkages in the Context of Multilocal Work Arrangements	Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug	• To what extent and why do communication activities created through digital devices such as laptops and smartphones differ between the urban and the rural? • How do multilocal knowledge workers deal with distance to their coworkers, supervisors and/or clients during multilocal work arrangements and the use of ICTs? • How and to what extent are multilocal knowledge workers embedded in the local structure of the rural and which economic benefits does this entail?	Mixed methods combining digital and analog methods	Urban centers and rural peripheries (mountain areas) in Switzerland	Status: Submitted to peer-reviewed journal, under review
4 – Analysing digital multilocality: Combining and integrating digital and analogue research methods	Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug	• Based on the research questions from articles 2 and 3	Mixed methods combining digital and analog methods	Urban centers and rural peripheries (mountain areas) in Switzerland	Status: Submitted to peer-reviewed journal, under review

[10] This article was also published in a shorter version as a CRED (Center for Regional Economic Development) article in German and is presented in the annex (section 8): Bürgin, R., & Mayer, H. (2020). *Digitale Peripherie? Eine Fallstudie über den digitalen Wandel in der Bergregion Unterengadin/Münstertal*. Bern. Retrieved from https://boris.unibe.ch/143940/ (last access 24. June 2021)

[11] Selected initial findings were also published in a magazine article in German and is presented in the annex (section 8): Bürgin, R. (2020). Heute hier, morgen dort – digital und ortsunabhängig arbeiten. In Metron AG (Ed.), *Von digitalen Städten und Dörfern* (Themenheft, pp. 14–16). Zürich. Retrieved from https://boris.unibe.ch/150802/ (last access 24. June 2021)

1.3 Structure of the dissertation

The remainder of this dissertation is as follows: Section 2 provides an overview of the dissertation's theoretical background. In doing so, the focus is on literature on digital geographies, changing rural economies, digital rural development and digital multilocality. The latter is addressed by literature of flexible working, marginality, urban-rural linkages, temporary proximity and embeddedness. Section 3 presents the research context. It focuses on the Swiss mountain areas, digitalization in Switzerland, past and current digital policies (also in mountain areas) as well as previous studies dealing with digitalization in mountain areas in general and in Switzerland. Section 4 presents the research designs of the two empirical blocks. In section 5, the four articles are presented. The subsequent section 6 summarizes the key findings of this dissertation and answers the research questions. In addition, it presents further reflections that go beyond the research questions, policy implications, limitations and future research avenues. Next, an afterword rounds off the dissertation. In section 7, the bibliography is presented. The final section 8 consists of two supplementary publications (in German), which came about through the dissertation.

2 Theoretical background

The theoretical framework of this dissertation is based on four blocks, which build on each other (Figure 1). This is reflected in the thematic sequence of the blocks from the general and superordinate to the specific. The first superordinate block is an excursus and deals with digital geographies. The focus is on (ontological) changes of the understandings of space and distance through the influence of digitalization. The second block focuses on the impact of digitalization on changing rural economies. The third block discusses the literature on digital rural development with a focus on the concept of 'urban-rural digital divide'. The fourth block is more specific and deals with 'digital multilocality', which consists of five sub-blocks on flexible working and concepts from economic geography such as marginality, urban-rural linkages, temporary proximity and embeddedness. The scope of the different concepts and the reading into different scientific debates was also a major challenge of this dissertation. This section is more extensive, because this is unfortunately often neglected in the articles.

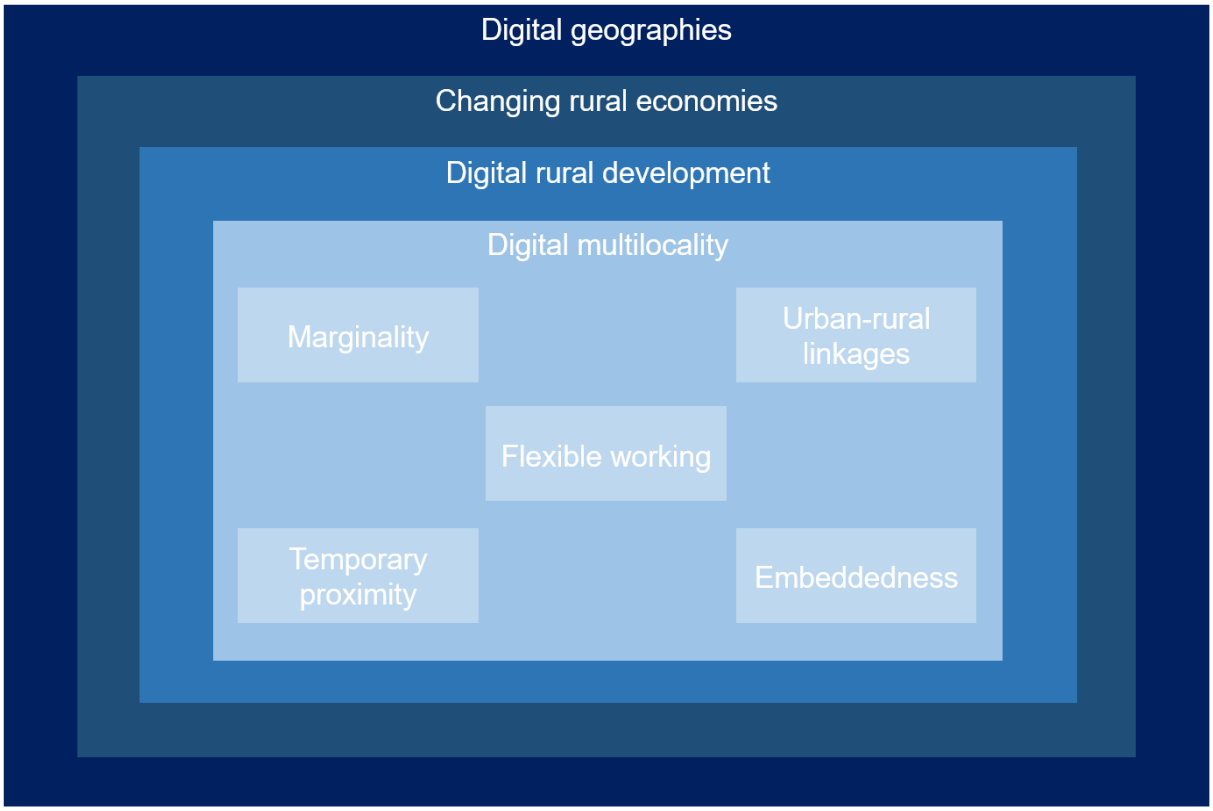

Figure 1. Composition of the dissertation's concepts. Source: Author.

2.1 Digital geographies

Digitalization is bringing about essential changes in the understanding of geographic space and distance. In particular, whilst differences remain, digital technologies bring geographically distant places and people closer together in digital space. This section addresses these changes in a brief excursus discussing the dissertation's underlying understanding of geography in the digital age. Why this excursion about digital geographies? The understanding of distance in digital space and the connections between physical and digital space are guiding principles for this dissertation to understand how digitalization affects changing rural economies and shapes the relationship between urban centers and rural peripheries in the digital age.

Not long ago, the emergence of the Internet and the increasing use of ICTs led to conceptualizations that declared space and distance to become less significant – or even dead. The thesis of the 'death of geography' (Bates, 1996) is based on the assumption that people and places around the globe are in constant connection and thus geography doesn't matter anymore. Similar ideas were also discussed in the thesis of the 'death of distance' (Cairncross, 1997), which deals with the decreasing necessity of geographic proximity due to advances of ICTs and reduced costs of telecommunication. Nevertheless, today we know that despite the transformative effects of the Internet and ICTs, physical space and distances are still important (Zook et al., 2011). Hence, geography still matters and the thesis of a geographic death as well as the death of distance are rejected (e.g., Cowie et al., 2020; Morgan, 2004).

However, such reflections on geography in terms of place and distance in the digital age are addressed in the literature on digital geographies. Space is generally connoted with distance (Zook et al., 2011) but it seems to be necessary to question the traditional Euclidean understanding of geography and distance in the digital age (Zook et al., 2004), due to the understanding that time-space constraints (e.g., Schwanen & Kwan, 2008) connect places and people from different geographic locations in digital space. Such considerations consequently also lead to a geographical understanding of the overlapping or blending of spaces: "Of particular interest for geographers is the creation – via the widespread diffusion of the Internet – of complex new geographies of interaction and connection between people and places, both near and distant, that blend virtual spaces and physical places" Zook (2007, p. 53). In this line of argumentation, physical and digital spaces (to which I also include the virtual spaces) cannot today be considered separately from each other.

In this context, it is important to take the digital or virtual space seriously and regard it as real (see for further reading: McLean, 2020). Differentiating some sort of realness between digital and physical worlds end in a false opposition. It becomes evident, for example, as digitalization creates real virtual spaces of connection, where people from distinct places all over the world can interact with each other (Boellstorff, 2016). Such an understanding poses major new challenges for geography that has been extended by cyberspace[12] and is thus no longer limited to the physical world (Zook, 2007).

However, while digital space or cyberspace is promoted as a space for all, the image beyond this 'egalitarian hyperbole' (Kitchin, 1998, p. 400) is different, as usage is diversely fragmented. This is showed by the unequal access to the Internet and thus to cyberspace, which is not equally distributed (Kitchin, 1998) and by geographic differences in the use of digital technologies (Blank et al., 2017). Consequently, neither geography nor distance are dead, as geographic differences in accessing digital space do exist, as further examined in the following.

[12] The term 'cyberspace' stands for a physically non-existing world (e.g., the Internet) that can be accessed with digital devices such as computers, smartphones or tablets (Lackes & Siepermann, 2017). The term was originally introduced by science fiction writer William Gibson, who described with this term virtual respectively abstract spaces, where people work using computer networks (Burnett & Marshall, 2003). Cyberspace, in this dissertation used as synonym for digital space, exists in a "symbiotic relationship with real space" (Kitchin, 1998, p. 402), which indicates that digital and physical spaces are interrelated.

2.2 Changing rural economies

In recent decades and to this day, rural economies are undergoing major transformation. In this regard, digitalization plays a crucial role and thus contributes to changing rural economies. In doing so, digitalization enhances the interconnectedness between rural and urban economies, whereby new economic opportunities can emerge. On the one hand, rural economic actors can gain access to urban economic actors and businesses. On the other hand, urban economic activities can be relocated to rural areas. With respect to the topic of this dissertation, the literature in this section provides important evidence for understanding the impact of digitalization on changing rural economies, including in mountain areas.

There is a body of literature coming from various related disciplines dealing with urbanization and how cities are the powerhouses of modern societies and economies. In this worldview, cities are seen as the triumphant focal points of innovation, creativity and thus economic prosperity (Florida, 2005; Glaeser, 2011). Literature from urban studies even goes one step further in arguing that urbanity spreads over the whole planet (Brenner, 2014; Brenner & Schmid, 2015; Merrifield, 2013), while the urban is the dominant human condition (Short, 2012) in a world that resembles one large city (Augé, 2012). In this regard, cities are viewed as the economic centers of the global economy (Sassen, 2001). Generally, such a perspective on urbanization "has led to an increased focus on cities as the drivers of economic growth and on a reshaping of how modern economies are organised" (Freshwater, 2016, p. 99).

However, such urban favored perspectives pay little attention to the specific characteristics of rural economies and thus create a hegemonic imbalanced perspective that gives greater economic importance to urban areas. This may also be reflected in the traditional perspective on the rural economy that is based on the farming and non-farming agricultural industry, which prevent processes of change (De Souza, 2017). Generally, the terms rural and peripheral are attributed with characteristics of economic challenges such as weak economic environment, high dependency on changes of the natural environment, an economically unfavorable social environment, low qualified human capital, smaller and less dense settlements, less accessibility in terms of transportation and ICT and larger distances of travel (Baumgartner et al., 2013). Nevertheless, despite this alleged unfavorable view, the "rural is not synonymous with economic decline" (Freshwater, 2016, p. 104). This is evident, because rural areas should no longer be considered only as suppliers of water and food or as recreational and residential areas for city dwellers and the commuting population. They should also be taken seriously as important economic and social spaces, as "it is obviously not right to assume that rural areas are always lagging or disadvantaged" (Copus & de Lima, 2015, p. 3).

Recent literature in rural studies highlight that a "fundamental restructuring" (Atterton, 2016, p. 165) of rural economies took place in recent decades. A shift is taking place from the importance of the traditional economic base of agriculture and forestry, which is a "pervasive myth" (Hill, 2005, p. 42) from today's perspective, to a more modern and service oriented and consumption-based rural economy and society (Slee, 2005; Woods, 2019). This shift of the roles and functions of the declining traditional rural economic base leads to changes for people working and living in the rural and new economic opportunities in the rural can emerge (Atterton, 2016; Scott et al., 2019b, 2019a; Woods, 2019). Furthermore, literature from rural

studies highlights that in this restructuring process, rural areas are increasingly socio-economically interconnected with urban areas and other regions (Copus & de Lima, 2015). This relational perspective also builds a general core of the 'New Rural Economy' paradigm, which goes beyond unfavorable, traditional perspectives on the rural (e.g., Atterton, 2016; Freshwater, 2016). In this perspective, rural economies are not (anymore) understood as isolated remnants that are leaning around the urban economies to only profit from them.

The interconnectedness is also based on technological advances via digitalization. Technological change is identified as one of the key drivers of rural change (Woods, 2019), whereby specifically new information technologies are considered to be "perhaps the key feature of the new rural economy" (Atterton, 2016, p. 171). This is because digital technologies have a fundamental impact on the rural economy and society:

> "New digital and communications technologies are creating new economic opportunities in rural areas and reconfiguring rural service delivery and the practice of everyday life in rural communities, as well as reshaping agricultural practice and geographies." (Woods, 2019, p. 623)

Digital technologies provide increasing access to the Internet and the use of ICTs for rural actors and businesses and therefore allow them to connect with actors in other locations (Copus & de Lima, 2015). In this regard, digitalization affects rural economies and societies insofar as they become increasingly integrated into urban and modern economies and societies due to broadband infrastructure and ICTs that allow them to create connections between urban and rural (Atterton, 2016; Weber & Freshwater, 2016). In doing so, technological advances are making urban-rural boundaries fluid and enhance interconnectedness (Lichter & Brown, 2011; Shucksmith & Brown, 2016). Therefore, in this perspective of interconnectedness, rural areas are not viewed as isolated spatial entities anymore in the thinking of changing rural economies but increasingly interconnected through urban-rural linkages (the concept of urban-rural linkages will be discussed in more detail in section 2.4.3) and relationships (Copus & de Lima, 2015). This not only leads to a new perspective on rural economies, but also changes the analytical approach to study changes in rural economies by shifting the focus from a static view of urban or rural to their interconnectedness in which "the rural-urban interface therefore becomes a zone of interdependence and connectivity, constructed through interactions, linkages and flows of people, money, ideas, information and materials" (Atterton, 2016, p. 173).

However, this interconnectedness also contributes to the transformation of rural economies through urban actors. Digital technologies thus can play an important role in the new orientation of the rural production system, as urban activities can also be relocated into rural areas (De Souza, 2017). Increasing digital connectivity for example has hailed the potential for home office and telework in the rural and the settlement of knowledge-intensive businesses that have tended to be located in urban areas (Atterton, 2016; Clark, 2018). This connectivity can be particularly important and an opportunity for rural areas, because "often these regions are left reliant on exogenous forces for their growth opportunities because they lack the capacity and resources, including human and social capital, to lead them by themselves" (Atterton, 2016, p. 166).

Hence, not much work exists that examines in-depth how digitalization affects changing rural economies, especially in a rural context, which is highly connected with broadband, such as

Swiss mountain areas. Generally, digital technologies are not yet researched enough in the context of rural areas (Dodge, 2019). Although the literature highlights that digitalization leads to new economic opportunities in rural areas, these have not yet been sufficiently explored, especially in the context of increasing interconnectedness between urban and rural areas. Article 1 contributes to this literature with a focus on digital transformations in a peripheral mountain community in Switzerland.

2.3 Digital rural development

Digitalization is viewed as a ray of hope for rural economic development. This is based in particular on the idea that ICTs have changed the nature of distance, making physical geographic distance less important due to technological advances of ICTs. Nevertheless, there are still hurdles, which are expressed in the concept of the 'urban-rural digital divide'. However, this divide is not only reflected in the available technology, but also in its use in the rural setting. Compared to the more general previous section, this section provides a deeper focus on the topic of digital connectivity in rural areas via the literature on digital rural development. With regards to the topic of this dissertation, via the concept of the urban-rural digital divide, this literature provides a lens through which to understand the challenges of digitalization in rural areas, including mountain areas.

Technological advances changed the nature of geographic distance (Anderson, 2000; Johnson, 2001). In doing so, normative and imagined borders between rural and non-rural areas tend to be bridgeable through digital technologies whereby the dichotomous perspective on urban and rural becomes outdated (Bulderberga, 2014; Lichter & Brown, 2011) and interactions between urban and rural are intensified (van Leeuwen, 2015). However, it is a common concern in the literature that urban and rural areas are still different in terms of digital development (see for an overview: Salemink et al., 2017). It would be too simple to claim that digitalization and shortened distances in digital space can overcome the challenges of rural areas. Digital divides[13] exist and should not be overlooked. They do not only exist in society between the rich and the poor but also between urban and rural areas (Lapping & Scott, 2019). This illustrates that the digital divide is also a geographic digital divide that is expressed in the uneven spread of digital technologies in the juxtaposition of urban and rural areas (Greenstein & Prince, 2009).

In the literature on digital rural development, the concept of the digital divide is examined as a spatialized concept of 'urban-rural digital divide' (e.g., Blanks Hindman, 2000; Farrington et al., 2015; Pant & Hambly Odame, 2017; Philip et al., 2017; Salemink et al., 2017; Skerratt & Warren, 2003). In this geographic and technological interface, studies highlight that the digital divide between urban and rural areas is increasing or resisting rather than decreasing (e.g., Blanks Hindman, 2000; Salemink et al., 2017; Townsend et al., 2017). The urban-rural digital divide shows that digital development in rural areas is progressing only slowly and thus "the digital cleavage between urban and rural communities will become even more pronounced" (Philip et al., 2017, p. 395). An explanation for this is that "newly developed technologies are

[13] The 'digital divide' is about existing social differences in terms of uneven access to and use of digital technologies and services (Sparks, 2013).

likely to be urban-led and based on ubiquitous connectivity, designed without consideration for rural needs. This dominant and largely urban rationale leads to the perpetuation of the urban-rural digital divide" (Salemink et al., 2017, p. 363). In general, new technological developments are examined from an urban perspective, which means that their impact on rural areas is rarely considered, but it still matters (Cowie et al., 2020). Therefore, the concept of the urban-rural digital divide helps to understand that technological advancements of ICTs and the Internet do not provide social and economic connectedness for all, as rural dwellers do not face the same conditions as urban dwellers.

These differing conditions in terms of digitalization are highlighted in the fact that rural communities face disadvantages compared to their urban counterparts in terms of digital connectivity (e.g., Philip & Williams, 2019). The literature proclaims that, compared to their urban counterparts, actors in rural areas are exposed to the risk of falling further behind due to uneven and insufficient access to digital technologies and services (Alam et al., 2018; Löfving et al., 2021; Roberts et al., 2017; Wallace et al., 2016). This leads to a paradoxical outcome: "The paradox in this digitalizing age is that the regions most in need of improved digital connectivity, i.e. rural regions in decline, are the regions which are the least connected and included" (Salemink et al., 2017, p. 367). From a geographical perspective, therefore, one can barely talk of equalization between different spatial entities (e.g., urban and rural) through digitalization.

There exists thus a gap in the digital infrastructure provision and adoption of digital technologies between rural and urban areas (Park, 2017; Whitacre et al., 2015; Whitacre & Mills, 2007). This juxtaposition of infrastructure provision on the one hand and its use on the other is evident in the debate about digital rural development. The digital connectivity is therefore a technical and social topic at the same time (Anderson et al., 2016). In this regard, Salemink et al. (2017) identified two research strands that deal with research on digital rural development: On the one hand, 'connectivity issues' are place-based and focus on the effects of broadband infrastructure provision in rural areas. On the other hand, 'inclusion issues' are people-based and deal with the social inequality of people's access to participate in the information society. However, to get a more nuanced understanding of the effects of technological advances, Salemink et al. (2017) call for a more integrated research agenda of both strands and suggest a community-based approach for research based on the combination of connectivity and inclusion issues. This call clearly indicates that digitalization, in rural and urban areas, is a phenomenon that is difficult to grasp and that goes beyond one-sided ways of looking at things, meaning that technology, economics and society must be thought of as a whole.

However, it is important to maintain a critical perspective here. Because even if the digital infrastructure were to resemble that of urban areas, there would still be no guarantee that it would be used by rural residents at all (Blank et al., 2017; Correa & Pavez, 2016; Pavez et al., 2017; Townsend et al., 2013). The first adopters of new technologies are young and wealthy people (Blanks Hindman, 2000). Because people living in rural areas are older, less educated and have lower incomes, it must be questioned if rural dwellers will increase their use of the Internet only due to access to broadband (Blank et al., 2017). In general, the opportunities of

digitalization for rural societies and economies should not be overestimated in the bigger picture:

> "Telecommunications is only one piece in the more complex puzzle of rural development. Because the issue is wrapped up in human capital, it is far more than a relatively simple infrastructure supply issue. It is part of a complicated process that goes beyond 'rural' and 'urban'. The relationships that affect rural places are global, and digital technology is only a small part of what affects all places as times and technologies change." (Malecki, 2003, p. 212)

Consequently, digitalization and thus digital connectivity should not be viewed as a panacea for solving rural challenges. It is only a part of the whole. Moreover, digitalization should not be understood simply as a technology, but always in terms of how people use it.

So far, the literature treats digital rural development from two different perspectives, without considering crossing the lines between connectivity and inclusion issues (Salemink et al., 2017). Article 1 shows in an application of a community-based approach (Salemink et al., 2017) that it is important to think of connectivity and inclusion issues together to get a more nuanced understanding of digital transformations in rural peripheries.

2.4 Digital Multilocality

While the phenomenon of multilocal work practices is heavily studied, perspectives and research interests vary widely. Due to the broad variety of terms and disagreements regarding terminologies and concepts dealing with ICTs and flexible, multilocal knowledge work (Ojala & Pyöriä, 2018; Vartiainen, 2006), the term 'digital multilocality', which was inspired by the literature on multilocality[14], is invented and used in this dissertation. Consequently, digital multilocality is thus intended to serve as an umbrella term that stands for working with digital technologies in different locations. It also includes terminologies from the literature such as multi-local or multi-locational and, furthermore, takes a relational view of the interplay between workplaces, especially between urban centers and rural peripheries.

To date, digital multilocality has been insufficiently studied from an economic geography perspective. However, a general reference to the literature on flexible working is inevitable at first. This forms the basis for the analysis of digital multilocality via the four concepts from economic geography (marginality, urban-rural linkages, temporary proximity and embeddedness) that follow and have been applied in articles 2 and 3. Regarding the research focus in this dissertation, this literature provides clues to explore and understand digital multilocality between urban centers and rural peripheries, including mountain areas.

[14] There is also a body of literature that deals with multilocality in terms of residential multilocality (e.g., Hilti, 2013; Rolshoven, 2007; Rolshoven & Winkler, 2009; Schier, 2016; Weichhart, 2009, 2015). However, this literature hardly deals with digitalization and the associated flexibilization of work and is therefore not discussed further in this dissertation.

2.4.1 Flexible working

In recent decades, work has become increasingly flexible[15] in terms of time and space (Messenger, 2019; Sennett, 1998). Recent studies illustrate that, in particular, knowledge work[16] has become increasingly location-independent and can be done in multiple locations (Burchell et al., 2020; Koroma et al., 2014; Pajević & Shearmur, 2017; Putri & Shearmur, 2020; Shearmur, 2020; Stevens & Shearmur, 2020). This change questions the relevance of fixed workplaces at, for example, an employer's premises (Ojala & Pyöriä, 2018), as work can be done from any place with an Internet connection and the use of ICTs. Such mobile and multilocal work forms have become popular for knowledge workers (Clemons & Kroth, 2010), most likely even more after the Covid-19 pandemic.

Multilocal work differs from stationary work forms such as home office telework (Hislop & Axtell, 2007) or work at an employer's premises (Ojala & Pyöriä, 2018). Multilocal work, which is also considered a mobile form of work, differs from other forms of work especially in the constantly changing context of the work environment (e.g., the type of a workplace, the social space at workplaces, the number of frequented workplaces, the frequency of changes between workplaces, etc.), whereas multilocal work is therefore not to be understood as monolithic, but as dynamic (Koroma et al., 2014) – and thus dynamic in space.

In my term 'digital multilocality', I also put an additional, more targeted focus on the work organization with digital technologies in such multilocal work practices. Multilocal work practices are made possible in particular by the use of ICTs, which increases the mobility of workers (Green, 2002; Hislop, 2013; Hislop & Axtell, 2007; Pyöriä, 2005; Vartiainen, 2006). This new way of working sheds new light on the geography of work, for example, with rural locations as potential workplaces for knowledge work, "as ICT and the immaterial character of 'brain work' should allow workers to locate everywhere and independently of place, thus equally including rural and remote areas" (Nadler, 2014, p. 54). The rural environment can even be beneficial for work, such as a decrease in time pressures, fewer interruptions, the feeling of less stress or increasing work satisfaction (Vesala & Tuomivaara, 2015).

However, little is known about work organization with digital technologies (Pershina et al., 2019), especially in different locations (Forman & van Zeebroeck, 2019; Verstegen et al., 2019). Furthermore, despite there being a large body of literature on flexible working, which deals with multilocal work, many facets of this way of working still remain unexplored (Ojala & Pyöriä, 2018). For example, the geographical context is rarely taken into account, which also

[15] 'Flexibility' is understood as a reaction to changing conditions with little exertion of resources or effort. Thus, flexibility in terms of work represents the reaction with low effort to changing conditions of the activities that people fulfill in their process of production (Benner, 2009). I understand the flexible alternation of workplaces as such changing conditions.

[16] Knowledge is generally understood as "the awareness and understanding of facts, principles, and truths (acquired and refined over time) that broadly relate to the origin, form, function, evolution, and interaction of the natural and human geographical environment" (Currah, 2009, p. 327). In this dissertation, knowledge work is understood as work that is reserved for the higher-status labor force from tertiary education (Elldér, 2019). It entails creative work practices, whereby new ideas and thus knowledge are created (Dul et al., 2011; Mumford, 2003). It is also characterized by higher freedom of workplace and work methods selection (Ojala & Pyöriä, 2018).

means that urban-rural differences have hardly been studied so far in this regard (Burchell et al., 2020).

This dissertation extends the literature on flexible working with a focus on multilocal work practices in the urban-rural context. For this purpose, multilocal work arrangements of knowledge workers, who mainly work in a city at a company workplace or in a home office, but occasionally withdraw themselves to the mountains (to a coworking space or a second home) in order to pursue their work there undisturbed, were investigated. In the following sections, I provide an overview on the literature from economic geography used for this purpose. Article 2 is based on the concept of marginality in the periphery, whereas article 3 builds on the concepts of urban-rural linkages, temporary proximity and embeddedness.

2.4.2 Marginality

Temporarily working in the rural periphery implies that the peripheral workplace must provide benefits and/or amenities for work and life that are not available in the urban center. A recent body of literature considers the beneficial effects of marginality in terms of creativity and the protected atmosphere away from the urban mainstream (Grabher, 2018; Hautala & Ibert, 2018), which also can give free rein to ideas for their (radical) development (Sgourev, 2019). It is an aim of this dissertation to analyze the effects of self-chosen marginality as a strategy in a more current context of multilocal work practices between urban centers and rural peripheries with a high use of digital technologies.

The literature on marginality is traditionally based on the sociological examination of the integration of Jewish immigrants from the European ghettos into the American society. In 1928, sociologist Robert E. Park published the article ‘Human Migration and the Marginal Man’, which is still consulted today as a reference for the scientific discussion of marginality (e.g., Bradatan & Craiutu, 2012; Déry et al., 2012; Goldberg, 2019; Grabher, 2018; Hautala & Ibert, 2018). Park (1928) understood the ‘marginal man’, which is influenced by the notion of ‘the stranger’ by sociologist Georg Simmel (1908), as a person who lives in two worlds and is on the borders of two cultures and societies. In this approach, marginality is viewed as a personality type that is simultaneously insider and outsider – one that belongs and yet also does not.

Nowadays, marginality remains a fuzzy concept that has been insufficiently researched (Danson & de Souza, 2012). It is a broad term and definitions as well as methodological approaches remain unclear (Cullen & Pretes, 2000; Déry et al., 2012). This is particularly based on the disciplinary struggle of the mutual blindness of geographers and sociologists towards each other (Déry et al., 2012). On the one hand, in a social constructivist perspective, marginality is understood as power relationships between social groups. On the other hand, in a more traditional understanding, marginality is understood as an economic concept of distance to markets and political interdependencies, in which areas, for example mountain areas, can be viewed as marginal (Chand & Leimgruber, 2016; Cullen & Pretes, 2000).

Recent studies consider both perspectives to gain novel insights in the effects of marginality on work practices. Marginality is a social position that can be deliberately and strategically taken precisely because of the geographical distance from actors or institutions in urban centers and

is thus freed from the pressure of the urban mainstream. This means, individual but also collective acting is freer, which is consequently conducive to creativity[17] (Grabher, 2018). This finding shows that the assumed geographical localization of creativity in urban space (e.g., Florida, 2005; Glaeser, 2011) must be questioned, because non-central places can also support it (Grabher, 2018; Hautala & Ibert, 2018; Nel & Pelc, 2020; Viazzo & Zanini, 2014). Thus, liberated from power and control, marginality serves as an incubator for creativity, if it finds fertile ground to flourish in peripheral, non-urban areas, which happens because of less value judgments from outside (Hautala & Ibert, 2018). In doing so, this causes the periphery to allow an escalation of new ideas, even exotic ones, which can eventually be radicalized and stand out from the status quo (Sgourev, 2019).

In this dissertation, marginality is understood as a self-chosen strategy in which a specific position due to distance from an urban center is deliberately created. However, not much research on the effects of self-chosen marginality on knowledge-intensive work exists. In addition, despite marginality and the center-periphery perspective being omnipresent in the literature, this literature treats marginality in a more static sense, without considering the concept in a more flexible alternation of combining marginality and non-marginality and what this entails for multilocal work practices. Article 2 analyzes the temporary use of self-chosen marginality in alternating workplaces between urban centers and rural peripheries.

2.4.3 Urban-rural linkages

Technological advances have inevitably led to a more connected world. People in any location create linkages to other locations through mobility or the use of ICTs (Weber & Freshwater, 2016). This also casts new light on geography, whereby not only the places themselves become the object of investigation, but precisely their linkages in between. This inevitably leads to a relational perspective, which can be transferred to the geographic context of urban-rural, in which the concept of urban-rural linkages[18] challenges the conceptual dichotomy between urban and rural geographic entities and analyze their relationships instead of their differences

[17] Creativity is a buzzword in public debates (Hautala & Ibert, 2018). It can generally be understood as "the mobilization, appropriation, and utilization of knowledge to create ideas, interpretations, forms, goods, methods, or technologies that are distinctly original and imaginative in their application and long-term impact" (Currah, 2009, p. 327). In the specific case of the marginality of Austrian Baukünstler (Grabher, 2018), a group of craftsmen-architects in the Vorarlberg region that have withdrawn themselves from the architectural establishment in Vienna, creativity is strategically linked to geographic space (in this case the periphery), which affects the creation of ideas. Creativity evolves through a recombination process (in the Schumpeterian sense) by belonging to different social groups and is manifested in a receptive collective learning system, through which, for example in the case of the Austrian Baukünstler, new combinations of construction and materials emerged (Grabher, 2018). Thus, creativity can be understood as a process and not simply an output and can be attributed in central (urban) as well as peripheral (rural) areas, which also can become "centres of creative inquiry" (Hautala & Ibert, 2018, p. 1691).

[18] In this dissertation, the direction of linkages is not indicated by using the concept of 'urban-rural linkages'. The concept is simultaneously used for linkages in both directions: from urban to rural and from rural to urban. This is important in order to maintain the relational perspective of the concept. It will be specifically indicated in this dissertation, when the direction is decisive.

(Funnell, 1988). In doing so, urban-rural linkages blur traditional conceptual boundaries between urban and rural.

Yet, urban-rural linkages are not phenomena that have only emerged in the course of digitalization. Even before laptops, tablets or smartphones became part of our everyday lives, scholars examined urban-rural linkages and dealt with social and economic spatial imbalances between urban and rural areas in developing countries. Since the 1970s, urban-rural linkages became of strong interest for development studies (Funnell, 1988). The so-called 'urban bias[19]' concept, elaborated by economist Michael Lipton (1977, 1984, 1993), is seen as an important starting point of a research focus on urban-rural linkages (Funnell, 1988).

Urban and rural are increasingly viewed in relation to each other. This is based on an emerging focus on 'flows' of people, capital, goods, wastes, technologies, knowledge, information, etc. between urban and rural areas (e.g., Atterton, 2016; Bengs & Zonneveld, 2002; Caffyn & Dahlström, 2005; Davoudi & Stead, 2002; Stead, 2002; Tacoli, 1998). Such flows – material and non-material – form the basis of the understanding of urban-rural linkages (Akkoyunlu, 2013; Bulderberga, 2014), because flows "act as linkages cross space between cities and countryside" (Tacoli, 1998, p. 160). This shows that the former dichotomic understanding of urban and rural, based on the view of both as two isolated areas, becomes less significant and outdated (Bengs & Zonneveld, 2002; Bulderberga, 2014; van Leeuwen, 2015).

Recent studies on urban-rural linkages have provided evidence to support such a relational perspective on urban and rural. In this regard, Bosworth & Venhorst (2018) show that mobility, such as commuting, creates economic linkages between the workplaces of high skilled workers in urban areas and the social life center in rural areas. Furthermore, the literature also shows that urban-rural linkages are important for economic actors (e.g., businesses, entrepreneurs) to create linkages in order to reach urban knowledge sources or customers in urban markets (Kalantaridis et al., 2019; Mayer et al., 2016). This leads to the concern that rural areas are economically as well as socially connected with urban areas (Irwin et al., 2009).

Nevertheless, the literature pays little attention to the technologies themselves with which economic actors create urban-rural linkages. Weber & Freshwater (2016, p. 162) highlight that "improvements in transport infrastructures and the rapid adoption of ICT by retailers, service providers and most other businesses have greatly expanded the linkages between urban and rural regions". For the analysis of urban-rural linkages, this means that not only the effects of the linkages should be examined but also the technology or the specific digital devices (e.g., laptops, smartphones) with which urban-rural linkages can be created. Article 3 contributes to the literature on urban-rural linkages with an analysis of the creation of urban-rural linkages through the use of ICTs and specific applications for communication on laptops and smartphones in multilocal work arrangements.

[19] The urban bias is a conceptual approach to understand class conflicts and urban-rural disparities in the Third World that are based on economic and social imbalances of power between people living and working in urban and rural areas (see for further reading: Jones & Corbridge, 2010). This leads to urban-rural linkages by movements from the rural poor areas to the wealthier urban areas (Bradshaw, 1987; Lipton, 1977).

2.4.4 Temporary proximity

Conceptualizations and implications of proximity are an inherent topic in economic geography (e.g., Boschma, 2005). Different types of proximity are widely discussed and an ongoing research desideratum especially with regard to the access to knowledge sources outside urban centers (e.g., Fitjar & Rodríguez-Pose, 2011; Shearmur & Doloreux, 2015). However, digitalization sheds a new light not only on the effects but also on the creation of proximity itself. Such a focus on proximity and technological advances does not only stress geographic but also temporal aspects of proximity (Torre, 2008; Torre & Rallet, 2005).

Previous research focused on so-called 'temporary clusters', which indicate that physical meetings at, for example, business events or trade fairs create proximity between actors from different locations (Bathelt & Schuldt, 2008; Henn & Bathelt, 2015; Maskell et al., 2006; Zhu et al., 2020). Consequently, due to the temporary physical co-location of economic actors in one place, proximity can be understood in a new way, which thus makes proximity temporary rather than permanent (Torre, 2008; Torre & Rallet, 2005). In the digital age and increasingly connected world, proximity can be created at any place and anytime through the use of ICTs (Graham & Anwar, 2019) and thus enhance knowledge exchange over distances (Forman & van Zeebroeck, 2019). Consequently, new forms of temporary proximity across distant locations emerged through the use of ICTs (e.g., through written, audio and video communication), which negate the relevance of geographic proximity (Torre, 2008; Torre & Rallet, 2005). In this dissertation, this kind of proximity is also understood as temporary in nature, as digital communication is not permanent. Hence, this suggests that ICTs facilitate greater links between urban and rural areas (Weber & Freshwater, 2016) and thus bring actors in both locations temporarily closer to each other – not physically, but digitally.

Nevertheless, the literature on which technology actually creates temporary proximity, also in the urban-rural context, remains limited. Article 3 contributes to this literature by examining urban-rural linkages and, consequently, the creation of proximity through the use of ICTs by multilocal knowledge workers.

2.4.5 Embeddedness

The work style of multilocal knowledge workers and their temporary stay in rural peripheries raises the question to what extent they are embedded in the rural local structure. The embeddedness literature provides little information about this, but initial hints, which were also explored in this dissertation.

The concept of embeddedness is applied in economic geography as a tool that tries to explain socio-economic development in space at a regional scale through refocusing on social and cultural aspects of economic activity (Hess, 2009). Based on that, the concept of embeddedness highlights that economic activity as a social action cannot be considered in isolation from its context (Bathelt & Glückler, 2018; Granovetter, 1985). Embeddedness is "defined as a set of ongoing social relations" (Hess, 2009, 423), which must be considered in relation to space. Moreover, embeddedness is understood as "the nature of economic action and the relations of economic actors with their socio-spatial environments" (Oinas, 1997, p. 24). In particular,

embeddedness is also to be understood as a process of "becoming part of the local structure" (Jack & Anderson, 2002, p. 483). It thus depends on relationships and social ties (Jack & Anderson, 2002). In this regard, it becomes obvious that embeddedness is based on networks of social relations (see for further reading: Granovetter, 1985) but also has spatial aspects and is thus interesting from a geographical perspective.

Thus, the embeddedness of actors also depends on their personality and the corresponding space, whereby the dynamic process of 'embedding' is related to the development of local relationships, acquisition of local knowledge and the engagement and value of aspects of the local community (Bosworth & Willett, 2011). This engagement in the local community must be questioned by today's novel multilocal work practices. Recent literature on embeddedness considers the permanent settlement of in-migrants. For example, when an entrepreneur becomes part of the local structure due to social relationships, new business opportunities can arise and their performance increases (Bosworth & Willett, 2011; Jack & Anderson, 2002). In contrast, in-migrants that are anticipating a sort of 'holiday lifestyle' (Bosworth & Willett, 2011, p. 210) become less embedded, which may be the case of multilocal knowledge workers.

So far, literature treats embeddedness as a process of becoming part of a local structure, but we do not know how and if multilocal knowledge workers are becoming part of it due to their temporary limited stays in rural areas. Article 3 extends this literature by analyzing the embeddedness in the rural periphery of multilocal knowledge workers.

3 Research context

The empirical analysis in this dissertation's articles focuses on digitalization in Swiss mountain areas. I selected the Swiss mountain areas for several reasons: First, the Swiss mountain areas are not simply a natural area that can be marketed to tourists but of central economic, social and cultural national importance. New economic opportunities are emerging due to digitalization, such as coworking spaces, but knowledge on the effects of digitalization on changing rural economies in mountain areas is still scarce. Second, compared to other countries, the Swiss national context is interesting for the study of digitalization in rural peripheries because the development of digital infrastructure is well advanced. It thus can be assumed that the urban-rural digital divide is rather small. Third, digitalization in mountain areas is a current topic of regional development, which is also promoted and supported by regional policies. Fourth, Swiss mountain areas are the subject of research in numerous human geography studies. However, compared to research on digital rural development in other European countries, the effects of digitalization in Swiss mountain areas is still largely unexplored. In the following sections, I will provide further details and justifications.

3.1 Swiss mountain areas

The Swiss mountain areas are an important living and working environment. Of course, the territorial range of the Alps goes beyond the Swiss national border. Nevertheless, due to different digitalization developments and the current state of digitalization in rural and mountain areas, the empirical research in this dissertation is limited to the geographical context of Switzerland. This is primarily due to the fact that this dissertation particularly focuses on the connection of mountain areas with urban centers, whereby the focus on one national context seems appropriate.

This dissertation defines mountain areas using the definition provided by the Federal Statistical Office (2019) of Switzerland. In this definition, areas in the mountains are defined in a two-step process in which, first, the altitude of hectares (800m height on average or hectares that have a difference in the altitude: at least 225m between the highest and the lowest point of the hectare within a radius of 500m) and, second, based on the latter, municipalities are assigned to mountain areas when more than 50% of their area is located in a mountain area. According to this approach[20], 37% (n=814) of all Swiss municipalities (n=2,212) are located in the mountain area, which contains 71% (n=2,847,840 hectares) of the total area of all municipalities (n=3,998,668 hectares) in Switzerland (Figure 2). In addition, 25% (n=2,115,973) of all Swiss residents (n=8,484,130) live in mountain areas, where around 22% (n=1,131,385) of all workers (n=5,120,335) are employed (Federal Statistical Office, 2019).

[20] The municipality data is based on the year 2019, the residential data on the year 2017 and the employment data on the year 2016 (Federal Statistical Office, 2019).

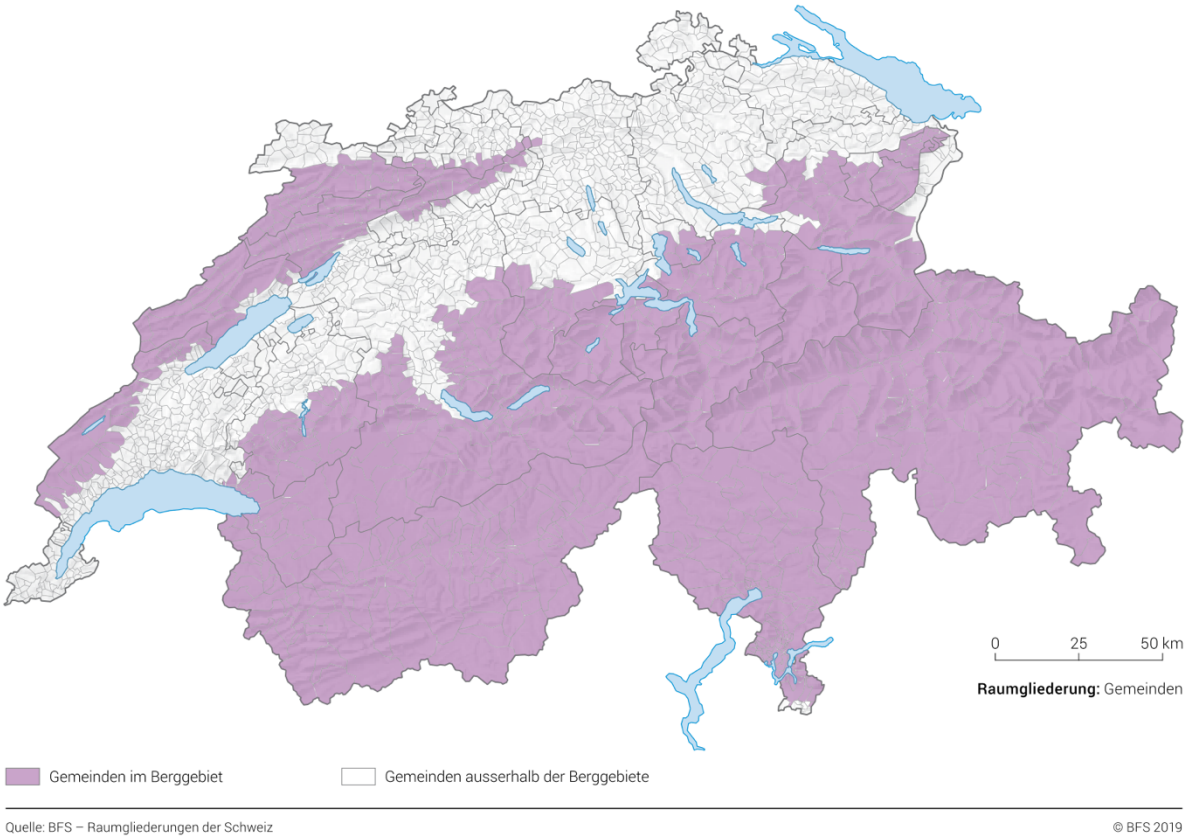

Figure 2. Municipalities in mountain areas in Switzerland (purple). Source and permission: Federal Statistical Office (2019, p. 3).

The Swiss mountain areas have been inhabited for millions of years. Their natural resources were in demand and used for agriculture, hunting and wood degradation, even by the ancient Romans. However, in the 20th century, the functional and structural transformation of Swiss mountain areas due to economic extensification began and they became hot spots for tourism, recreation, transit and energy production (Veit & Haeberli, 2011). The economic base of the mountain areas that was primarily based on resource exploitation has changed in favor of the tourism industry (Perlik, 2006). Thus, they gained in importance and became popular excursion destinations or temporary places to stay (e.g., second homes) for the urban population (Schuler & Perlik, 2011).

Nevertheless, Swiss mountain areas are facing major challenges such as out-migration and brain drain, ageing, diminishing public service, shortage of skilled workers, increasing number of vacant buildings, which has led to economic and social destabilization of mountain communities (Mayer & Meili, 2016). A glance at regional disparities in Switzerland confirms this imbalance between the mountain areas and other areas (Federal Statistical Office, 2021). In order to counteract this disadvantageous structural change, digitalization is seen as a glimmer of hope to regain economic attractiveness of the mountain areas (Medaglia & Petitta, 2014; Müller-Jentsch, 2017; von Stokar et al., 2018), which will be discussed in the following sections.

3.2 Digitalization in Switzerland

Switzerland is a highly digitalized country. This is particularly evident in the widespread provision of broadband infrastructure to businesses and households throughout the country and the high share of jobs and popularity of remote and flexible workplace models for which a fast and stable Internet connection is essential (OECD, 2020; Weichbrodt et al., 2020). Furthermore, Switzerland has a proportionately higher number of people that use the Internet (97%) compared to the EU28 (87%) (Eurostat, 2021). In terms of ICT equipment, 90.5% of Swiss households have at least one computer, putting the country in third place behind Norway and the Netherlands in an international comparison (Federal Statistical Office, 2020).

In terms of Internet access, Switzerland is one of the most developed countries. Recent published data of national broadband coverage in Europe from 2019 showed that the overall fixed broadband coverage in Switzerland was 99.8% (EU28: 97.1%). In terms of faster Internet, 99.0% (EU28: 85.8%) of Swiss households are connected to 'Next Generation Access' (NGA[21]), which have complete coverage only in Malta and Cyprus. The gap between Switzerland and the EU28 continues to widen in terms of even faster connections, as 80% of Swiss households have access to 'Very High Capacity Networks' (VHCN[22]) compared to 44.0% in the EU28 (European Commission, 2020a).

A similar picture emerges in the coverage of broadband in rural areas. Yet the differences here are even larger. 98.6% (EU28: 89.7%) of Swiss rural households have access to fixed broadband. The NGA coverage of rural households in Switzerland is 93.8% compared to 59.3% in the EU28. The gap is also widening as Internet speed increases: 67.5% of Swiss rural households access VHCN compared to 20.1% in the EU28 (European Commission, 2020a). These high figures can also be attributed to the fact that, in a European comparison, Switzerland also has many areas that do not have rural households such as the northwestern Switzerland, the Lac Leman region, areas in and around Zurich and northeastern Switzerland (European Commission, 2020a).

Politics seems to play an important role in this regard. The universal service license makes a significant contribution to this high coverage: "The purpose of the universal service is to guarantee that a basic telecommunications services offering is made available to all categories of the population and in all the regions of the country. These services must be affordable, reliable and must be of a certain quality. The universal service includes the public telephone service, broadband internet connections and the provision of special services for the disabled" (Federal Communications Commission, 2019). In this regard, all regions, from the major urban agglomerations to the most peripheral mountain areas, have to be digitally connected.

The largest telecommunications provider in Switzerland 'Swisscom' is the holder of the universal service license. Since the year 2020, Swisscom has therefore to guarantee 10 Mbps

[21] NGA technologies of fixed-line broadband access achieve up to 30 Mbps download speeds (European Commission, 2020a).

[22] VHCN technologies of fixed-line broadband access achieve up to gigabit download speeds (European Commission, 2020a).

download / 1Mbps upload (formerly 3/0.3 Mbps) Internet speed to all households regardless of their location (see also the 'broadband atlas' of Switzerland: Federal Office of Communications, 2021). The increase of bandwidth speed was the result of a parliamentary motion from 2016, which demanded that the minimum speed in the universal service be increased to 10 Mbps (The Federal Assembly - The Swiss Parliament, 2016). Just recently, a motion was submitted calling for at least 80 Mbps, but no final decision has been made yet (The Federal Assembly - The Swiss Parliament, 2020). Of course, Switzerland is not the only country that puts special attention on non-connected or least connected areas (e.g., Arai & Naganuma, 2010), but due to the high connectivity rates even in rural areas, Switzerland may be viewed as a forerunner in nationwide broadband development.

A glance at the broadband coverage, the high use of digital devices and the Internet in Switzerland and the existence of the universal service license lead to the assumption that the urban-rural digital divide (see section 2.3) is rather small compared to other countries. Based on this, it is thus possible to study changes and effects of digitalization on rural peripheries such as mountain areas, which can otherwise only be estimated. In addition, the digital developments in rural areas can also be critically questioned by analyzing what rural actors actually do with their enhanced connectivity and what they do not do. Consequently, the high broadband connectivity and access to fast Internet in Switzerland, even in rural households, provides an ideal setting to research digitalization. The mountain region of Engiadina Bassa/Val Müstair therefore served as a suitable research area to study digital transformations (article 1) due to the active local initiative miaEngiadina (2021) that is gearing up with high standard infrastructure such as fiber optic broadband, Wi-Fi hot-spots and additional services for various local and non-local actors. The geographic research context of article 2 and 3 is dispersed over the entire Swiss Alpine arc and set in relation to urban centers.

3.3 Conglomerate of digital policies

Digitalization is a special focus for development across European countries, whereby the 2020s are considered as the digital decade (European Commission, 2021). In this regard, the EU Cohesion Policy (legislative package 2021-2027) supports less connected areas with developments in digital technologies (European Commission, 2020b). Research also emphasizes the need for EU rural policies to foster digital skills and ICT infrastructure in rural areas (Pelucha & Kasabov, 2020). In Switzerland as well, digitalization is given importance and is considered a megatrend (Council for Spatial Planning, 2019), which has an impact on the spatial development of the country. Initially, digital policies at the federal level were mainly general and neglected the geographic context. Over time, however, digital policies became more diverse, with reference to rural and mountain areas coming late in the course of time and more specifically in the 'New Regional Policy' (NRP). In this section, I will focus on both general digital policies and regional digital policies, as they will be discussed for policy recommendations in section 6.3.

Since the end of the last century, Swiss politics has been dealing with technological advances through new means of communication and digitalization on a nationwide level. In 1998, the Internet and ICTs were recognized as supporting resources for society, economy, science and

politics. In doing so, the Federal Council laid the foundation for the nationwide program, which incorporates new technological advances of digitalization by giving priority to new information technologies and the promotion of an information society in Switzerland. The so-called 'Strategy of the Federal Council for an Information Society in Switzerland[23]' initially focused on four principles (access to new ICTs, empowerment of all citizens, freedom in arrangement and acceptance) in which geographic aspects were not mentioned (Federal Office of Communications, 1998). In the revised version from 2006, these principles were still valid, but more emphasis was placed on the topics of eGovernment and eHealth (Federal Office of Communications, 2006). In 2012, the thematic focus was reopened and the information society in particular was recognized as a cross-sectoral issue in which principles for action spread across diverse fields of action (infrastructure; security and trust; economy; e-democracy and e-government; education, research and innovation; culture; health and healthcare; energy and resource efficiency) (Federal Office of Communications, 2012).

In 2016, the Confederation's digital policy 'Strategy Digital Switzerland[24]', which is an umbrella strategy, replaced the former policy of the information society. In general, this strategy focused on the development of the economy in the digital space as well as competent application of ICTs in all areas of life of the Swiss population (Federal Office of Communications, 2016). This new strategy, which represents a clear commitment to digitalization as an overarching development process for Swiss economy and society, pursued the goal of stakeholders working more closely together, which might also have geographic implications but is not yet given special attention in the document. Finally, in an updated version in the year 2018, the importance of digitalization on economic development of rural and mountain areas now found a mention in the strategy. Furthermore, the multi-stakeholder approach was extended with the key issues of artificial intelligence (AI), intensified dialog with the cantons, promotion of new interdisciplinary working methods of collaboration and, importantly, the development of smart cities, smart villages and smart regions (Federal Office of Communications, 2018). In the latest update of the Strategy Digital Switzerland, the aspects of environmental protection and data spaces (for access to trustworthy data and data sharing) were added and the relevance of digitalization for rural and mountain areas was further addressed (Federal Office of Communications, 2020). Just recently, the Federal Council published the '2030 Sustainable Development Strategy', which also assigns a major role to digital transformation for the implementation of the 2030 Agenda for Sustainable Development (Federal Office for Spatial Development, 2021a).

Although national digital policy pays little attention to the geographic context, so has digitalization attracted increasing attention in regional policies. Since 2008, the NRP has come into effect in which the confederation and cantons support rural and mountain areas in their regional economic development. In its second funding period[25], a focus was led on the two topics of regional innovations systems (RIS) and tourism, in which digitalization was already

[23] Translated from German 'Strategie des Bundesrates für eine Informationsgesellschaft in der Schweiz' (own translation).

[24] Translated from German 'Strategie Digitale Schweiz' (own translation).

[25] One funding period lasts eight years.

an important issue (regiosuisse, 2021). However, a study on digitalization and the NRP indicated that digitalization has great economic potential for mountain areas, for example through digital sales channels or new opportunities for networking, and should therefore be incorporated into the NRP to an even greater extent (von Stokar et al., 2018). Consequently, since 2020 digitalization became a core focus of the NRP in order to support economic potential and opportunities in Swiss mountain areas (regiosuisse, 2021). The NRP thus supports regional development projects in Swiss mountain areas such as miaEngiadina (2021), which is considered as one of the lighthouse projects in this regard that received greater media attention (Bondolfi et al., 2019; Hofmann, 2019a; Miller, 2016; Müller, 2016).

However, digitalization is again encountered in various digital policies in relation to mountain areas. There is also the hope that regional digital policies could help to eradicate regional disparities, with digitalization being considered as the appropriate tool for problem solving. More recently, the 'Smart Villages/Smart Regions' program was launched, which aims to ensure the appropriate use of digital technology for the benefit of the population in mountain areas (SAB, 2020). In addition, digitalization projects in mountain areas are also supported by the 'Pilot Program for Sustainable Spatial Development[26]' (Federal Office for Spatial Development, 2021b). Those programs are still new and their impact is yet to be seen.

3.4 A glance at former literature on digitalization in (Swiss) mountain areas

The Swiss mountain areas provide great potential for scientific research. In one of the most famous studies to date in this regard, sociologist Urs Jaeggi (1965) investigated social and economic transformations in the Bernese Oberland. He examined society and economy in relation to each other and found that the one-sided economic structure leads to structural underemployment, which provokes emigration. However, while there is also recent research by economic geographers on Swiss mountain areas (e.g., Mayer & Baumgartner, 2014; Mayer & Meili, 2016; Meili & Mayer, 2015; Perlik, 2019; Perlik & Membretti, 2018; Tschumi et al., 2020), studies focusing on digitalization are absent.

Little work from the international context exists that has looked at digitalization with a particular focus on mountain areas. This literature on digitalization in the mountain context shows that it is important to be digitally connected and that digital skills need to be promoted in these areas. One part of the literature is mainly supply-oriented and emphasizes that more policy interventions are needed to overcome the digital divide between remote mountain areas and central urban areas. The underlying problem is, again, the problem of distance, as mountain areas are often too far away from the cities that benefit from the investments of telecom providers (e.g., Arai & Naganuma, 2010; Bucciol et al., 2007; Li et al., 2007; Ruth, 2012; Vandoni et al., 2007). These studies conclude that it is essential to invest more financial resources in the digitalization of (remote) mountain areas in order to create new digital connections and overcome the digital divide. The other part deals with the adoption of digital technologies, which becomes a challenge because the appropriate digital skills are not available

[26] Translated from German 'Modellvorhaben Nachhaltige Raumentwicklung' (own translation).

in such areas (e.g., Aitkin, 2006; Chakraborty & Bosman, 2005; Gyabak & Godina, 2011; Podber, 2003). Therefore, the subdivision of supply and demand issues (Salemink et al., 2017) is also present.

However, there is a body of applied literature such as policy reports and political agendas that deal with digitalization in the mountain areas of Switzerland (e.g., Gerster & Haag, 2003; Laesser et al., 2018; Müller-Jentsch, 2017; Niederer, 2018; regiosuisse, 2018; SAB, 2018; von Stokar et al., 2018). An example of such applied literature at the EU level is the 'Agenda digitale delle Alpi' (Medaglia & Petitta, 2014). A glance at this literature gives the impression that practitioners and policy makers are faster than research. This is reflected in the recommendations for action emerging from this literature for generous development of mountain areas with fast broadband infrastructure. However, such practices have not yet been sufficiently researched in terms of socio-economic effects and whether they can generate the expected added value in those areas.

4 Research designs and methodologies

This dissertation does not only provide an epistemological contribution to digitalization in rural and mountain areas but also contributes to this literature methodologically. The empirical work addressed the effects of digitalization in mountain areas using two different research designs from heterogeneous data sources. This is showed through the application of a community case study and a mixed methods approach. The empirical work of this dissertation is divided in two empirical blocks that will be explained in the following two sections.

4.1 Community case study

Article 1 builds on a community case study research design that was conducted in order to integrate multiple perspectives on expectations and experiences from digitalization at the actor level. The overarching goal was to examine how fertile the ground is for digitalization in the peripheral mountain community in the region of Engiadina Bassa/Val Müstair. In doing so, this empiricism answers the call for more community-based research on digitalization and rural development by Salemink et al. (2017). This empirical contribution therefore addresses the need for research on the combination of connectivity and inclusion issues. This community case study contributed to the frame of the dissertation but is an empiricism in its own respect: On the one hand, it served to sound out the research field. On the other hand, it provided in-depth insights into socio-economic changes triggered by digital transformations in mountain areas.

This community case study relies on an embedded single case study design (Gustafsson, 2017; Yin, 2014). This single case study design allows to better study individuals and groups of individuals in more depth (Gustafsson, 2017). In doing so, the community builds the case and the actor groups form the units of analysis. The single case study design allowed deeper insights to be gained into the community itself due to the embeddedness in which different units of analysis can be connected to refine the general theoretical outcomes (e.g., Neergard, 2007). Therefore, the community case study serves as a suitable research design to explore a community that is unknown to the researcher and that is only known from desk research. One can immerse oneself in the community and gain a sensitivity for the topic. In this empirical work, the community was understood as a unification of different actor groups that were identified using the snowball system. Nine actor groups were identified: firms and entrepreneurs, municipal administration, religion, health care (veterinarian and human doctors), schools, service providers (national and local), second home owners, tourism (organization) and cultural institutions.

A total of 46[27] qualitative semi-structured interviews were conducted during 18 fieldwork days during summer 2018. Numerous informal talks were not included but still helped to get a clearer picture on the research topic. The interviews were fully transcribed, coded deductively and inductively and analyzed conducting a qualitative content analysis (Mayring, 2015) using the MAXQDA12 software. In doing so, the deductive coding supported the more systematic investigation, while the inductive coding allowed me to remain open-minded and curious, so that the unexpected and the surprising findings can still be included in the research.

[27] 44 interviews were conducted in person, 1 via Skype and 1 via email.

The region of Engiadina Bassa/Val Müstair was selected due to the geographic context of the local initiative miaEngiadina (2021) created by pioneers in 2014 and supported by the NRP. Furthermore, the mountain region of Engiadina Bassa/Val Müstair can be labeled as an unusual case (Yin, 2014), as the broadband connectivity in Switzerland is already high and miaEngiadina is an actor pushing digitalization. Consequently, there is something going on in this region in terms of digitalization. This also differentiates this case from other studies, which were conducted in digitally underserved areas, and allowed for a critical perspective on digital transformations.

4.2 Mixed methods: combining digital and analog methods

Articles 2, 3 and 4 build on the second empirical block of this dissertation. In articles 2 and 3, it was the aim to analyze multilocal work practices of knowledge workers who mainly work in a corporate office or home office located in a major urban agglomeration and temporarily choose to work at a workplace in a Swiss mountain area. The method article 4 provides deeper insights into the methodology and the lessons learned from the mixed methods approach. In this section, a general overview of the mixed methods approach is given, as the detailed research design is covered in article 4.

To gain deeper insights into the subtleties of multilocal work practices between urban centers and rural peripheries, a novel mixed methods approach that combines digital methods[28] and analog methods[29] was applied. However, mixed methods approaches are still underrepresented in scientific research on rural areas (Strijker et al., 2020; Woods, 2010). Nevertheless, they have a clear advantage in the study of rural problems as they "proved to show more insight in a real world problem" (Strijker et al., 2020, p. 264). This recognition is based on the combination of qualitative and quantitative methods, which can generate deeper insights into a studied phenomenon (Tashakkori & Creswell, 2007). Thus, the living and working worlds of multilocal knowledge workers were addressed from different perspectives by using different quantitative and qualitative (digital and analog) methods in order to gain deeper insights. In doing so, this mixed methods approach also contributes to the rethinking of methods for rural studies (Strijker et al., 2020) and for economic geography by providing an experimental approach to bridge the qualitative/quantitative divide as well as the accurate compliance with ethical standards (Bathelt & Li, 2020).

This exploratory methodological approach required careful procedure and is also more challenging because it requires the use and mastery of more research techniques (Strijker et al., 2020). In particular, the 'mixed' element of the mixed methods approach had to be carefully crafted to present a robust framework so that the empiricism could be successfully pulled off without incident. Therefore, it was important to determine from the beginning which method

[28] The term 'digital methods' (see for further reading: Leszczynski, 2018; Rogers, 2013) is used in this dissertation for computer aided methods, which are described by a broad variety of terminologies (e.g., e-Research, digital research methods, methods for Internet research).

[29] In contrast to digital methods, the term 'analog methods' is used in this dissertation for methods that are not computer aided during the data collection process (before data processing).

collects which data and what the sequence of application of the methods looks like. In this respect, great attention was paid to the integration of the different methods and results (Bryman, 2007).

The mixed methods approach was inspired by the automated data collection method of individual user data from the use of digital devices from Crabtree et al. (2015). As the tracking software ('Digital Replay System[30]' and 'fieldwork tracker[31]') of this precedent study was no longer available, which was also confirmed on my inquiry with the first author, a customized methodological approach was developed. In collaboration with project leader Heike Mayer and IT experts Alexander Kashev and Sigve Haug from the Science IT Support (ScITS) of the University of Bern, a mixed methods approach was elaborated in order to collect valuable microdata on work practices using four digital methods (geolocation tracking, laptop tracking, smartphone tracking, self-administered digital diaries) and two analog methods (ethnographic walk-along observations, qualitative semi-structured interviews). The three tracking methods are quantitative in nature and the other three are qualitative. The six methods were applied in two consecutive phases of data collection: The digital methods were applied in the first phase, in which the study participants were tracked for five days at the central workplace and five days at the peripheral workplace. At the same time, they also filled out a self-administered digital diary on each of such a digital work tracking day (inclusive image material taken by the smartphone). The statistical analysis of the tracking data and the qualitative content analysis of the self-administered digital diaries formed the basis for the analog methods applied in the second phase. In this second phase, the data from the first phase was deepened by allowing the study participants to comment on their own data and we were able to ask precise follow-up questions during the walk-alongs from their central workplace to their peripheral workplace.

The use of the Internet and ICTs for research require ongoing reflection of ethical standards of research (Anderson & Jirotka, 2015; Burbules, 2009; Madge, 2007; Tiidenberg, 2018), which were important in this empirical block since the beginning. The highly sensitive nature of the collected personal data required careful research procedure in compliance with high ethical standards in terms of data treatment, accessibility, ownership, disclosure and privacy (Elliot & Purdam, 2015). These are not only important current topics in geographic research using digital technologies but generally in economic geography methods (Bathelt & Li, 2020).

However, it is important to note that the data collection was done before the Covid-19 pandemic and thus is concerned with pioneers of such multilocal work practices. It can be assumed that their number has increased due to Covid-19 and that the motives may be more varied.

[30] The 'Digital Replay System' (DRS) is an application that combines digital records (log files, digital footprints) from study participants. It can also combine different data sources (e.g., audio, video, text) (Crabtree et al., 2015).

[31] The 'fieldwork tracker' is a smartphone application that creates location-based logs of smartphone activities (Crabtree et al., 2015).

5 Articles

Article 1: Digital Periphery? A Community Case Study of Digitalization Efforts in Swiss Mountain Regions

Authors: Reto Bürgin, Heike Mayer

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Chapter 4
Digital Periphery? A Community Case Study of Digitalization Efforts in Swiss Mountain Regions

Reto Bürgin and Heike Mayer

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Keywords Digitalization · Broadband · Peripheral community · Switzerland · Urban-rural linkages

R. Bürgin (✉) · H. Mayer
Institute of Geography and Center for Regional Economic Development, University of Bern, Bern, Switzerland
e-mail: reto.buergin@giub.unibe.ch

H. Mayer
e-mail: heike.mayer@giub.unibe.ch

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4.1 Introduction

Digitalization[1] has become a central part of our everyday lives. As a result, permanent and immediate access to information reached new dimensions. Digital devices and online communication tools have become more important for work and leisure [4, 6, 33, 92, 103, 105]. However, not all people and communities have equal access to the Internet and can benefit from using digital technologies. Notably peripheral mountain regions[2] are still lagging behind the urban core in terms of broadband[3] access and use of ICTs[4] for business and private life [57].

In Switzerland, mountain regions also face a number of disadvantages regarding the access to information and services. There is a general fear of being digitally excluded and left behind (see e.g. [84, 85, 107, 108]). The potential of digitalization is widely discussed and there are efforts underway that aim to utilize digital technologies to connect Swiss Alpine communities in the periphery to urban centers (see e.g. [61, 64, 108]). The mountain region of Engiadina Bassa/Val Müstair is particularly interesting, as there exists a local initiative called 'miaEngiadina' (Eng. my Engadine). The goal is to advance digital development through fiberglass implementation and related offerings such as Wifi hot-spots and co-working spaces known as 'mountain hubs'. The initiative aims to transform the region into a so-called 'third place[5]'. In doing so, the aim is to attract teleworkers and digital nomads from cities for co-working in the mountains [58, 62].

[1]We understand the term 'digitalization' as the conversion of analogue technologies (especially information and communication technologies) into digital formats and as a process that combines the rapid development of ICTs and, in particular, the spread and use of the Internet and its infrastructure (see [9]).

[2]Peripheral regions can be understood as areas "outside the main metropolitan growth area" [51, 18]. This is a process-oriented perspective on the subdivision center-periphery (especially rural regions and mountain areas). Swiss mountain regions are part of the European Alps and here we consider them as peripheral regions [51]. Peripheries are also defined as outskirts and in geography, the term is applied to scarce populated rural regions, border regions or suburban fringes of cities [43, 368–369]. In this chapter, we understand Alpine mountain communities as part of the periphery.

[3]The term 'broadband' is used in terms of a high speed Internet connection that differs from traditional telecommunication infrastructure (Czernich et al. 20: 505). Broadband allows high bandwidths for data transfer in very short time (e.g. see [65], 7). It makes part of telecommunication and combines data of multiple channels in a single medium of communication [60].

[4]'ICT' is a collective term for both information and communication technologies as fixed telephone networks, mobile telephony, Internet and broadband access and for devices such as mobile phones, notebooks, desktop PCs, servers and LAN infrastructure (see Böcker and Klein 13: 11–13).

[5]A 'third place' is a social environment or public setting that combines the 'first place' (home) and the 'second place' (work) that is integrated into daily life (see [67, 270]). The term was introduced by the American sociologist Ray Oldenburg and describes informal public places for gathering [66, 6], where people enjoy the company of others and they can benefit from social participation in this arenas. Third places are forums of association for new experiences and relations that are unavailable otherwise [67, 267–270]. Active participation, conversation and the social exchange

Not only due to this local initiative, but also in general, Switzerland is an interesting case to study digital connectivity in mountain peripheries because of the excellent nationwide coverage [26, 30, 41, 99]. This raises the critical question about how the urban-rural digital divide looks like in a country where peripheral regions are relatively well connected to the Internet and how local communities are experiencing digital transformation.

Focusing on local experiences of digitalization connects with a number of research gaps [110]. There is particularly a lack of research regarding the adoption of digital technologies in mountain communities. Also, research on a community level that combines the perspective of connectivity (supply side) and inclusion (demand side) is still lacking. The research presented in this chapter answers the call for more community-based research on rural development in the digital age by Salemink et al. [87, 368]. To analyze adoption of digital technologies in a mountain community, we conducted a community case study in the Swiss mountain context and focus in particular on the region where miaEngiadina is currently being implemented.

Digitalization has become a relevant topic for Swiss mountain communities and their economies are changing as a result. As Woods [111] argues, technological change is one of the key drivers for rural change. Digitalization can bring up new economic opportunities for rural areas and shape rural economies that may become less dependent on resource-based sectors such as agriculture or forestry. In order to reflect these changing rural economies, we conducted empirical fieldwork in order to find answers to the following research questions: In what ways does the community of the peripheral region Engiadina Bassa/Val Müstair experience digital change as illustrated by the case study? In what ways does the case study reflect the realities of changing rural economies?

4.2 Literature Review

Digitalization challenges mountain regions and provokes structural economic changes. These changes may offer new opportunities like teleworking and linking peripheral businesses with firms in the central regions [100]. So far, little attention has been paid to research on digitalization in Swiss mountain communities. Yet, there is some research on digital development in a mountainous context (see e.g. [1, 5, 15, 17, 36, 76, 83, 113]). These studies found that due to affordability or cultural problems, major gaps between urban and mountain regions exist in terms of ICT use and Internet connectivity. The studies highlight that mountain areas need further investments in digital development and infrastructures so that their

are key elements for third spaces, which become embodied in a "spirit of pure sociability" [67, 272]. Examples for third places are diners, coffee shops, public parks or today's co-working spaces [89, 72].

communities can be connected and not remain isolated. These studies also note the importance of policy interventions for bridging the digital divide. In addition, a larger body of applied literature such as policy reports, political agendas and newspaper articles exists particularly for Switzerland (see e.g. [31, 59, 61, 62, 64, 84, 86, 77, 78, 108]). At the EU level, the 'Agenda digitale delle Alpi' is also an example of such applied work (see [57]). Common to these reports is the positivist perspective on the potential of digitalization. This is understandable as policy-makers across the board are quite optimistic about digitalization.

Switzerland is an economically, socially and culturally advanced (western) country. Around 85% of its inhabitants live in cities, towns or in the surrounding suburban areas [28]. While the Alpine mountain region accounts for approximately two thirds of the country's total area, only around one fourth of all Swiss residents lives there and this region hosts one fifth of all workplaces [86]. However, rural regions in general, but more specifically Alpine mountain regions are still lacking behind urban economic development [91, 40]. In recent years, the typical rural economy in the Alps that is primarily based on resources has changed through e.g. the development of the tourism industry, which today is dominant in these regions [73, 229].

With the exception of urban tourism centers such as Davos or Zermatt, the majority of Swiss Alpine regions are rural and in some cases even peripheral. A number of mountain communities are geographically and functionally separated from metropolitan core regions (see also [3]) and suffer from out-migration, ageing, brain drain, etc. Nevertheless, it is important to keep in mind that Swiss mountain regions differ from other European mountain areas due to federalist policies (see e.g. [47]), which, from the past until today, have led to decentralized development dynamics. According to this, the federalist structure of Switzerland and location factors such as available space, the beauty of the landscape and regional identities are factors that make mountain regions attractive to live [16, 17, 61, 73].

For centuries, the European Alps were affected by out-migration, especially of younger people. This process resulted in brain drain and in consequence to socially and economically destabilized traditional communities in the mountain regions [53]. In recent years, some Swiss mountain regions have become more attractive for working and living. They attracted amenity migrants [73], 'new highlanders[6]' (see Bender and Kanitscheider [10]; [49]) respectively 'new highlander entrepreneurs' (see [53]) and second home owners (see [81, 82]). With the in-migration of new types of residents, new uses such as living and leisure of Alpine regions represent new types of valorization of this landscape. As a result, the qualities of the landscape have become rare and marketable resources [90, 146]. Improvements to infrastructure and enhanced connectivity for commuters helped with these changes.

[6]New Highlanders are immigrants in mountainous areas that decide to move—mainly with their families—away from major centers and to work in a peripheral area. Due to modern telecommunication technologies, new highlanders are able to work from home and commute sporadic to appointments or meetings in core centers [49, 5]. New highlanders can also establish new firms or establish branch offices and become so-called 'new highlander entrepreneurs' [53].

These improvements may have led to shrinking distances between the urban and the rural, and have allowed "families to move from urban areas into mountainous regions while maintaining their workplace or school in the town linked by periodically, weekly or daily commuting" (Perlik 72: 2). Selective in-migration and the increased valorization of mountain regions have implications for the rural economy. Traditionally, mountain regions have been seen as places for leisure and travel for urban dwellers. Furthermore, the periphery is *inter alia* characterized by farm and non-farm agricultural industry that is dominated by SMEs, low levels of R&D and innovation, weakly developed clusters, few knowledge providers, low production, low rates of entrepreneurship, weaker financial capacities of companies and a place shaped by interaction and information-related disadvantages due to its distance from core regions (see e.g. [21, 24, 23, 102]). In recent years, the characteristics of peripheral regions changed profoundly and digitalization plays a relevant role.

4.2.1 Rural Change and Digitalization

In recent decades, rural economies have changed substantially. Their function of traditional primary production became challenged by new consumption patterns. This implies a shift towards a more consumption-based rural economy. The rural does not only serve as a "picturesque backdrop to urban development", but also as a place with diverse functions and economic opportunities [93, 633–634]. While there is little question about these changes in the past, future changes such as the influence of digitalization and their effects on rural population are uncertain (see e.g. [111, 630]).Technological improvements may lead to a rediscovery of mountain regions, not only for leisure, but also for work. Woods [111, 623] notes that "the shift towards a consumption-based economy involves different priorities for land management and planning, leading to localised conflicts". Other key drivers of rural change are urbanization, globalization, environmental change, political and ideological pressures and technological change. Technological change implies that "new digital and communications technologies are creating new economic opportunities in rural areas and reconfiguring rural service delivery and the practice of everyday life in rural communities, as well as reshaping agricultural practice and geographies" [111, 623]. In this regard, digital technologies induce profound changes in rural economies and communities.

Rural economies have seen their traditional economic base in decline in recent years. Shifts in roles and functions of agriculture served as a starting point for examining rural transformations such as "demise of productivist agricultural models, opening opportunities for a substantial growth in demand for new uses for rural space (e.g. amenity, recreation, conservation, residential) and creating new conditions for actors to pursue their demands both in the market place and in the political system" [94, 1–3]. As stated by Hill [38, 43], "perhaps the most pervasive myth, and one that still dominates the rationale behind much current policy

intervention, is that agriculture is the driver of the rural economy". Furthermore, the economic role of agriculture and forestry in rural areas seems to be less important [38, 43]. New perspectives for rural economies are "new orientations within their extended productions systems" such as bio-economy, biotechnology, experience, creative activities and realizations or displacements of activities from the core to the rural resp. periphery [21, 224–226]. De Souza [21, 224–226] also highlights that ICT and improved communication facilities become relevant for this. As De Souza [21, 122] argues, the periphery cannot keep pace with the digital revolution and continues to be left behind.

The position of being left behind may be detrimental for the periphery's economy. As stated by Grimes [34, 175], "there is a real danger that peripheral rural areas will become increasingly disconnected from the opportunities presented by the new digital economy". In addition, the competition for rural SMEs can become more intensified in the digital economy: "Despite the efforts of development agencies to help rural SMEs to benefit from the opportunities arising from ICTs, there is a real threat that rural areas may become further marginalized as a result of competition from outside their areas" [34, 181]. This shows that contradictory developments in terms of digital connectivity can emerge in rural areas and particularly in mountain communities, as the heterogeneous set of actors in these communities may not experience the change towards new types of rural economies in the same ways. Moreover, the contribution of ICTs for rural businesses can also be limited and the associated hype with the telecommunication sector should be more questioned [34, 189]. Disparities in levels of participation of community members (individuals, businesses, institutions, etc.) in the digital economy are significant and may produce a consistent digital divide between urban and rural areas [34, 188].

4.2.2 From Digital Divide to an Urban-Rural Digital Divide

Debates around this digital divide are ongoing and the geographic perspective has become quite relevant. In this sense, digital divides do not only exist between the rich and the poor, but also between metropolitan and rural areas [45, 31]. Studies on the digital divide assume that the division is still widening between urban and rural regions (see [11, 556], [87, 363], [88, 558], [105, 457–458]). On a spatial level, the digital divide can be analyzed as some sort of 'urban-rural digital divide', which, according to Philip et al. [74, 394], "has quickly become an entrenched facet of exclusion facing rural communities". The 'urban-rural digital divide' [11, 27, 69, 74, 87, 95] places the technological concept of 'digital divide' in a spatial tension, where the technological aspect of digital divide is challenged by the geographic urban-rural context. Salemink et al. [87, 363] differentiate this by saying that "newly developed technologies are likely to be urban-led and based on ubiquitous connectivity, designed without consideration for rural needs. This dominant and largely urban rationale leads to the perpetuation of the urban-rural digital divide".

In this sense, "many rural communities are unable to exploit the full potential of the Internet and thus continue to be at a comparative disadvantage to the majority of their urban counterparts" [75].

The debate assumes that rural areas run a risk of falling further behind due to lacking digital connectivity in terms of broadband access [109]. Furthermore, rural and remote areas with unstable satellite, wireless and mobile Internet technologies are facing challenges of speed and reliability of the Internet [2, 63]. The resulting status of 'remoteness' can lead to economic and social disadvantages. Practices of daily-urban-life, such as online (social) networking, online banking, online shopping and working, can be a challenge for unconnected rural communities [103, 581]. As a consequence, "people who live and work in remote areas are unable to adequately benefit from the high value-added services currently available via the network" [57, 20].

Yet, businesses and societies in rural areas may effectively benefit from enhanced Internet connectivity (see e.g. [2, 69, 75, 103]). Furthermore, as our case study shows, policies push digital development in these regions. Efforts in order to improve ICT can support business innovation, the efficiency of public administration and foster social inclusion [57]. While the benefits are often discussed and presented, the actual receptiveness by actors in peripheral communities for digital connectivity is still unclear (see e.g. [2]). Even when access to broadband technology is assured, it is not certain that rural residents will participate in a modern (online) society, due to the "willingness or ability of residents to adopt" these new technologies [103]. Having access to digital connections does not imply that people will use it [19, 70].

The digital divide may also result in a digital rural penalty [87] that can lead to negative consequences for the economic competitiveness of businesses in rural regions. This leads to a paradox where "regions most in need of improved digital connectivity, i.e. rural regions in decline, are the regions which are the least connected and included" [87]. One aspect of this penalty is poor broadband availability [88]. However, Irvine and Anderson [39, 20–23] proved in an earlier study that the use of ICTs is essential, for example, for peripheral hospitality businesses in order "to remain competitive and to attract and manage visitors". According to Roberts et al. [80, 358], the access to digital infrastructure plays a crucial role for working and living because "if digital telecommunication infrastructure and applications are not equally available to all, regardless of location, those working and living in not served or underserved areas, such as many rural areas, are disadvantaged". Businesses in rural areas need continually to develop and stay connected with other businesses to remain viable [104, 178]. In this sense, Internet and ICTs may compensate the penalty and problems of physical distance by providing new economic opportunities [103, 586].

On a broader level and related to the emerging discussion of urban-rural linkages, new technologies have "changed the nature of distance" [40, 5]. With broadband access, remote areas do not have to be remote anymore or perceived as the so-called 'hinterland'. Following the argumentation of Anderson [3, 97], peripheral regions are closer than before, because of new technological improvements. He highlights

telecommunications and transportation improvements, which "lessened the distance between the core and the periphery". Furthermore, telecommunication developments and infrastructure have strong effects on the interaction between urban and rural areas [106, 273, 274]. According to Anderson [3], physical spaces move closer together through digital innovations that help to overcome physical distance. McIntyre [56, 230] strengthens this argumentation and observes that progresses in communication technologies and transportation lead to increased mobility, which brings "rural and urban communities closer together in both character and space" [56, 241], Ref. to Barnes and Hayter [8]. As a result, technologies like ICTs help to overcome physical distances through advancements in mobility, so that people can live further away from their workplaces [14, 4]. As a result, the actual physical borders between urban and rural areas tend to disappear and the traditional dichotomous understanding of urban and rural may become outdated [16, 157]. This in turn may lead us to think about and question the traditional sharp distinctions between the urban and the rural, which may become obsolete (see [48]).

4.2.3 Adoption of Digital Technologies from a Community's Perspective

Scholarly debates around the digital divide tend to not address the effects of digital connectivity on rural communities and individual community actors. Nevertheless, a community focus seems relevant as the local needs and demands of rural community actors are not uniform and can strongly vary. In order to address these issues, Salemink et al. [87, 361] called for "a new research agenda for better understanding the impacts of rapid technological developments". Our case study is inspired by this new research agenda and focuses on the lack of research on the level of communities particularly in the context of mountain areas. In light of this perspective, the research on digitalization and its effects on rural areas can be divided in two main strands:

- *Connectivity issues* deal with digital connections of places and regions and derived economic benefits. This place-based perspective of the supply side deals with issues such as deployment costs and economic impacts. A relevant theme are material inequalities and connectivity of regions, places and households. In addition, the main focus is "on the lack of digital connectivity in rural areas, which in the literature is referred to as the digital divide, urban-rural divide, or rural digital divide" [87, 362], Ref. to Townsend et al. [103]. Salemink et al. (2017: 362) identified four subthemes such as 'telecommunications markets', 'technologies in rural areas', 'regional development' and 'policy and regulation' that stand in relation to the connectivity issues and the lower level of connectivity in rural areas plays a relevant role.

- *Inclusion issues* deal with themes that are people-based [87], 362, 368). Research in this theme focuses on social inequality issues such as ICT use and development and the ability to participate in the information society [87, 365], Ref. to Mariën and Prodnik [50]. Inclusion research emphasizes factors and mechanisms behind ICT adoption [87, 362]. Salemink et al. [87, 365] identify three subthemes such as 'diffusion theory research' (diffusion of ICT in time and space), 'digital inequalities research' (people's knowledge, attitudes, skills and aspirations) and 'digital inclusion policy research' (inclusion into the digital society of digitally deprived people in rural areas).

As suggested by Salemink et al. [87], connectivity and inclusion research should be combined in a community-based approach. The community focus allows for more detailed insights into the variety of community actor's local needs and demands of digital connectivity and use. As Salemink et al. [87, 369] argue, the design's purpose for such an integrated approach is to bundle connectivity and inclusion research, which can be used for analyses in the context of specific communities.

Why is the community level promising and relevant? Salemink et al. [87, 369] argue that the urban-rural digital divide cannot be solved by generic policies. Instead, rural areas and communities are in need of more customized policies as telecommunication companies are not able to satisfy diversities of individual needs and demands. This is why the community level becomes important as the scale where generic and individual levels converge. In consequence, social and economic aspects are brought together and the supply side and the demand side are addressed in terms of connectivity and inclusion in a 'community-based approach' (Fig. 4.1).

The community-based approach adds a new perspective to research on digitalization and rural development and serves as the impulse for our case study. The community focus can generate deeper insights regarding the community's local

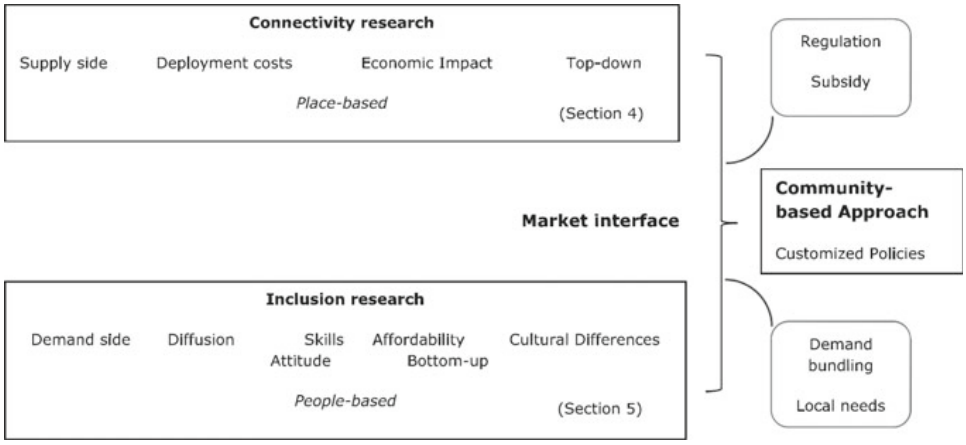

Fig. 4.1 Combination of research on connectivity and inclusion in order to establish a community-based approach [87, 368]

needs. Such a community-based approach generates a more profound understanding of these local needs within communities. Our community-case study addresses this niche by integrating both research strands in order to generate a more nuanced understanding of the varieties of local needs and demands in terms of digitalization in a mountain community. The community case study focus serves as a method in order to illustrate how experiences of digital change vary between different actors in the mountain community. While new economic opportunities can be created, contradictory experiences may emerge due to community actor's different levels of experiences with digitalization. This also has implications for the changing rural economies. Digitalization can indeed enable linkages to core regions, yet, not all actors may benefit from it. Focusing on the community allows us to detect such nuances.

4.3 Methodology—Community Case Study

For this study, we followed the community-based approach and adopted an integrated approach that incorporates multiple perspectives at the actor level. This allows us to focus on various needs at the community level. Our methodological approach answers the call for a more 'community-based research agenda' by Salemink et al. [87]. The community is understood as a set of actor groups,[7] to which the individual actors are grouped. With this procedure, the community itself is differentiated and subtleties resp. differences between the actors can be explored. In this sense, however, the community is not seen as just one actor, but rather as a constructed assemblage of various individual actors.

Our community case study is set at the community level in the region Engiadina Bassa/Val Müstair in Switzerland. We followed an embedded single-case design, where the case (the community) and its units of analysis (defined as actor groups) were analyzed in more detail (see e.g. [35, 112]). The 'embeddedness' of the case study allowed us to analyze various units of analysis *within* the case that were put together to generate an image at the broader level of the case (see also [63, 268–269]). We selected the single-case design instead of a multiple-case design, because single case studies can generate a deeper understanding. The careful study of a single case allows to question prevailing theories and can generate new and adequate insights [35, 11].

Following Yin's [112] typology of case studies, the 'context' in this study is the ongoing digitalization process in a peripheral mountain region. The 'cases' are the communities of the Alpine mountain region Engiadina Bassa/Val Müstair, which consists of two valleys: Engiadina Bassa and Val Müstair. Salemink et al. [87] do

[7]We understand the term 'actor groups' as a collective term for actors and individuals that share similar characteristics in terms of interests and actions such as e.g. clubs, organizations, unions, businesses or social groups that are homogeneous [42, 18–19], [96].

not further specify their understanding of 'community' and do not define who is part of the community resp. of whom the community is made up of. However, the community can be understood as a social and organized network of individuals and actor groups that interact (common goals, identity or interests) with each other and have a sense of 'togetherness' [25]. Communities are traditionally defined as groups in which individuals are connected or organized around common values and predominantly live in the same place [46, 572]. The vague term depends on the context and purpose [22, 418].

In summer 2018, we conducted a total of 46 guided semi-structured interviews with community actors and experts in the case study region of Engiadina Bassa/Val Müstair. The semi-structured interviews were complemented by various informal talks during the fieldwork. We followed the snowball sampling approach, in which we first contacted and interviewed key informants who put us in touch with other community actors. With this procedure and in combination with document analysis, all relevant actor groups were identified. During our fieldwork we identified nine sub-groups in the community, which can be described as firms and entrepreneurs (SMEs), municipal administration (mayors, planners), religion (pastor), health care (human and veterinarian), schools (teachers and pupils), service providers, second home owners,[8] tourism (organization and related businesses) and cultural institutions (national and natural parks, art center, archeology).[9] All interviews were fully transcribed with the MAXQDA12 software. After that, we conducted a qualitative content analysis that allowed us to handle the large data material and to generate systematic and generalized insights (see Mayring [54, 55]).

4.3.1 Case Study Region—An Unusual Case

Switzerland is a small country in the middle of Europe and mountains take up a large share of its territory. While the country is highly urbanized, its Alpine mountain regions are quite important not only environmentally, but also in terms of identity, culture and leisure, resources and tourism. Yet, many communities in these Alpine regions are subject to deeply rooted economic changes such as out-migration, ageing, structural economic changes, etc. (see e.g. [57, 61, 71, 97]). Young people tend to move to the cities in search of better job opportunities, for education or just for living the urban lifestyle. This out-migration leads to structural changes in the peripheral community.

[8]Next to their primary home, second home owners possess a second accommodation (a house or an apartment) that is temporary used. 49.02% of accommodations in the case study region are second homes that are not inhabited permanently [29].

[9]Number of interviews by actor group: firms and entrepreneurs (13), municipal administration (5), religion (1), health care (4), schools (7), service providers (3), second home owners (2), tourism (5), cultural institutions (4). Additional expert interviews (2) were conducted.

Many Alpine communities develop initiatives and programs to address these structural changes. One example is the initiative 'miaEngiadina' that was started in 2014 in the region of Engiadina Bassa. We chose to focus on this initiative and the region for our case study because of its pioneering aspects in terms of digital rural development. The initiative has set itself the goal of developing the case study region with fiberglass implementation and offering additional services such as co-working spaces. Its motivation is to establish an innovative and sustainable model for the region's future. As the initiative's slogan 'your first third place' shows, it is their vision to transform the region into a place for retreat, inspiration and networking, where existing jobs should be preserved and new ones created. In order to achieve these goals, the initiative hopes to attract knowledge workers and companies. Ultimately, the initiative aims to create an alternative vision and sustainable development for the region by emphasizing digital connectivity [58].

miaEngiadina was first initiated by a small group of visionaries who originally come from the region. Today, the project is based on a broad set of private and public actors. The initiative is also supported by public funds from the 'New Regional Policy' [79], a regional development program jointly funded by federal and cantonal agencies [97]. At the time of writing this chapter, the initiative continues to expand fiberglass development into the region, establishes an educational platform for schools, constructs a new campus for innovation called 'InnHub', expands to the neighboring region of Upper Engadine and supports other regions and cantons interested in establishing similar digital development efforts. miaEngiadina targets different actor groups in the region (second home owners, tourism, SMEs, Schools, etc.). The initiative is seen as a milestone project [97] and it is well known in Switzerland and beyond.

The region Engiadina Bassa/Val Müstair consists of five municipalities. Approximately 9.300 inhabitants live in an area of 1.197 km^2. The region is strongly dependent on tourism. Employment is primarily in the tourism sector and most businesses are small to medium-sized. Despite the fact that the buildable land area has been growing over the past two decades, the region is facing outmigration (−3.3% between 2010 and 2016) and the number of employees is declining [29].

Regarding digitalization, it seems relevant to keep in mind that the Swiss Alpine regions differ from other Alpine areas due to federalist politics (see e.g. [47, 92]). For example, the Swiss telecommunication company 'Swisscom' received the basic services concession. The largest shareholder of Swisscom is the Swiss Confederation and Swisscom has the highest market share in terms of broadband Internet access. As the basic services concessionary, Swisscom was assigned to provide at least a minimum data transfer rate of download 3/upload 0.3 Mbps for every permanent inhabited household in the whole country—also in remote areas [7, 101]. In order to ensure the provision of basic services, most of the households in the mountain areas are connected to the Internet with a minimum speed rate.

Our case study region is highly relevant for analyzing community experiences of digitalization for several reasons: First, the peripheral mountain region Engiadina Bassa/Val Müstair is an 'unusual' case (see [112, 52]) due to Swisscom's basic services concession. Switzerland has one of the most developed network coverage

in Europe [57, 13]. In 2017, 99.0% (EU28: 80.1%) of all Swiss households and 93.2% (EU28: 46.9%) in rural regions had access to NGA[10] broadband [41]. Second, the case study region is of interest due to digitalization processes taking place currently. The project 'miaEngiadina' pushes digitalization in the region proactively. At present, transformations are taking place and the expectations and outcomes can be analyzed in situ. Our interviews therefore addressed current changes and expectations of community actor groups for the future. Third, the project miaEngiadina targets different actor groups in the region (second home owners, tourism, SMEs, Schools, etc.). The targeted level of the project matches the community-based research agenda (see [87]). Fourth, the case is also of interest because current digitalization efforts can be questioned critically due to the already existing accessibility (by basic service concession) to the Internet in this region.

4.4 Results—Chances and Pitfalls of Experiencing Digital Connectivity in the Periphery

Broadband and the use of ICTs became indispensable for a large variety of actors in the mountain communities we analyzed. All interviewees mentioned that the Internet and the use of computers and smartphones became an essential part of social life and everyday work. As our interviews show, traditional analog work such as for example crafts, medical examinations, teaching, retail, construction work by architects and construction firms, monitoring of animals and vegetation in a natural park, managing a hotel or conducting archeological research are nowadays supported in a variety of ways by digital technologies and connectivity to the Internet. This shows that digitalization has become an omnipresent topic in everyday lives in mountain communities. Furthermore, digitalization influences all types of economic activities and sectors and has the potential to transform traditional rural economies. In this section, we show that digital technologies can encourage new economic opportunities for various actors in the mountain community and that linkages to core regions can be created. In addition, we also discuss how digital connectivity can entail contradictory and in some cases even negative experiences and developments. Nevertheless, these experiences strongly vary between the actors. In this regard, our data show that while the interviewees positively notice the chances and opportunities of digitalization for their work and everyday lives, they also take rather critical stances and show anxieties.

[10]NGA (Next Generation Access) are fixed-line broadband access technologies that achieve download speeds with at least 30Mbps. It is a combination of technologies such as VDSL, DOCSIS 3.0 and FTTP [41, 4].

4.4.1 New Economic Opportunities

Regarding technological improvements to the digital infrastructure, broadband Internet connection is not a new phenomenon in our case study region. However, most of the interviewed persons, firms and organizations are not yet connected with fiberglass broadband technology. The rollout and connection processes are still under development. While the infrastructure is still being built, the initiative miaEngiadina already triggered various projects in the case study region. For example, several co-working spaces have been built and are already operating in the region. One of the co-working spaces is located in the region's main village Scuol and offers 20 workplaces. The largest one is situated next to Scuol in the building of the High Alpine Institute Ftan, an international high school, in the village of Ftan. Around 40 co-workers can find a place in it. The third co-working space is located in Ardez, another smaller village only twelve minutes away by bus from Scuol, where two co-workers can find a place for work [58].

The establishment of new co-working spaces in the mountain community goes along with new production structures for rural and peripheral areas and its changing economies. The emergence of co-working and creative work in the mountain community shows how activities, which are traditionally seen mainly urban, are relocating to peripheral regions (see [21, 224]). This can also be seen as countryside commodification and the development of a more consumption-based economy (see e.g. [111, 623]). As a result, amenities such as remoteness, landscape and nature become re-valorized and serve as impulse for new economic opportunities. The initiative and the establishments of co-working spaces reinforces these changes as they aim to bring new types of residents to the region.

In this regard, the initiators and representatives of the local initiative also provide a "very large network to various Swiss companies" from which especially start-up businesses can profit, as stated by the initiative's co-initiator: "I have directly or indirectly supervised or accompanied various start-ups or arranged contacts where they have proven to be very valuable." Digital nomads or workers from start-ups and other cooperations who can work spatially unbound are targeted clients in order to work in one of the co-working spaces. These multilocal workers are an "interesting group" and "these are people who travel all over the world and I effectively believe that you can spend some time in Bali, but just as well spend a few weeks in the Engadine". The attraction of this so called "work tourism" is one of the initiative's goals, as mentioned by the co-initiator:

> There is also a lot going on in the co-working area. In Scuol, we now have more and more people in the co-working space who use it. At the same time, we opened a new co-working space in Ftan and Ardez. We have more and more requests from partners who want to do their own co-working with us.

miaEngiadina and the associated infrastructure development allows for co-working in peripheral mountain regions and with the establishment of these dedicated work spaces, a new business model has been created. Co-working spaces in Swiss Alpine regions are a phenomenon of recent times. They represent a new

business opportunity, which aims to relocate urban workplaces and lifestyles to the periphery in hope to attract new (part-time) residents and customers. Co-working spaces are not only a core element of the initiative, they are also widely promoted by Swiss policymakers and practitioners (see e.g. [108]).

While these spaces represent new models of work and doing business for a mobile workforce that originates in the urban realm, our interviews show that digitalization also provides potential for new opportunities for other, more traditional businesses. As mentioned by the owner of the large hotel, he is already planning the construction of a fully digitalized hotel in the periphery:

> We want to construct a very modern, contemporary digital hotel. We want to make a modern hotel where you can book 24-hours a day via AirBnB and self-check-in. You can book a room with or without cleaning and everything can be booked digitally such as skis, the ski subscription and the ski instructor. Everything is digital. A 24-hours hotel in the mountains. This is our idea and we are working on it.

While the fully digitalized hotel has not been built yet, the project shows how digitalization triggers innovative thinking by established actors. Another opportunity that was triggered by the ongoing digitalization efforts was mentioned in the interview by the owner of a fashion boutique. In recent years, shopping underwent a shift towards online shopping. Nevertheless, the analog shopping experience has not disappeared entirely. The owner of a fashion boutique mentioned how he recognizes digitalization and takes advantage of this development:

> We have started many years ago with an online shop. That is about 15 years now. It was a very simple shop and it grew without any budget. That led then to a good additional income. Today it is actually already a little professionalized. So today this is already existential, because the business here on site actually tends to decrease and online business increases.

The case of the fashion boutique owner shows that although the Internet negatively influences on-site retail, digitalization also offers new possibilities by entering online retail. He noted that "it's not bad for us if things go on like this, we also benefit". The example of the fashion boutique owner shows how digitalization can also help to expand traditional retail business concepts. It can therefore be a source of innovation in peripheral mountain communities.

While in some cases digitalization shows such positive effects, this is not necessarily true for every retail business in our case study region. The owner of a photo shop did not share the same positive experience in the interview. He observed that the Internet forced price competitions for electronics, which made it almost impossible for him to compete in online retail. Nevertheless, he mentioned social media as a positive factor: "I will make sure that I am there on all the channels. Also, for example, to communicate promotions. And also, that you are always subject of conversation there." While he also offers a selection of pictures that can be purchased on his website, this online retail is not that relevant. It seems to be more relevant for him so stay in conversation with customers and to reach new clients.

The examples generally illustrate that (digital) technological change, as mentioned by Woods [111, 623], is indeed a driver for creating new business opportunities in mountain communities. Nevertheless, there are also contrasting developments and negative experiences with digital technologies, which may lead to more marginalized positions of some businesses due to the competition from outside (see [34]).

4.4.2 Digitalization and Distances Between Periphery and Core

Digital technologies such as the Internet and ICTs allow working in multiple locations while certain types of tasks can be done via cloud software and Internet applications. The use of digital communication technologies influence distances between core and periphery (see e.g. [3, 56, 106]). The empirical data shows that overcoming of physical distances through digital technologies is a highly relevant issue that was mentioned by the majority of the interviewees. Especially the immediate access to information and time saving communication channels via smartphones and the Internet lead to changing perspectives of community members on being peripheral or central. This represents a significant advantage for mountain communities, as stated by one of the mayors who were interviewed:

> It is our advantage, that the distance becomes short. It was insurmountable before and these are the new chances today. We can communicate with the center and you can come from the center and work in our community. At the same time, you have the work here, in the center or vice versa. We can find solutions together or search and solve problems where you do not have the know-how locally. You can generate very short and efficient work.

As mentioned by the mayor, the Internet can bring core and periphery closer together in terms of multilocal work arrangements. Being geographically peripheral in terms of work that can be done remotely does not seem to be a penalty anymore. Relevant information is accessible from everywhere, as long as Internet connection is available.

Mayors, policymakers and the initiators of miaEngiadina are obviously aware of this potential. Yet, other economic actors also see this potential to overcome physical distances via the Internet and use of ICTs. One example is the healthcare sector. All interviewees of this actor group highlighted the significant relevance of the Internet and use of ICTs for their work. They specifically mentioned easier communication with patients, being more up to date with on-time information and being able to provide better health care—not just for humans, but also animals. The interviewed veterinary doctor reverberates the relevance of the Internet in order to provide better health care:

> Communication with specialists reduces the distance. It becomes irrelevant. I could also do the same with specialists abroad or somewhere else. However, this is actually a national thing, we stay there in Switzerland and you know who is who and you know who to ask and to whom you have confidence. So that's important for us, it brings us closer.

Having the opportunity of immediate access to second opinions and health experts in urban regions is a major change to the traditional provision of health care in the periphery. Telemedicine became increasingly relevant in order to provide adequate health care services also far away from urban core regions, as mentioned by a member of the larger hospital's executive board: "We have also recognized that thanks to digitalization the peripheral regions are moving closer to the center and a bridge can be built, which would otherwise not have been possible."

Next to telemedicine, digitalization also gives doctors in peripheral mountain regions direct access to up-to-date medical knowledge, which, as mentioned by the family doctor, is an important improvement for their work in the periphery. Because distances to important knowledge sources such as libraries and experts that are most often located in core regions are quite large. As a result, the Internet can profoundly compensate this penalty:

> Information is of course very important, because the further away you are from any library, the happier you are the quicker you get to the information in the Internet. There are many open source articles. You always find them. […] Especially the half-life of our medical knowledge is short. Therefore, they say, anesthesia is two or three years I think and for the other medicine it is maybe five or six years. That is the half-life of medical knowledge, which means that after that time half of it is outdated, no longer up to date. The atlas of anatomy does not change so fast, but otherwise therapies, diagnostics and possibilities change fast.

As stated by the family doctor, the Internet reduces the physical distance to knowledge sources and enables instant access to medical knowledge online. This is relevant for providing up-to-date medical services in the periphery. Nevertheless, access to written knowledge is just one part of digitalization and its relevance for health care. On the other hand, as stated by the veterinary doctor, the Internet is a time saver and allows comparing prices of medicine. Two important aspects that have a direct financial impact especially for independent doctors who are often few in numbers in the periphery. All interviewees in the health care actor group noted the positive experiences with telemedicine and the opportunities that come along with enhanced digital connectivity.

Another actor that may profit from shrinking distances is the international high school. Digital technologies do not only affect school lessons, they also provide new teaching opportunities and direct economic benefits. Because schools in the case study region are significantly smaller than in urban areas, the educational offerings are smaller too. However, digitalization triggers new opportunities and can be "economically interesting", especially in terms cooperation with other educational institutions in order to reduce the peripheral penalty, as stated by the school director of an international high school:

> We receive students from all over the world. We also want to be connected here. We have the ideas that we could cooperate with schools in the medium term. With a Chinese university, one could also collapse the Mandarin lessons. As an extreme example, so that our Chinese pupils could also be in class with China. Because, as a relatively small school, we cannot provide the full range of education from our perspective with the classic school model. […] In the medium term, our school will be two-third international and one-third regional; perhaps from Switzerland. Moreover, there will certainly be new demands on us. I have now given the example of Mandarin lessons, where if, for example, we do not have enough Chinese pupils, we will not be able to bring a Mandarin teacher up here. However, this could also be a sales argument for us. On the one hand, it is a Swiss school where our students can graduate here. They get to know the culture. And on the other hand, we could still take something from these cultural circles, where they come from, into the school.

Furthermore, the cooperation with other educational institutions in order to combine classes via digital communication paths has become a viable vision. In this sense, national and even international collaborations can be created that can save costs and enlarge the school offerings. This in turn can increase the school's attractiveness and educational offerings. As our interviews showed, school representatives in the mountain community are highly aware of the possibilities of digitalization and they are already thinking about harnessing its potential. This is connected to miaEngiadina's efforts to connect the region's schools with fiberglass broadband and efforts to build online platforms that connect schools, teachers and pupils within the region.

The interviews and mentioned examples illustrate that digital technologies can bridge physical distances within the case study region itself and can bring the periphery closer to the core and vice versa. Certain types of work and communication can be done in various places as examples from our data show: digital connectivity enables external maintenance of machines and robots of a local brewery, allows to simultaneously manage a bed and breakfast in the periphery and a daycare center in the city or can speed-up work processes due to immediate data transfer from person to person over larger distances within the periphery itself or with core regions. While these examples show a certain bridging between core and periphery and many interviewees stated that digitalization links periphery and core in cognitive ways, it still cannot overcome physical distances per se. In this sense, direct contacts that rely on physical proximity such as for example with customers are still relevant and important.

This section's selected examples illustrate how ICT use and the Internet indeed contribute to transforming processes of various forms of distances between the core and the periphery. This finding goes along with the assumptions from the literature that technological improvements of telecommunication technologies lessen the distance between core and periphery (see e.g. [3, 56, 106]). In general, while the physical distance between the case study region and the core remains unchanged, the Internet and the use of ICTs bring urban and peripheral actors closer to each other within the digital space. Linked to this is also the aspect of speed and time saving by not having to travel from one location to the other to access information and knowledge. Reflecting upon changing rural economies, new types of linkages between the core and the periphery emerge through digitalization and can bring businesses, organizations and institutions in the periphery closer to the core.

4.4.3 Contradictions of Digitalization in the Periphery

As outlined above, digitalization seems to bring many positive aspects to mountain communities. Yet, as our interviews also show, various actors make contradictory experiences with digitalization. Emerging contradictions due to digital connectivity imply that digitalization not only has upsides, but also downsides in the periphery. This leads us to a more nuanced and dialectical understanding of digital transformations in the periphery and a discussion of its unfavorable effects. Peripheral businesses can see new economic opportunities in the Internet, but at the same time, competition is increasing too. Furthermore, the impersonality in the Internet can lead to new insecurities for peripheral businesses due to higher flexibility of clients in the digital economy. Also second home owners experience contradictory transformations when they find themselves in a dilemma of being constantly digitally connected and enjoying the recreational amenities of the periphery in terms of not being connected and distant from everyday life at the primary home's location. Second home owners, which represent a rather large actor group of the mountain community, seek the peripheral environment in order to enjoy the nature and landscape. The president of the second home owners association in the case study region said the following:

> The highest priority for most second home owners is that they can simply meet their expectations up here. For many this means: nature, sports in winter and summer, but also a certain distance from 'daily routine'. Especially that you live in a different surrounding from home and do not feel like being a slave of various facilities or having to check every ten minutes for a possible new email. There are many of us who simply turn off their mobile phones on a daily basis.

The periphery serves them as a place for leisure and gives them distance from everyday life in the urban core. Yet, ICTs and the Internet are constant companions in order to access information during the stay in the second home.

Contradictions at the community level and within individual actor groups became obvious in a variety of interviews. For example, as digital technologies profoundly transform the hotel industry, new platforms in the sharing economy were created, data and statistical monitoring became more precise, infrastructures were added and business models became digitalized [44]. In practice, however, through digitalization hotels can adapt more specifically to the needs of their guests, as explained by the owner of the largest hotel in the region: "We need to have people [guests] who can be managed differently. Much more efficient, faster and more flexible. New products for new guests. And that is where digitalization comes in." He also mentioned the advantage of advertisement in the Internet, because "we can't do without it anymore. Classic advertising is practically disappearing today". While customers can be attracted with online advertisement, online booking platforms became an indispensable tool for the hotel industry in Swiss mountain regions. Booking procedures became simplified and can be done faster by both customers and suppliers. All interviewed hotel owners mentioned the time saving aspect of online booking. In addition, the managing director of a booking platform

for holiday apartment rental and event organizer mentioned the high relevance of these online platforms: “I think we are the ones who are present at the moment on the right platform and our apartments are booked above average compared to many other apartments.” She goes further by emphasizing that digitalization infiltrates her daily work because “we work every day, with all projects digitally. Be they events, most of which we only advertise online, or data management. If someone nowadays could no longer register online for a bike race, then we simply have no more registrations. This is an everyday topic and I notice that we stand in front of a radical change that is taking place”.

In times of online booking, hotels are undergoing profound changes in terms of customer care and communication between hotels and customers. In contrast, while the booking procedure and transaction became facilitated due to digital technologies, personal contacts between staff, hotel owners and customers seem to decrease more and more: “Our generation is such that we actually like to know what the guest’s name is, what he sounds like on the phone, how he writes. This became very impersonal now”, as stated by the owners of the medium sized hotel. These kind of personal relations seem to be relevant, as they continue, especially for the hotel industry in mountain regions:

> It is also an important part of guest houses in these small villages. If you fall into this impersonal, then you have no chance to survive. In a city, many new, modern and big hotels are opened. There is a constant supply of customers. Simply by the size. In contrast, here this supply does not come. The guest who is here we must be able to keep it and say that he talks about us and he comes back again. The supply does not come automatically like now in Lucerne where new hotels just keep coming up.

The son of the owner of the medium-sized hotel added to this that “the repeating guest is much more important up here than in big cities”. The repeating guest seems indispensable for the medium-sized hotel, but here the Internet is seen critical, as “you do not get that much [repeating guests] from online stories”, as mentioned by its owner. These statements by the owner of the medium sized hotel and her son contradict the benevolent perspectives of online booking platforms as digitally enhanced communication tools between hotels and their guests. More precisely, they emphasize that this kind of impersonal relation between hotels and customers can be detrimental to run a hotel business in the periphery. The greater flexibility of today’s customers due to impersonal online booking and cancellation procedures create new types of insecurities for these businesses.

Criticism in terms increasing impersonality due to ICT use was also mentioned by other actors. Personal contacts and interactions are still a relevant issue in the digital age. And it seems even more so in the rather small, peripheral communities. As stated by the family doctor, medical examinations are still done best in person and not via the Internet: “The physical examination, it just doesn’t work digitally.” The same is true for schools, as mentioned by the school director because the school is still “a pedagogical place”. She also had doubts concerning the strength of digital networks:

> You have the opportunity to really do networking and form new networks. I think that is a huge opportunity. On the other hand: How strong are these networks? That is the other question. Alternatively: What is the value of personal conversation? Can it really replace that? Or what gets lost? That could also be downsides. But we don't know.

The same criticism towards impersonality due to the use of digital technologies was mentioned by the director of the Swiss National Park: "The conversation with you would not take place the same way on the phone. From that point of view it is still a peripheral region and will remain so." He indeed favors the personal face-to-face interaction instead of communicating via digital channels. A perspective also shared by the director of the region's tourism organization: "Something gets lost in between. It makes many things easier, but I am still convinced that it needs human exchange and human contact." The same is true for the interviewed architect. She mentioned that overcoming distance with digital technologies entails dangers:

> The danger is that the contact between people becomes less. You can do everything with distance. I no longer have to be physically on site with the client, because I can send everything digitally, we can watch it together via face time or with a video call. Maybe the danger is that it will become more impersonal. That would be a shame. Face to face is still the most important thing.

The new possibilities by joining meetings in form of video conferences was a relevant topic mentioned by various actors. Yet, it is also one where skepticism emerged, as mentioned by the director of the smaller hospital:

> We had also studied whether we wanted to do this in the future by video system or something. Nevertheless, I have to say that we break away on it as a peripheral region. Personal contacts are 90% more important to me.

The broad coverage of the community that our interviews allows shows that digitalization entails a large set of contradictions. One of the interviewed carpenters, for example, mentioned that the Internet's transparency could improve working processes between him and his customers: "Actually only an advantage, you save a lot of time to discuss the outline, because he [the customer] already knows from the beginning what it is about. And one advantage or disadvantage, which I interpret as an advantage, is that it has a completely different transparency." In the same interview, he explained "what you can also observe well, the whole market for kitchen construction is completely down. Because the transparency is so high. A Bosch refrigerator in Germany does not even cost half the Swiss refrigerator". This example illustrates how the Internet, on the one hand, can improve working processes and, on the other hand, can make these obsolete due to enhanced price transparency. In this sense, for good or bad, customers in the periphery can also buy their products and services anywhere and do not depend on the carpenter's offerings in the periphery.

The other interviewed carpenter notes another downside of digitalization, because it implies "that you have to communicate a lot more". He goes on to explain that "maybe 30 years ago you had for the same amount of work maybe five phone calls a day. The rest of the time, we had worked productively. Nowadays you have 25 emails instead of five phone calls". In contrast to a larger manufacturing

firm in the region, which has special staff for online communication, the carpenter with its smaller carpenter's workshop loses analog work productivity, as he has to do both digital communication and analog work.

As shown in this section, digital connectivity can be a double-edged sword. It offers advantages such as accessing information, expanding local retail to the online world, simplifying booking procedures or enhancing transparency for local businesses. Yet, these advantages go hand in hand with negative experiences made by various interviewees. In more detail, communication via digital channels such as video conferencing or online booking platforms saves time and can shorten the distance to other actors outside of the periphery. However, this form of communication is more impersonal. In addition, transparencies regarding products and their prices increased due to the Internet. While this can simplify work operations, price comparison has become a problem especially for smaller local sellers. These developments can lead to further marginalization of peripheral regions and their communities (see [34, 181]).

This section showed that digital technologies and their influence on rural communities and economies and also the hype of digitalization can be questioned critically (see [34, 189]). The contradictions can have various origins and effects, as shown by the examples above. Actors in the periphery experience advantages that also have a flip side. In general, these experiences highlight the differentiated critical perspectives on digitalization by various actors. While economic downsides of these contradictions predominantly affect smaller and perhaps structurally weaker businesses, organizations and institutions, contradictory topics such as improved communication versus greater impersonality or faster access to information vs. constantly being connected are issues experienced by most actors.

4.4.4 Differences of Digitalization in the Mountain Community

This section discusses barriers for rural communities in order to exploit the potentials of digital connectivity (see [75, 307]). These barriers affect various actors in different ways. An actor group that experienced profound digital changes in the case study region are businesses and entrepreneurs in the secondary and tertiary sectors. As the empirical data shows, enhanced Internet connectivity and ICT infrastructures seem to be related to high financial costs and this aspect divides the community. While larger businesses, cultural institutions, hotels and hospitals welcome the advantages of digitalization, smaller actors criticize the high costs of enhanced digital connectivity. These differences in financial prowess can lead to stressful situations especially for less powerful actors with fewer resources. This is illustrated in more detail by using the example of the healthcare actor group, where differences within the group are larger and, to a certain extent, more existential in comparison to another group.

Stable and fast fiberglass Internet is embraced by the community's large health care actors. For example, a member of the larger hospital's executive board stated that "we as a peripheral institution, thanks to digitalization we can connect to larger institutions". This is relevant for either finding staff in a peripheral region and facilitating the access for doctors who live at a distance to their workplace, as mentioned by the leader of the hospital's IT group. Through electronic health services, medical aid or supervision can be provided at larger distances. As mentioned by the director of the smaller hospital, the process of e-health development "is even prescribed from above. There is a legal resolution that we actually have to implement in 2020". In contrast, however, digitalization and the upcoming preparations for e-health can bring up new challenges for a hospital in the periphery. The implementation and maintenance of digitalization has larger dimensions for hospitals than for private users. This is also reflected in the finances. In addition to fiberglass broadband access, there are also high costs such as technical equipment and further training for doctors and nursing and administration staff. The interviewed managing director of the smaller hospital criticized these high costs:

> This is certainly something that can almost kill us in terms of costs. You have to be honest about that. Last year these costs were for our small company, with a total turnover of CHF 8 million, already at CHF 160,000. These will continue to grow. One can say for sure that it is a high amount. Moreover, I think with e-health we will certainly be CHF 100,000 higher at some point, once all this has been implemented. You have to ask yourself where its limits are and where you can use synergies.

In addition, the same interviewee mentioned that the canton's administration does not provide enough financial support for this financial risk. The canton creates the law, but when it comes to implementation, the hospital is left alone. A possible containment of the problem could be using synergies with other hospitals. A venture that, as mentioned in the interview, seems to be difficult such as technical differences in patient or accounting administration still exist.

However, digital technologies have their price. As a result, the case study region's institutions with smaller financial resources have restricted access to digital technologies. While the larger and prestigious Swiss National Park is equipped with fiberglass broadband and up-to-date digital technologies, the smaller institutions struggle with the costs for digital connectivity, ICT use and maintenance. In this regard, the commercial director of the art center explained, "I think the problems with using social media platforms are management and resources, because we are just a small team and if you use social media, you have to do well and make good use of the channels". In addition, she mentions that "the topic is certainly speed and dependency, how fast the whole IT develops. We have an external IT company that supports us, but that costs a lot and then you always think three times about whether you take the phone in your hand. And that's a challenge, if you have no idea about an IT problem or just superficial knowledge, then you are quickly in a fix" and the artistic director continues in a humoristic way that "one is also dependent on the specialists. It's like a car, you can't repair it yourself". This example of the art

center shows that it is not all about only purchasing digital infrastructure but also the upcoming cost for its maintenance. In consequence, the example gives to understand that with lower financial budget, digitalization can also lead to interruptions of everyday work processes and stress. The latter is also the reason why the art center used to be cautious when placing its open calls for residencies in its artist house on online platforms:

> Of course you could find us on the Internet, but we did not want to advertise too much for the artist residency, because then we would have received too many applications that we could not have handled in the small team.

At a more general level, the art director explains that "it's the downside that you're totally dependent on all this machinery. Sometimes I think we can no longer all function normally together, we are so dependent". He explained furthermore that the continuous use of digital technologies in combination with the Internet leads to an inappropriate acceleration that one needs to learn how to handle it.

The results in this section show that experiences of digital connectivity in the mountain community can vary between actors and actor groups. The community focus (see [87]) gives more insights in the varieties of the actor's needs and demands of digitalization. As shown in this section, digital differences can arise due to different financial resources of actors. Smaller and financially weaker actors cannot benefit the same way from digital connectivity as financially stronger ones. In addition to the fiber optic connection, this connectivity also entails additional costs for maintenance and new projects such as e-health, which can be very costly. However, there is no general solution for becoming digital in the mountain community, as differences in use and needs can strongly vary. This heterogeneous image gives to understand that becoming digitally connected is a process that does not take place the same way for all actors. A closer look at the actor's needs, demands and financial possibilities shows that digital connectivity may also arise new problems for financially weaker actors in the mountain community. The community-based approach (see [87]) was helpful in order to detect differences of individual experiences of actors made with adoption of digital technologies in the mountain community.

4.5 Conclusion

Digitalization does not by-pass mountain communities without traces. The aim of this chapter was to analyze how the peripheral community in the Swiss mountain region of Engiadina Bassa/Val Müstair experiences digital change. Our findings show that digital connectivity offers chances but also entails crucial limitations for various actors in the periphery. Moreover, not all actors can participate in digital change equally. Divergences between actors must be taken into account and cannot be ignored. As such, larger firms, organizations and institutions in the periphery can profit more than smaller, financially weaker ones. Due to high costs of

digitalization, inequalities and insecurities can arise in the peripheral mountain community. Yet, enhanced digital connectivity can encourage the development of new business opportunities and work patterns in the periphery. In addition, urban-rural linkages can be created due to digitalization. There are new challenges and negative implications such as additional workload, speed and stress as well as the impersonal character of communication that starts to emerge through digital connectivity.

According to this, the findings of the case study provide us various opportunities to reflect upon changing rural economies. In the digital age, conceptual distinctions between urban and rural/peripheral must be questioned, as digital urban-rural linkages provoke a blurring of distances. Digital technologies can bring rural areas economically and socially closer to the core and vice versa. This finding shows also the relevance for fast broadband connections in peripheral areas, which is a technology that enhances these kinds of relations in time and space. Another relevant finding is that the commodification of the countryside can enable new business opportunities that also profit from digitalization. Nevertheless, the findings also show that smaller actors in the rural economy face major (financial) challenges for digital connectivity. Given digital development, various parts of the rural economies are changing differently and individually for various people.

The chapter contributes to theorizations of peripheries, core regions and their relations. In the digital age, space, place, time and distances in between undergo profound transformations. Digital technologies create urban-rural linkages and challenge the traditional perspective on urban-rural dichotomies. It is replaced by an integrated perspective that considers both spatial entities together in a dynamic field of tensions by linkages, which also take place in digital space such as the Internet. In doing so, digitalization leads to a flexibilization of space with dynamic linkages than rigid dichotomy. In this sense, digitalization goes beyond the urban-rural divide in its topographic extent, as digital urban-rural linkages can be created within the dispersed mountain community itself or between the mountain community and urban cores.

Our community-based approach underlines the relevance of a more differentiated and critical understanding of digital transformations for the peripheral actor's varieties in the background of urban-rural linkages as digital divides between actors and actor groups still exist. The community-based approach (see [87]) proved to be helpful for case study research about digital transformations community case. Focusing on both supply and demand provides a more integrated perspective. At this point, the project miaEngiadina comes into play in order to provide a more adapted accessibility that matches the special local needs and demands of the large variety of actors in the mountain communities. Perhaps it can also be understood as getting control over the community's digital future (see [88, 556]). However, the enhanced focus on a larger variety of actors asks for a larger sample and a conscious and careful approach research procedure, which goes broader instead of the deepness.

There are also limitations of the presented research in this chapter. For a peripheral community, the empirical data cannot confirm if digitalization is a

success story or not. In addition, we cannot clarify whether digitalization can indeed eliminate digital divides and whether digitalization can effectively counter larger dynamics such as out-migration, re-migration or ageing of the mountain communities (see also [57, 19–20]). Further research is needed in order to explain this current phenomenon in the Swiss peripheries. Furthermore, the data in our research cannot explain if digital transformation has larger transformational effects for the periphery's economy compared to other technological revolutions in the past. The results of the case study cannot be generalized in the first place due to its single-case design. It is limited by its geographic context and the analyzed case. Nevertheless, the outcomes may be generalized in terms of transferring them to other regions in similar geographic settings. In this way, the study can lay a fundament for future empirical research on changing rural resp. peripheral economies in the background of digitalization. Future interdisciplinary research is needed in order to improve the understanding of digital rural and peripheral economies and societies, by conducting more qualitative research. This would help to analyze urban-rural linkages, the relocation of creative or knowledge-based work from the city to the periphery (through for example co-working infrastructure), dynamics and procedures of preparation for digital connectivity in the periphery, effects of digitalization on innovation in the periphery and digital multilocal work arrangements (e.g. digital nomads) between cities and peripheries. Furthermore, digital divide and digital technologies such as fiberglass broadband must be questioned critically due to upcoming technologies such as mobile 5G.

The topics of digitalization and co-working spaces became a larger issue for practitioners, politicians and policy makers that hail their potentials in order to keep the periphery vital or to re-vitalize again. As shown in our case study, the beneficial effects of using the Internet and ICTs vary between different actors. A more differentiated debate in terms of the various characteristics, needs and demands of actors must take place. Thus, only increasing speed seems not to be sufficient for all kind of actors in the peripheral community (see also [98]. The empirical data shows that, in the well connected case study region, digital inequalities did not arise due to lacking digital connectivity for online activities [75, 316]), but rather in terms of its financeability and maintenance. The findings show that there is no universal solution for all actors in the mountain communities and differences and inequalities should be given more attention and recognition (see [87, 369]). The variety of local needs in the case study shows that policies indeed should be more customized and flexible concerning the adaptation in mountain communities.

The case study contributes new insights and a nuanced understanding of different effects of digitalization on mountain communities. Becoming digitally connected in mountain communities is not a uniform process, but rather experienced individually, which calls for a more diversified perspective on effects of digitalization in rural resp. mountain communities. In doing so, the case study gave deeper insights on the receptiveness of digital connectivity in peripheral communities (see [2]). Furthermore, the study adds a more differentiated perspective on urban-rural digital divides at the community scale (see [87]). Due to digitalization, new urban-rural linkages emerge in forms of online communication, multilocal work

arrangements, relations between customers and firms or social contacts between family members and friends, which are relevant for researching peripheries (see e.g. [14, 16, 18, 23, 37, 52, 68]). These findings go along with the questioning of sharp conceptual boundaries between the urban and rural (see [48]), as digital communication technologies can foster the interaction between the core and the periphery (see e.g. [3, 56, 106]). Concerning the widening of the digital divide between urban and rural regions (see e.g. [11, 556], [88, 558], [87, 363], [105, 457–458]), the case study illuminates that, depending on actor varieties, the digital divide is widening and shrinking at the same time. These findings go along with reflections on changing rural economies and technological change as one of its key drivers as new business opportunities emerge (see [111, 623]). These changes by new digital and communications technologies go also hand in hand with re-evaluations of the periphery's qualitative values and characteristics such as landscape, nature and tourism. The relocation of activities from the core to the periphery (see [21, 224]) encourages a new questioning of the rural idyll and a new valorization of peripheral amenities and marginalization (see e.g. [12, 32]) in the background of changing rural economies through digitalization.

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Article 2: Digital Multilocality: New Modes of Working between Center and Periphery in Switzerland

Authors: Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug

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Abstract: The use of information and communication technologies (ICTs) allows to work in multiple locations. The purpose of this article is to investigate how multilocal knowledge workers engage in work in the interplay of workplaces between cities and mountain regions. We follow a mixed methods approach with intertwined quantitative and qualitative data sources. The results show that working in the periphery using marginality can be beneficial and disadvantageous at the same time. Furthermore, marginality is seldom utilized for creativity but preferably for working undisturbed. This study contributes to the literature on marginality and flexible working between urban centers and rural peripheries in the digital age.

1 Introduction

Over the past decades, knowledge-based work became increasingly flexible and detached from fixed workplaces. As a consequence, physical co-presence at one workplace has become less relevant (Nadler, 2014). This flexibility is characterized by the knowledge workers' increased autonomy of selecting workplaces due to the intensive use of information and communication technologies (ICTs) in their work practices (Pyöriä, 2005; Hislop, 2013). As a result, novel mobile and multilocal work forms have become increasingly popular in recent years due to increasing spatial and temporal flexibility of work practices by knowledge workers (Clemons and Kroth, 2010; Ojala and Pyöriä, 2018).

These novel types of work flexibilities emerge due to improved digital connectivity. In particular, they cast a new light on the suitability of workplaces in areas outside urban centers (Vesala and Tuomivaara, 2015) such as, for example, mountain regions. In Switzerland, numerous mountain areas are gearing up with modern infrastructures such as broadband Internet and coworking spaces (e.g., miaEngiadina, 2020; NüGlarus, 2020). Their goal is to attract knowledge workers from the urban areas for temporary work stays in the periphery. However, what kinds of spatial changes in knowledge-based work this entails has not been analyzed so far.

Indeed, not much research exists on the ways in which multilocal knowledge workers utilize the interplay between a workplace in an urban center[1] and one in a rural periphery[2] – or, in other words, between a central and a marginal spatial environment. Working at the employers' premises in a center and choosing to temporarily work in the periphery might involve different types of multilocal work environments. In this regard, the use of marginality in particular could offer new starting points for the study of multilocal work between center and periphery. Marginality has been researched as a self-chosen strategy (Grabher, 2018), as an incubator for creativity (Hautala and Ibert, 2018) or as a way to radicalize ideas and innovation away from the mainstream (Sgourev, 2019). In this regard, marginality becomes relevant as a strategically sought-after position between center and periphery to avoid pressures from the urban mainstream in order to shield creative thinking and dissenting ideas (Grabher, 2018). Furthermore, little is known about the specific use of digital technologies in knowledge-based work (Pershina et al., 2019; Verstegen et al., 2019) and even less about their differential use in multilocal work arrangements. An examination of marginality in the context of digitalization and flexible, multilocal work is missing. Multilocal work arrangements may increasingly blur

[1] In this study we use 'center' as the counterpart of the periphery, which however do not exist isolated from each other (see, Kühn, 2015). This term is used to refer to larger urban agglomerations, which are characterized by high economic, social and political activity. They are the places of employment for knowledge workers and the creative industries (see, Florida, 2005).

[2] In the geographic understanding, which also guided our research, 'periphery' is understood as a remote place due to its distance to a center and the situation at a fringe in relation to the center (see, Hautala and Ibert, 2018; Kühn, 2015). 'Peripheralization' describes a process in which peripheries are produced through multidimensional processes including changing economic, social, political and spatial dimensions, which can also occur in central places (Kühn, 2015).

the spatial division between the center and the periphery in terms of creative work and must be examined and perhaps rethought.

Our analysis builds on and extends the literature on flexible and multilocal work arrangements through the examination of the interplay of workplaces in the center and in the periphery and the effects of using marginality for multilocal knowledge workers. To do so, we examine the ways in which multilocal knowledge workers interact with ICTs in order to fulfill working tasks at a peripheral workplace in the mountains in comparison to a workplace in an urban center. We examine differences of work organization in the center and in the periphery and how the change of scenery affects work practices and work-life balance. Furthermore, we examine the reasons why multilocal knowledge workers temporarily work in the periphery and how they strategically use the periphery's marginality. Hence, the following research questions structured our research: To what extent and why does the use of applications on the laptop and smartphone for work differ between the workplace in the center and in the periphery? How do multilocal knowledge workers utilize marginality in their work? What are the benefits and limitations of using marginality for work and why do they decide to work in a multilocal setting between center and periphery?

To answer these questions, we analyzed work practices of multilocal knowledge workers, who predominantly work in urban centers and who temporarily work in the periphery in Swiss mountain areas. In this exploratory study, we used a novel mixed methods approach combining quantitative digital tracking data of application usage on laptops and smartphones, linked with qualitative digital diary data, ethnographic walk-along observations and qualitative semi-structured interviews. We conducted the fieldwork in 2019 and thus our data represents observations from a time before Covid-19, which forced many employees to adapt such work practices. Thus, we gained insights perhaps from pioneers who have strategically chosen such work patterns before they may have become mainstream.

The results make important contributions to the literature on flexible, multilocal work and the periphery's benefits of marginality. First, by accounting both for the use of marginality and ICTs for multilocal work, we offer novel insights on differing work organization using digital technologies in the center and the periphery (Pershina et al., 2019; Verstegen et al., 2019) . Second, our research highlights the sometimes beneficial and disadvantageous effects of different workplaces on multilocal knowledge-based work (Ojala and Pyöriä, 2018). Advantages such as a better work-life balance and more concentrated work practices are offset by the disadvantages of distance, such as limited spontaneous interaction in person and decreasing influence in work projects. Third, we contribute to recent literature on marginality by providing evidence that in multilocal work arrangements marginality is less sought to shield creative thinking but rather used for working without interruptions (Grabher, 2018; Hautala and Ibert, 2018; Sgourev, 2019). Fourth, for our sample participants we found a recurring cycle of working in the center and in the periphery. This latter result might point to new opportunities for knowledge-based work in alternating workplaces in rural or peripheral locations.

2 Literature review

In the post-industrial age, knowledge-based work has become more flexible in terms of space and time, especially due to rapid technological advances (Sennett, 1998; Messenger, 2019). As

a consequence, people can work and live in distinct places and are still connected through the use of the Internet and ICTs (Kirschner, 2005; Moseley and Owen, 2008; Coombes and Champion, 2011; Nadler, 2014). Thus, even geographically distant locations can be connected with each other through the use of ICTs (Forman and van Zeebroeck, 2019). In this regard, new opportunities emerge for rural or peripheral locations in terms of digital participation in the knowledge economy (Vitola and Baltina, 2013). In this regard, digital infrastructures such as broadband Internet connections and ICT skills are important prerequisites to ensure that economic activities with digital technologies in rural peripheries is possible (Townsend et al., 2013; Wallace et al., 2016; Salemink et al., 2017; Philip and Williams, 2019).

Literature on flexible working deals with all facets of spatial and temporal changes of work and shows that knowledge-based work can be done in multiple locations (see, Nätti et al., 2011; Ojala and Pyöriä, 2018). Multilocal work is characterized by the use of multiple workplaces in different locations, instead of one single workplace. This geographic aspect of multilocality fundamentally differentiates multilocal forms of work from traditional, stationary forms of teleworking such as, for example, home office teleworkers (Hislop and Axtell, 2007). However, the literature shows that despite working at the employers' premises is still the dominant form of work in Europe before the Covid-19 pandemic (Ojala and Pyöriä, 2018), mobile and multilocal work forms are becoming increasingly popular for knowledge workers (Clemons and Kroth, 2010).

Knowledge-based work is characterized by high degrees of autonomy combined with greater degrees of freedom in terms of choice of work methods and workplaces (Ojala and Pyöriä, 2018). Knowledge-based work entails creative work (Dul et al., 2011) such as the creation of novel ideas (Mumford, 2003) and is reserved for the status-higher labor force (Elldér, 2019). Furthermore, knowledge-based work is favored by ICTs, which allow for higher spatial mobility of knowledge workers (see e.g., Green, 2002; Pyöriä, 2005; Hislop and Axtell, 2007; Hislop, 2013).

Nevertheless, little is known from this literature on how knowledge workers interact with ICTs in different workplaces, although their use is characteristic for multilocal knowledge-based work. Recent studies have shown that the interplay between analog and digital work is fruitful for innovative work processes (Pershina et al., 2019), but there is a lack of knowledge on the use of digital technologies and particularly how these activities differ between geographically different locations (Forman and van Zeebroeck, 2019; Verstegen et al., 2019) such as, for example, center and periphery.

Scholars of flexible work practices found that especially multilocal forms of knowledge-based work influence general well-being and thus work-life balance (Peters et al., 2009; Sullivan, 2012; Ojala et al., 2014; ter Hoeven and van Zoonen, 2015; Sjöblom et al., 2019). According to these studies, multilocal work forms can create work-life balance problems such as increased time pressure due to family commitments, overtime work, part-time work, increase in informal work or insufficient separation of work and private life (Ojala et al., 2014; Aguilera et al., 2016; Thulin et al., 2019). Such work-life aspects in multilocal work arrangements have been insufficiently explored by economic geographers (James, 2014) and must be reconsidered in terms of different geographic locations such as work locations in the center and periphery

(Danson and de Souza, 2012). The literature pays little attention to geographic 'localization' and its effects on multilocal work

From a geographic perspective, considering combinations of multiple workplaces due to the use of ICTs became of a larger interest recently. However, despite a growing body of literature on workplace mobility in urban areas (see, Putri and Shearmur, 2020; Pajević and Shearmur, 2017; Burchell et al., 2020; Shearmur, 2020), rural peripheral areas have not been studied. Yet, they can also serve as valid environments for multilocal work practices involving the use of ICTs (Clark, 2018). Multilocal work may have advantages when working temporarily in a rural setting. In this regard, Vesala and Tuomivaara (2015) showed that the natural green environment has positive effects on work and that temporary work in the rural creates various positive effects for knowledge workers in terms of decreasing experienced time pressure, negative feelings at work, interruptions, exhaustiveness and stress, while work satisfaction is increasing (Vesala and Tuomivaara, 2015). In combination with outdoor amenities, rural areas can serve as an attractive environment for knowledge workers (McGranahan et al., 2011). On the down side, teleworking in the rural can lead to disadvantageous isolation, due to larger distances to the employer's premises and coworkers (Simpson et al., 2003; Pyöriä, 2011).

Due to the terminological disagreement and conceptual overlaps regarding flexible, knowledge-based and multilocal modes of working in different locations using ICTs (Pyöriä, 2009; Ojala and Pyöriä, 2018), we propose to use the term 'digital multilocality'. Digital multilocality stands for working with digital technologies in multiple locations. The term incorporates different terminologies that are used in the literature regarding multi-local work arrangements such as multi-local, multilocal, multi-locational etc. Furthermore, we understand this term as a broader concept that also takes into account the interplay of different workplaces (e.g., those in a central location vs. those in a peripheral location, rural vs. urban) and the influences of the correspondic geographic environments.

Working in the periphery can have positive effects on work due to the distance to the center. Recent literature from economic geography and sociology shows that actors in the periphery can take advantage of the remoteness through the use of marginality. Marginality can be used as a strategy to unfold creative ideas as illustrated by Grabher's (2018) analysis of the Austrian Baukünstler[3] in the Vorarlberg region. They returned to their home in the periphery in order to take advantage of being distant from the standard setting organizations in Vienna, which was considered the center of architecture. The self-chosen peripherality entailed a conscious break with the pressure of the architectural mainstream from the center (Grabher, 2018). Peripherality in this sense can be understood as a deliberate choice and geographic dissociation from centrality and its pressures from the (architectural) mainstream. Due to their peripherality, the Baukünstler were able to take advantage and be creative in new ways as they were in a "specific position of betwixt and between center and periphery, insider and outsider, mainstreams and mavericks" (Grabher, 2018, p. 1792). This marginal position became enabled through their relocation in the periphery. In the periphery, therefore, the Baukünstler used the marginality to

[3] The 'Baukünstler' were Austrian craftsmen and architects that built a hub for architecture in the Vorarlberg region and deliberately distanced themselves from the establishment of the center in Vienna (Grabher, 2018).

become free in their works and could give free rein to their creativity. This example shows that marginality and peripherality can be considered together. Marginality is viewed as a social and cultural position (see also, Park, 1928) that can strategically be used (e.g., to be creative). Marginality in turn can be enabled by the distance, for example of the periphery to the center. In doing so, marginality is not simply a given condition, but rather a practice, as people and places can become marginal by individuals or groups through placing themselves at the margins in a process of self-marginalization (Syrett, 2012).

Marginality is thus a self-chosen practice that can be sought for creativity in knowledge-based work. As illustrated by the case of the Baukünstler, creativity is not ultimately bound to an urban center but can also take place in the rural periphery. The reduction of power and control from the mainstream in the center can be facilitated through geographic remoteness (see, Hautala and Ibert, 2018; Glückler, 2014; Hautala, 2015). The periphery and its different context can thus be a fruitful and promising source for novelty because in this environment there may be less powerful value judgements (Hautala and Ibert, 2018). This may encourage creative or innovative actors in the periphery as they are freer for the creation of new ideas and products away from the status quo in a center. In doing so, the periphery can be supportive for the escalation of ideas that come in from the outside (Sgourev, 2019). For example, ideas that have been developed in the center can be further developed in the periphery. In doing so, peripheries can serve as spaces for creativity as they can protect unfolding novelties from criticism and thus facilitate the development, radicalization and experimentation with new ideas (Hautala and Ibert, 2018). Consequently, not only central places but also non-central places can be supportive for creativity (Nel and Pelc, 2020). Non-central places or peripheral places such as rural areas or mountain regions – our study areas – can provide a rich environment for the unfolding of novelty as they experience ‘emptiness’ through processes of depopulation and this can be an advantage in terms of creativity (Viazzo and Zanini, 2014). However, knowledge about the benefits and disadvantages of working in the periphery using marginality for knowledge-based work is lacking.

Our focus on marginality should not be read without caution. Marginality is quite a fuzzy concept that is not considered in many studies so far (Danson and de Souza, 2012). In our study, marginality is not understood in terms of a specific position at the margin of two cultures, but rather as a deliberate choice and strategy to consciously put oneself in an isolated and remote location and taking advantage of it – for example through temporary work in a rural area.

3 Methodology

3.1 Empirical setting

In Switzerland, flexible workplace models are becoming increasingly popular. In 2020, approximately 48% of all employees (roughly 2.4 million in Switzerland) worked mobile and not at a fixed workplace (Weichbrodt et al., 2020). In comparison to other European countries, Switzerland shows one of the highest share of jobs that can be performed remotely and the capacities in Swiss cities, towns and rural areas for remote working are above average (OECD, 2020).

In recent years, digitalization became a relevant topic also for Swiss mountain regions that suffer from outmigration of young people, ageing, structural economic changes, etc. Digitalization has become a strategy in order to become more attractive for those interested in working and living in these regions (Medaglia and Petitta, 2014; Bürgin and Mayer, 2020). In this regard, a high broadband coverage that allows efficient and fast access to the Internet is a basic prerequisite for being able to work from distant locations (OECD, 2020). Compared to other western industrialized countries, the development of broadband is more advanced in Switzerland, even in rural and peripheral mountain regions (Joiner, 2018). Even before the Covid-19 pandemic, Swiss mountain regions are becoming increasingly popular for knowledge workers who engage daily with digital technologies due to optimal infrastructure in terms of digital connectivity but also housing (often secondary homes) (Miller, 2016; Bondolfi et al., 2019; Schilliger and Steiger, 2020; Spring and Leutwiler, 2020; Dreyfus, 2021).

3.2 Mixed methods research design

To gain deeper and more detailed insights into digital multilocal work, new data sources must be explored. In recent years, so-called 'e-Research' methods have emerged (Halfpenny and Procter, 2015). The use of data gathered by digital technologies also led to innovations in participatory research methods in geography, as the research subjects share their personal data and become directly involved in generating it (Geoghegan, 2019). In order to investigate the working practices of multilocal knowledge workers in more detail, we chose a mixed methods approach to improve rigor through bridging the qualitative/quantitative divide (see, Bathelt and Li, 2020). More specifically, we utilized quantitative microdata of work activities that informed our qualitative methods. Mixed methods are not yet very common in rural studies compared to qualitative and quantitative research methods (Strijker et al., 2020). Nevertheless, the number is increasing in recent years and our digitally based mixed methods approach makes an original contribution to get in-depth insights into a novel rural phenomenon.

3.2.1 Sample and recruitment

To examine multilocal work activities, we selected study participants who fulfilled the following criteria: First, study participants primarily work in a major urban agglomeration (such as Zurich or Bern) in a corporate office or in home office and engage and work in a Swiss mountain region. Second, they spend ten[4] working days over a period of six months in a peripheral workplace. This criterion is important in order to exclude daily or weekly (long-distance) commuters and people who work in the periphery by chance, for example during holidays. Third, they utilize digital technologies such as laptops and smartphones in daily work activities. Fourth, they needed to be willing and allowed to collaborate during the study period and share digital work activities with the research team. The study was highly exploratory because there is no register or census of those engaged in multilocal work and we relied on finding willing study participants through a snowball method.

[4] We chose ten workdays to compare one workweek (5 days) in the center with one workweek in the periphery. The ten days were also chosen to keep the participants' effort low, because the methods used required a great commitment from them. This was an important requirement for the recruitment of participants

The recruitment of the study participants proofed to be rather difficult. Initial expert interviews suggested that coworking spaces in Swiss mountain regions would be a good place to start. We got in contact through email and phone calls with all coworking spaces (at the time of recruitment n=12) located in the Swiss Alps and which participate in the national coworking association (see, Coworking Switzerland, 2020). As a result, we were able to recruit two participants for the research project. We also got in touch with the association of digital nomads in Switzerland. We were allowed to post a call for participants in their Facebook group and were able to recruit one participant. At the same time, we got in touch with the Work Smart Initiative (2020), an organization in Switzerland that promotes location-independent work among major employers. Following this, two participants agreed to join our research project. The final participant was recruited via personal contacts in the research team's social network. In total, six multilocal knowledge workers agreed to participate in the research project[5]. Table 1 gives an overview of the participants. They work at an employers' premise or in home office in the center and predominantly in private apartments in the periphery. Only half of them work temporarily in a coworking space in the periphery. Due to the small sample, the findings cannot be fully generalized, but nevertheless provide interesting and novel in-depth insights into multilocal work arrangements.

Pseudonym	Anna	John	David	Laura	Mark	George
Profession	Virtual assistant	Product manager digital public services	IT specialist	Innovation manager	Data & AI solution specialist/lecturer	Specialist for Human Resources and organizational development
Employment status	Freelancer-entrepreneur	Firm employee	Freelancer-entrepreneur	Firm employee	Firm employee	Firm employee
Business size	Micro (only her)	Macro	SME	SME	Macro	Macro
Industrial branch	Secretarial and writing services	Logistics	IT services, telecommunication	Commerce, telecommunication	IT services	Logistics
Multilocality Frequency	1-2 days per week	2 days per week	1 week every two months	Two to three times per month for three to four days each	Every weekend	Ten to fifteen times per year for at least one day
Workplace in the center	Home office	Employer's premise	Home office, employer's premise	Home office, employer's premise	Employer's premise, home office, coworking space	Employer's premise
Workplace in the periphery	Private	Private, rarely coworking space	Private, coworking space	Private, coworking space	Private	Private

Table 1. Overview of sampled participants.

[5] For this explorative study, we aimed for a total of ten to twelve participants. After the initial recruitment phase, a total of fourteen multilocal knowledge workers showed interest to participate. During the introductory phase in which we installed the tracking applications, eight participants left the project due to privacy insecurities or time constraints.

3.2.2 Data collection

We divided the data collection in two phases. Phase one consisted of collecting the participants' digital work tracking data during five workdays in the center and five workdays in the periphery. In the second phase of data collection, we conducted ethnographic walk-along observations in combination with qualitative semi-structured interviews. In this phase, the descriptive digital work tracking data from the first phase fed into questions during the interviews. Fig. 1 provides an overview of the methods used.

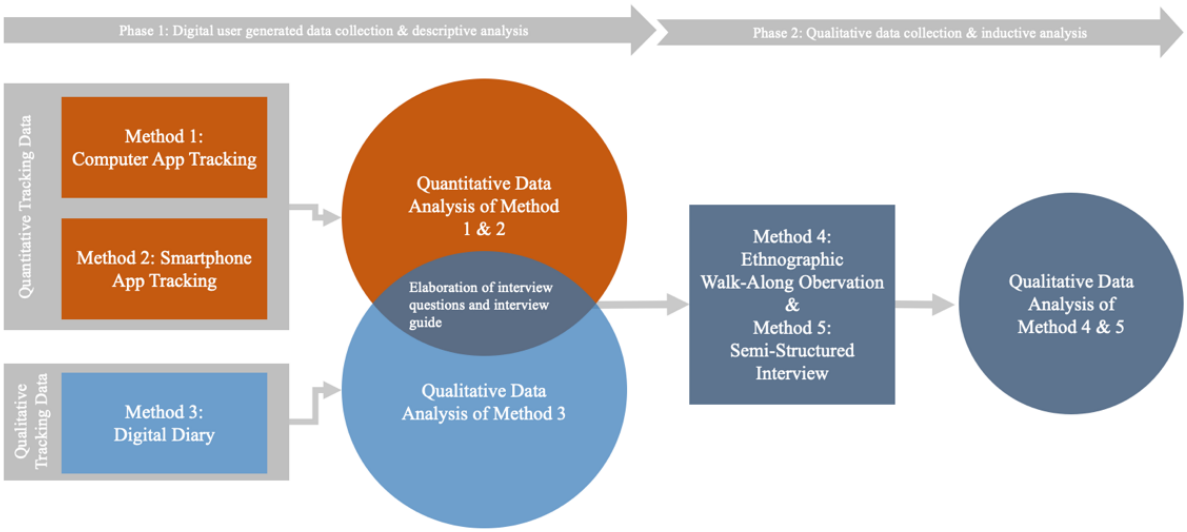


Fig. 1. *Mixed methods approach.*

To track the participant's digital work activities, we needed to utilize appropriate applications. Automated methods that record digital records such as the 'Digital Replay System' (DRS) or the so-called 'fieldwork tracker' have been used before (Crabtree et al., 2015). While DRS and fieldwork tracker are no longer available, we used alternative ways to record digital work tracking data.

First, computer application tracking was used in order to gain insights in the applications used and for how long. After testing various computer tracking applications, we selected an open-source time tracker called 'ActivityWatch' (2021), which logs the focused application name and window title in a timeline of events, as well as user input activity to detect inactive periods. The participants downloaded the application and had to run it during their digital work tracking days.

Second, smartphone application tracking was added because we were interested in the phone logs of the mobile user activity (see, Birenboim and Shoval, 2017). As the Apple iPhone (all participants used a smartphone from this brand) does not allow third parties to access the application usage data, we asked the participants to take screenshots of their battery usage (where duration of application usage within 24 hours is displayed with 1-minute resolution) after each digital work tracking day.

Third, we asked the study participants to fill out digital diaries to gain insights from their experiences of marginality. Diaries as a research method actively involve participants in the research process and provide an opportunity for participants to reflect on their work behavior by self-reporting (Meth, 2003; Latham, 2010; Birenboim and Shoval, 2017). During each digital work tracking day, the participants were asked to fulfill three tasks: First, take a picture of what was inspiring during their workday. Second, write a short description of the picture and explain why this was inspiring. Third, briefly describe the work activities of the workday with keywords. We used a free version of the mobile application 'Day One' (2021).

Fourth, we conducted ethnographic walk-along observations (Rose et al., 2010; Cao et al., 2019; Van Cauwenberg et al., 2012) to observe the spatial practices of the participants by accompanying them during their travel from their workplace in the center to the workplace in the periphery. We were also 'talking whilst walking' (Anderson, 2014) with the participants to gain a better understanding of the knowledge workers' behavior in their multilocal setting. The untold aspects of work practices and their specific workplaces were recorded (in the researcher's notebook), which would not have been possible by merely doing interviews (McMorran, 2012).

Fifth, we conducted qualitative semi-structured interviews during and after the walk-alongs in order to collect more detailed information on the participants' work behavior. The questionnaire was developed utilizing the results of the digital work tracking and digital diary data from phase one. As the research focus was fairly clear, we selected a semi-structured type of interviews (Bryman et al., 2012). The interview questions addressed the use and the effects of marginality on multilocal work as well as the participant's work activities based on their digital work tracking data.

3.2.3 Data processing and analysis under ethical premises

In a first step, the digital work tracking data of laptop use was processed using Jupyter notebooks. The data was sorted by digital work tracking days in the center and in the periphery. Based on that, the data was categorized according to the broad variety of applications used by the participants and cleaned of artifacts arising from the data collection method. The highly sensitive data (e.g., window titles) was removed from analysis. In a following step, the cleaned data was classified into categories among nine different types of activity (documents, browser, email, communication, programming and development, miscellaneous[6], work organization, lockscreen, media). Based on available user activity information, the data was filtered to only include periods of user activity. Based on that, individual and comprehensive overall statistical evaluations were generated.

We applied a similar procedure for the data processing and analysis of the smartphone tracking data. In a first step, we manually transcribed the iPhone battery screenshots in a digital editable

[6] 'Miscellaneous' combines all work activities that could not be assigned to one of the other categories. These activities were excluded from further statistical analysis and the interviews due to the wide range of its heterogeneity.

format such as Microsoft Excel tables. After this, the smartphone tracking data was imported into Python, categorized and cleaned for statistical analysis.

The digital diary data of the 'Day One' application was imported into the analysis software MAXQDA12. The recordings of the qualitative semi-structured interviews were also imported and fully transcribed. In a next step, we coded both the digital diaries and the interview transcripts with the same codes conducting a qualitative content analysis (Mayring, 2015).

3.3 Research ethics

The mixed methods approach required careful and attentive methodological procedure due to the highly sensitive and personal nature of the participants' digital work tracking data. Novel digitally supported research methods require the adaption of prevailing standards and ethics in social science in terms of data collection and analysis (Madge, 2007; Tiidenberg, 2018).

One key issue was the informed consent between the research team and the participants. During the recruitment phase, we provided a fact sheet about the research project's aims, the methodological approach, the data management, the compensation for the participations' efforts[7], the funding and the research team. We also aimed for personal commitment and agreement of the participants. After they accepted to join the research project, we sent to each of them a personal letter of consent (see, Birenboim and Shoval 2017). In this document, we provided more detailed information about the methods, data security and data storage. All four digital methods were described in detail in terms of accessibility, security and privacy policy. The letters of consent were signed by all researchers of the research team and each participant.

Confidentiality of data was taken very seriously. The data collection and analysis procedures required a great of care in terms of anonymization and security during data processing. We were aware that during the research process new ethical issues could emerge such as for example sharing first insights at conferences and in lectures. We adapted the presented material to the specific situations and treated them with utmost awareness and carefulness (see, Anderson and Jirotka 2015).

From the start of this research project, we addressed ethical considerations such as confidentiality and security of the participants' personal data. Privacy and protection of the participants' identities (e.g., anonymization of personal data and firm) were clearly defined from the beginning and kept secret.

4 Findings

4.1 Digital multilocal work between center and periphery

To gain a better understanding about the effects of using marginality for work, we focus in this section on how digital multilocal work differs during workdays in the center and those workdays in the periphery. The statistical analysis of the participants' digital work tracking days revealed notable differences of work patterns when using the laptop (Table 2) and the smartphone (Table 3) at both locations.

[7] A voucher of the Switzerland Travel Centre AG was offered in exchange for the participants' time and efforts.

	Center		Periphery		
Type of activity	Average per day	Percent	Average per day	Percent	Delta
Documents	01:58:03	32.02%	01:09:11	20.33%	00:48:52
Browser	01:39:24	27.04%	01:51:10	37.36%	00:11:46
Email	01:11:42	19.87%	01:21:20	24.45%	00:09:38
Communication	00:29:42	8.15%	00:25:52	8.62%	00:03:50
Programming and Development	00:19:51	5.62%	00:04:24	1.58%	00:15:27
Work organization	00:03:20	0.90%	00:04:50	1.87%	00:01:30
Media	00:01:17	0.35%	00:03:21	1.12%	00:02:04
Miscellaneous	00:19:06	5.48%	00:14:34	4.45%	00:04:32
Lockscreen	00:02:02	0.56%	00:00:45	0.21%	00:01:17
Combined average	06:04:30		05:15:31		00:48:59

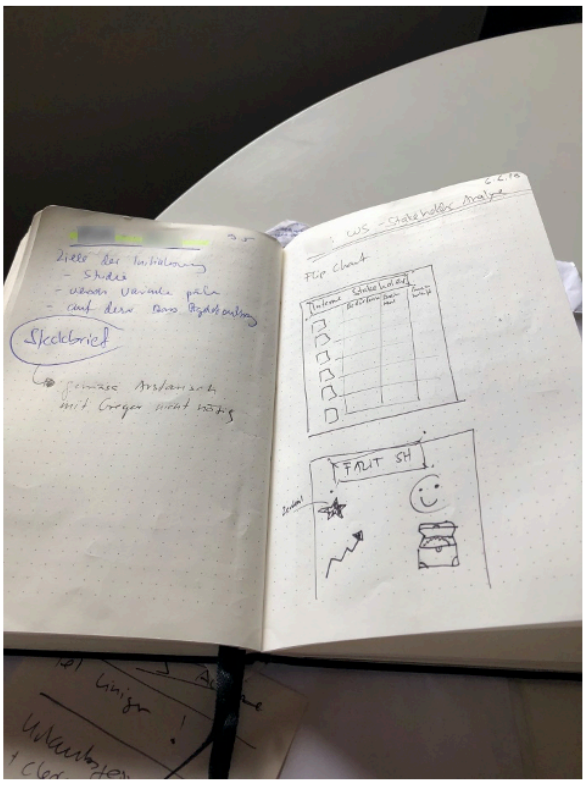
Table 2. Type of activity on laptop during digital work tracking days in center and periphery (all participants' averages combined)

	Center		Periphery		
Type of activity	Average per day	Percent	Average per day	Percent	Delta
Communication	01:16:26	43.81%	01:17:54	49.76%	00:01:28
Miscellaneous	00:39:40	22.56%	00:28:22	16.74%	00:11:18
Social media	00:12:13	6.73%	00:15:26	8.87%	00:03:13
Media Consumption	00:09:20	5.73%	00:12:52	7.25%	00:03:32
Travel	00:09:35	5.71%	00:02:49	1.74%	00:06:46
Browser	00:11:00	5.65%	00:09:57	5.51%	00:01:03
Email	00:08:54	5.17%	00:07:50	4.49%	00:01:04
Work organization	00:03:40	2.28%	00:02:56	1.81%	00:00:44
Media Creation	00:02:14	1.36%	00:02:06	1.30%	00:00:08
Finances	00:00:38	0.40%	00:00:22	0.28%	00:00:16
Personal	00:00:32	0.33%	00:06:37	2.08%	00:06:05
Documents	00:00:28	0.27%	00:00:18	0.19%	00:00:10
Combined average	02:54:45		02:47:35		00:07:10

Notes: As user-generated data is prone to error, we did not receive complete and usable smartphone data for analysis by all participants. In contrast to automatic data collected on the laptop by the ActivityWatch application, the battery screenshots of application usage had to be taken by hand after a digital work tracking day, which was not done correctly by all participants. In this table, the following data was used: participant 1 (5 days center; 6 days periphery), participant 2 (6 days center; 4 days periphery), participant 3 (6 days center; 8 days periphery), participant 4 (6 days center; 5 days periphery), participant 5 (3 days urban; 2 days periphery), participant 6 (data was removed from the statistics because the data was not recorded correctly and this participant rarely uses his business phone).

Table 3. Type of activity on smartphone during digital work tracking days in center and periphery (all participants' averages combined)

During digital work tracking days in the periphery, the six participants spent less time on their laptop (on average 48:59 minutes)[8] and their smartphone (on average 07:10 minutes). As our interviews and walk-alongs showed, our study participants fulfilled more analog tasks such as sketching in notebooks, conceptualizing outlines using pencil and paper, brainstorming, etc. When asked about the difference in digital device use between central and peripheral workplace, David explained that "maybe I was just thinking more. Or brainstormed. […] and in the city, yes, I find this generally more difficult". The same is true for George, who uses a traditional paper notebook with pencil more frequently while working in the periphery. This is nicely illustrated in his digital diary (Fig. 2).



Description (George):

"Today I took some time to get away from working on the laptop for once. I generated ideas for flipboard and practiced the workshop.

I have also planned several work packages of 1-2 hours for today. Mainly concept work."

Fig. 2. Digital diary entry by George: Analog work in the periphery (Anonymization blurring by authors).

According to George's digital diary entry, we asked why he was doing conceptual work in the mountains not using his laptop. The motivation behind this was the use of analog visualizations in a paper notebook because they allow a more detailed overview:

> "Yes, maybe because I was so much attached to the PC all the time. I thought I really need that now. So, I try to draw things more by hand in general. […] On paper I make sketches, or I can see connections or where one is going, what methods could I use. And

[8] There is no general significance found of working less on the laptop in the periphery (standard error of the mean: 44:30 minutes).

> I really consciously took the time to do it then [on the workday in the periphery]. Or I really took the time for this: Now I shut down the PC, now I do it like this."

During time off from work in the periphery, Anna, Laura, Mark and George tend to refrain from using the smartphone and also tend to not take it on outdoor activities. Smartphones are used more in the center in order to connect and network with coworkers and friends, as mentioned by David. Sometimes the smartphone is used to fill downtime at work with phone calls with friends and family members, as Anna explained.

The digital work tracking data show subtle differences in the use 'documents' among the workdays in the center and in the periphery. On average, the six participants worked 48:52 minutes more with document applications on the laptop (e.g., Microsoft Office, Ulysses, PDF, Numbers) in the center. Though, on smartphones such applications were used less than one minute in both locations. However, one reason for that is the higher use of PowerPoint on the laptop for holding presentations during physical meetings, an activity that predominantly takes place in the center as explained by George.

The six participants used browser applications slightly less on their smartphones (01:03 minutes on average) but more on their laptops (11:46 minutes on average) during workdays in the periphery. One explanation that emerged from the digital diaries and interviews for this is that research tasks and background work preferably take place in the periphery. George described in one of the digital diary entries that he reads articles about theories and methods that were on his to-do list for a long time.

The digital work tracking data show higher use of 'email' applications on the laptop during workdays in the periphery (09:38 minutes more on average). In contrast, 'email' applications on smartphones vary less (01:04 more in the center on average). When looking at 'email' activities, we noticed that during workdays in the periphery our study participants tend to have more time to write and answer emails, as explained by George:

> "Well, I can imagine that I had time again to respond to all the emails that I hadn't in a long time. That when I go back to the urban, I didn't have any emails that were open in any way. [...] Things that you just don't usually do and have time for."

In contrast, other 'communication' activities on the laptop were used a little more in the center (03:50 minutes on average) but roughly equally on the smartphone at both locations. Yet, communication is a task mainly done with the smartphone (three times higher as on the laptop). We discovered that the reasons for using communication applications is changing while working in the periphery. For example, Mark consciously isolates himself from coworkers in the center by closing Outlook and communication applications such as Microsoft Teams or Skype to focus better on work. John mentioned that these kind of communication applications are more relevant to show presence from time to time to the coworkers in the center. Nevertheless, being connected with coworkers and/or supervisors at the central workplace seems still important during workdays in the periphery, as shown by the slightly higher use of communication and social media applications on the smartphone. In this regard, Laura explained that the smartphone is used to "stay connected" with coworkers for meetings and project development.

Only David and Mark showed work activities of 'programming and development', which is part of their jobs. This includes laptop activities such as data analysis and programming that predominantly take place at the workplace in the center (on average 15:27 minutes more). In this regard, David explained that he was working on open issues and preparing other work tasks rather than actively programming while in the periphery.

Our analysis reveals that 'media' applications (e.g., video, music or photo editing, screen recording) on the laptop have a slightly higher use during workdays in the periphery (02:04 minutes more on average). The same is true for 'media consumption' on smartphones (03:32 minutes more on average). Though, 'media creation' activities using applications for photo and video editing or taking pictures were barely equally used on the smartphone in both locations.

Initially, we were also interested in the lockscreen times[9] but there was only a small difference detected between workdays in the center and in the periphery (on average 01:17 minutes more in the center), which was not further analyzed. The same applies to 'work organization' activities on laptop and smartphone. Furthermore, smartphone activities labeled 'finances' (e.g., mobile payment, mobile banking, expense tracking or checking cryptocurrencies) were short, not very meaningful and therefore not further discussed during the interviews. We also did not further focus on the smartphone activities 'travel' and 'personal' (e.g., cooking, fitness, shopping lists, sleep tracking), as this data was not considered relevant for analyzing the effects of using marginality for work.

4.2 Benefits of using marginality during workdays in the periphery

The empirical data revealed that multilocal knowledge workers consciously use marginality during work in the periphery because it entails various benefits for them: First, improving work-life balance due to detachment from control by supervisors. This in turn allows workers to be more self-determined in their workdays and thus – in their view – work more efficiently. Second, inducing a change of scenery leads to more inspiration and greater motivation.

Finding a better work-life balance is one of the main reasons why the multilocal knowledge workers we examined chose to work temporarily in the periphery. This is illustrated by self-organized workdays in terms of flexible allocation of working time and free time. In this regard, during workdays in the periphery, work and leisure are not strictly separated from each other like they are in the center. In the periphery, the participants allowed themselves more breaks for leisure activities between work phases, as explained by Laura:

> "You do not feel like you have to enlist like in the military at 8:00 am. […] And it also has a lot to do with leisure activities, because you maybe don't have to go into the office in the classic way. […] That exists there [in the periphery] like not."

The same is true for George, who can make full use of the day and feels more efficient and balanced. This finding seems also to be related to a certain degree of detachment from supervisors in the center. In this regard, George explained that when working in the periphery, one can free oneself from self-imposed and self-imagined control and that this allows to

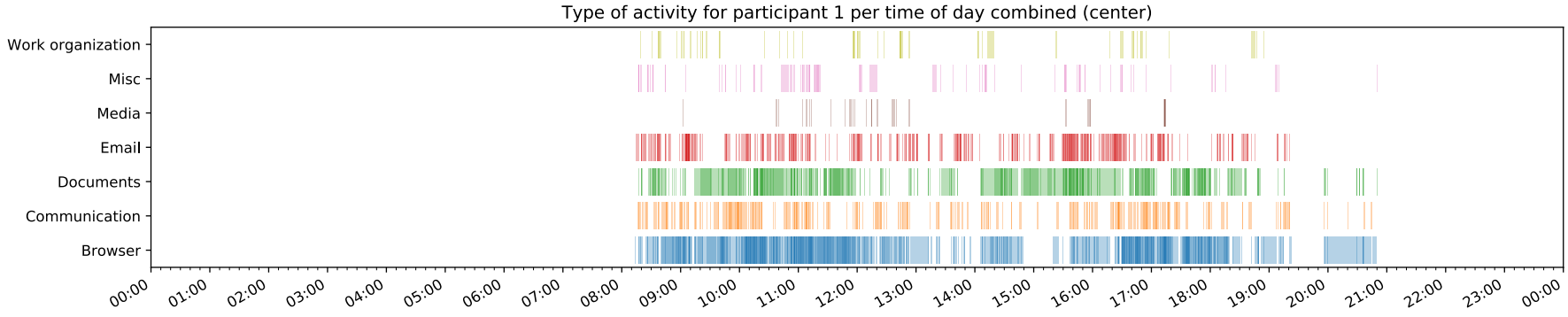
[9] Times when laptop was set in locked mode and not actively used.

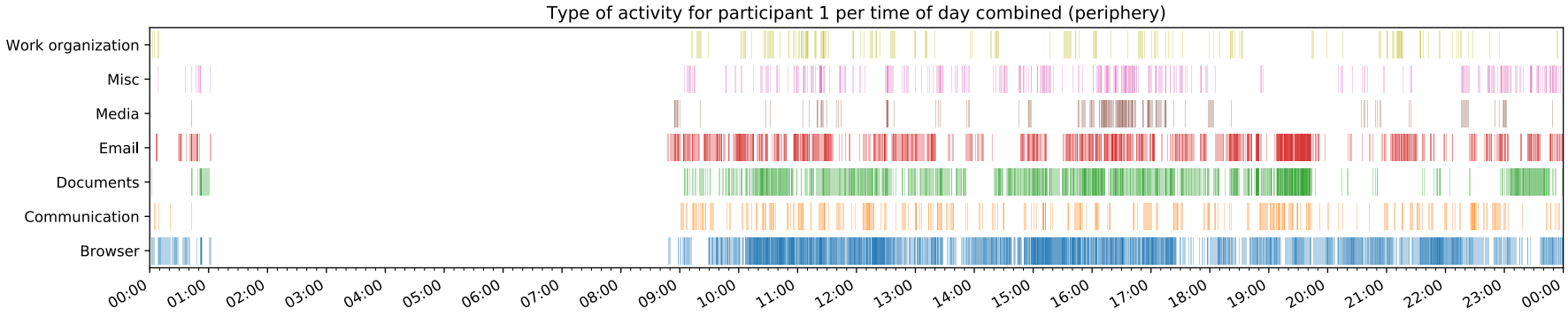
organize the workday on one's own pace – although, as George admits, his supervisor grants most of these freedoms at the central workplace too.

Furthermore, George highlighted that he becomes more efficient at work due to more time spent in nature during recreational breaks in the periphery, something that makes him feel more balanced. Other participants use their recreational breaks to engage with sport activities in nature such as skiing, biking, climbing, hiking or trail running. Through these activities, as they state, they gain new energy for work. Another work-life balance aspect is related to quality time with family, as mentioned by John and Mark.

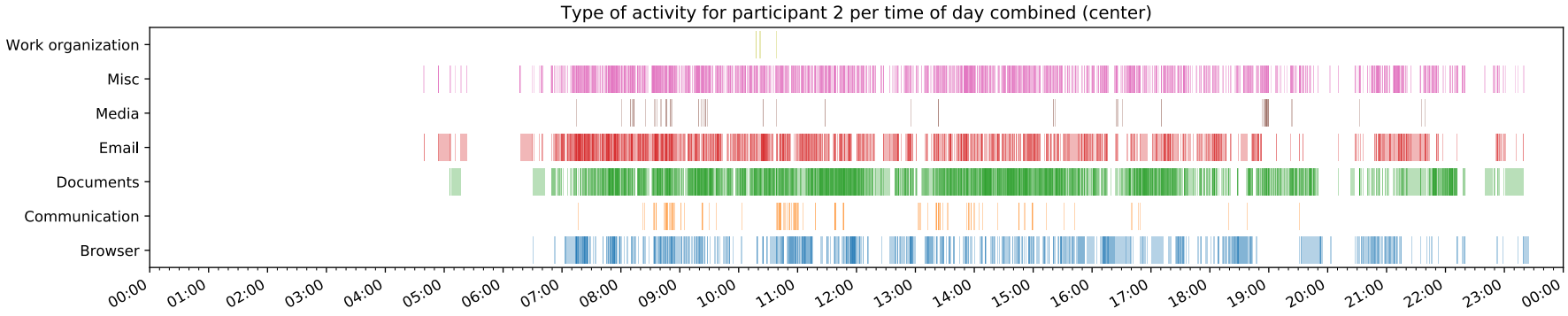
Times for laptop use in the periphery are characterized by more interruptions, which is an indication for the more flexible allocation of working time and free time. During workdays in the periphery, the participants took more breaks to gain distance from the laptop screen (as mentioned above) and sometimes use the laptop until late in the evening or into the night. This finding is also based on the combined timelines of laptop use for each participant (Fig. 3).

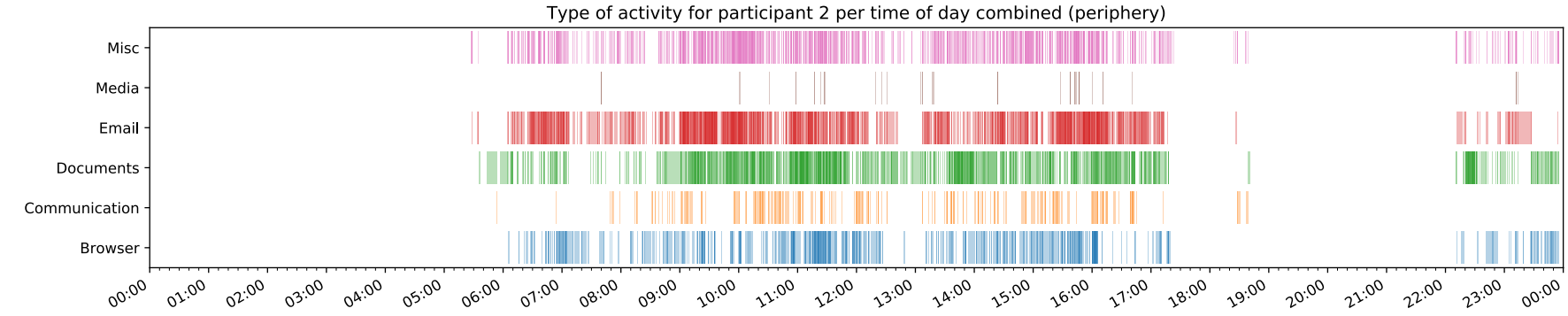
Participant 1 (Anna)



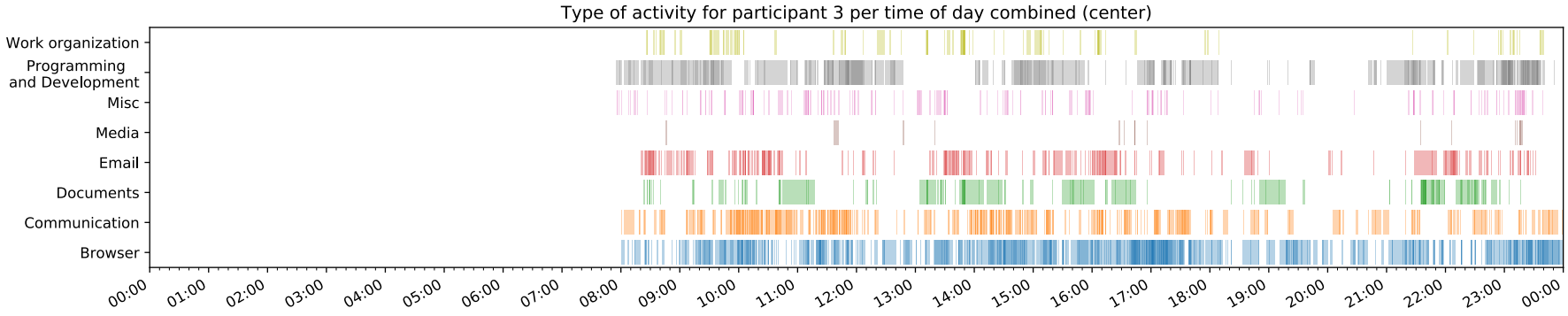


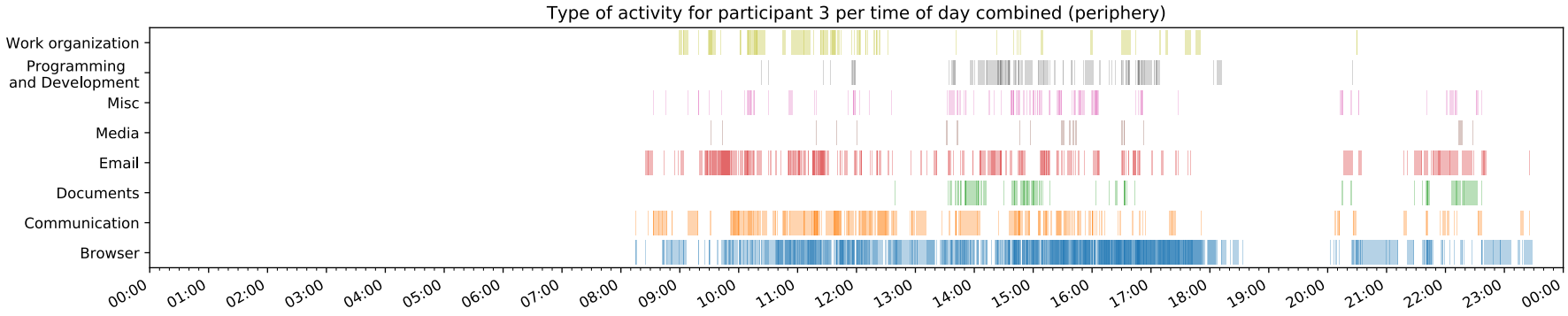
Participant 2 (John)



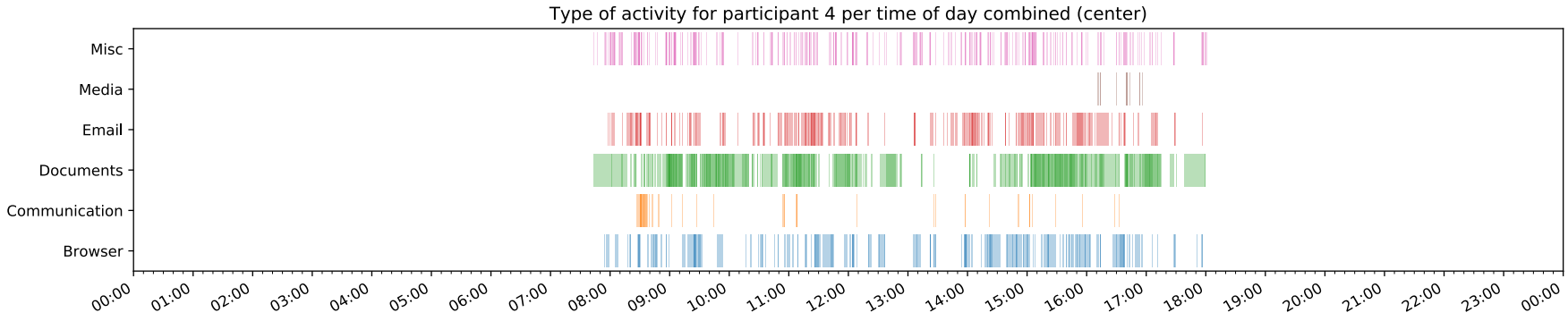


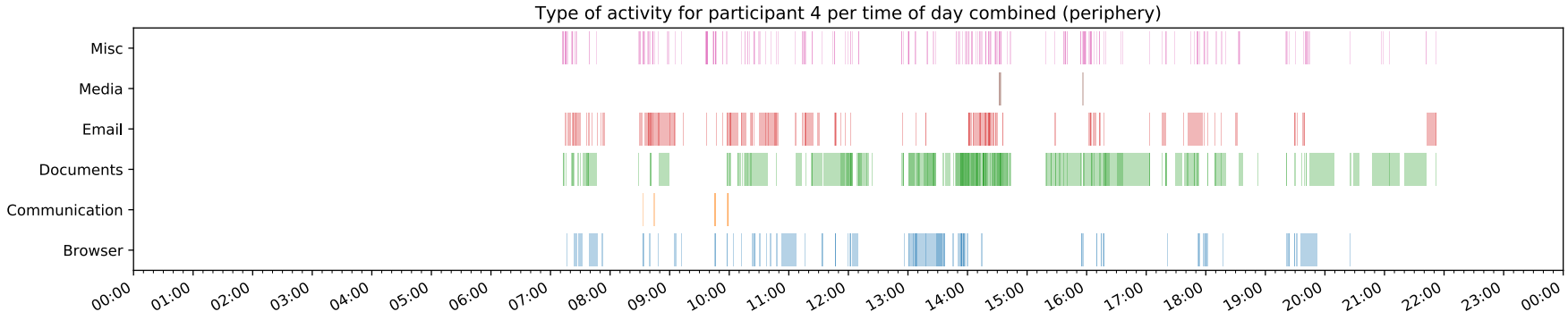
Participant 3 (David)



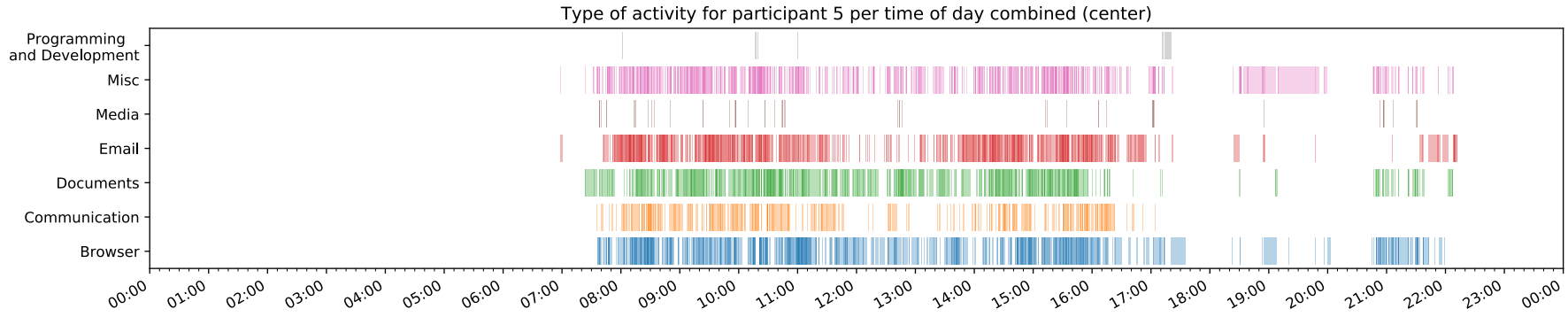


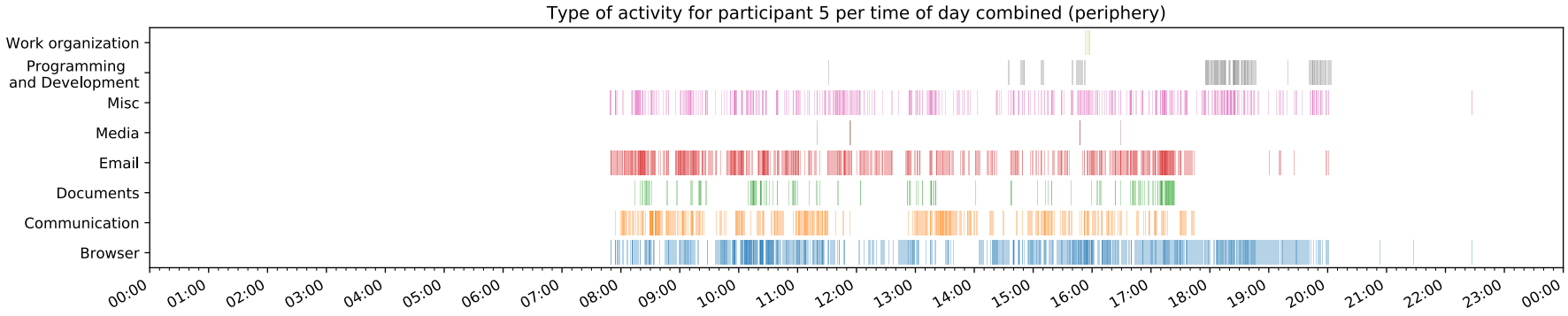
Participant 4 (Laura)



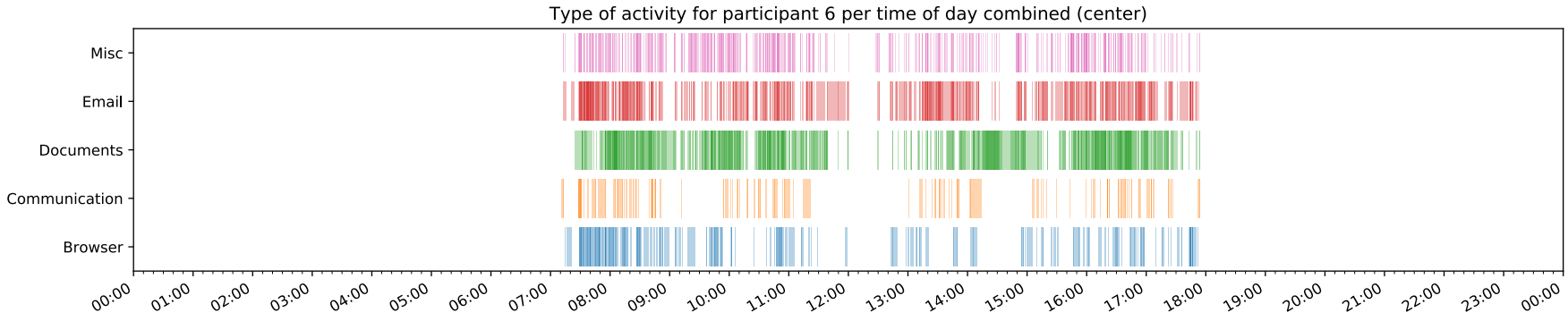


Participant 5 (Mark)





Participant 6 (George)



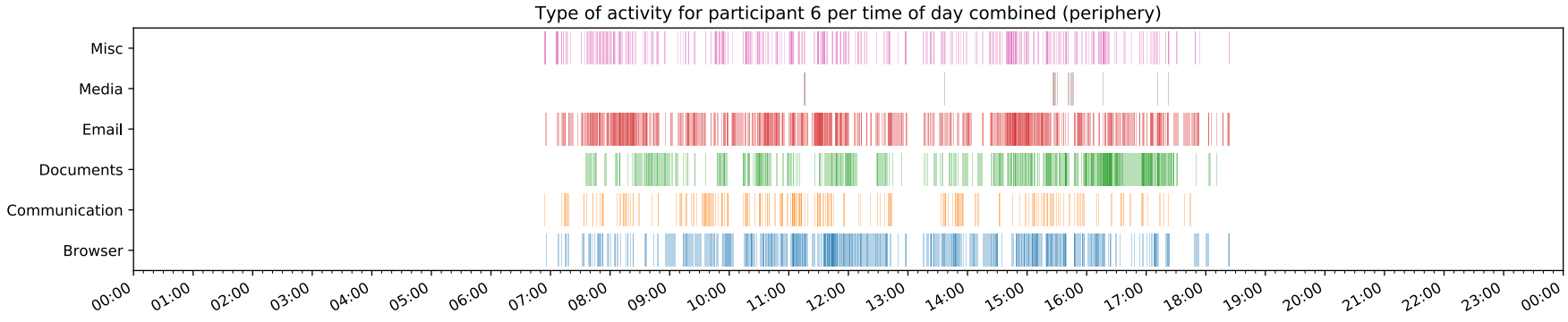


Fig. 3. Timelines of digital work tracking days combined for each participant and split by center and periphery (laptop use for work but also private use). The more saturated the color, the more similarity of activities between the respective digital work tracking days in the corresponding location.

The timelines also show that work practices in the center are slightly more similar on each workday, compared to workdays in the periphery. This also indicates a more flexible work organization in the periphery.

Working in the periphery and associated improvements in work-life balance seem to be related to changes of sceneries. The view of the natural landscape (e.g., mountains, lakes, forests, the wideness of mountain valleys) while working has a beneficial effect on multilocal knowledge workers in terms of greater inspiration and higher motivation. This was mentioned in one of the digital diary entries of George for a workday in the periphery (Fig. 4).

Description (George):

"The view from my "MountainOffice" inspires and motivates me again and again!

Today I was able to work on 2 big topics for a long time. On the one hand, I finished the script and clarified open points for a two-day workshop.

On the other hand, I created the script and the presentation for the start event of the Reverse Mentoring Program.

I also had a Skype meeting with 2 work colleagues"

Fig. 4. Digital diary entry by George: The workplace at the kitchen table in the chalet. (Anonymization blurring by authors)

Based on his diary entry, we wanted to understand how this view of the mountain from the kitchen table could augment George's motivation and inspiration and asked this during the interview:

> "The mountain shines something that is just so stable. […] I think the mountains generally do a bit of "grounding" when everything is coming apart at the seams. And you just look at a mountain again: "Ah, they are still the same." So, it's like the anchor. […] Well, it makes me calmer and because of that also more focused. If I'm not calm, then I have the feeling I'm more likely to be distracted."

The change of scenery is beneficial in two ways: First, the view of the natural environment has beneficial effects on the psyche of the workers in terms of inspiration and motivation as it relieves stress and makes them more focused. Second, having the possibility to immediately access the natural environment for leisure activities, leads to more breaks during workdays in the periphery, which in turn augments well-being.

4.3 Disadvantages of using marginality during workdays in the periphery

Working in the periphery also has its disadvantages: First, the feeling of isolation and decreasing possibilities for spontaneous personal interaction with coworkers, supervisors or clients due to larger physical distances. Second, family members, the wealth of leisure activities and constant digital connectivity can be distracting.

The main disadvantage emerges due to the feeling of isolation. The participants claimed that the increase of physical distance to the workplace in the center has negative effects in terms of a decrease in important face-to-face interactions, as George explained:

> "It's not the same thing as doing a quick Skype together. We'll just sit down and figure it out. It's much more efficient for complex things. You just don't have that here [in the periphery]. That's actually the downside."

Furthermore, Anna explained that spontaneous meetings in person particularly with clients are difficult: "The disadvantage is if you would like to meet someone for something to discuss, then you are just not there." She notes that the first contact with new clients mainly takes place in person. This came up too during the day after the walk-along, as she spontaneously had to travel back to the center for an initial meeting with a new client.

As a possible consequence of less spontaneous personal interactions while working in the periphery, John highlighted that the influence of multilocal knowledge workers particularly in team projects can decrease. Some of his work takes place in form of workshops, in which he cannot involve himself the same way as if he would be on site in the center. This means that also his role and involvement in a project can change into a more passive and supporting function: "Because if you really need to define a concept about more difficult elements, yes, sometimes when you're not there, you can still try to follow, decide a bit with questions, but you're not quite into it."

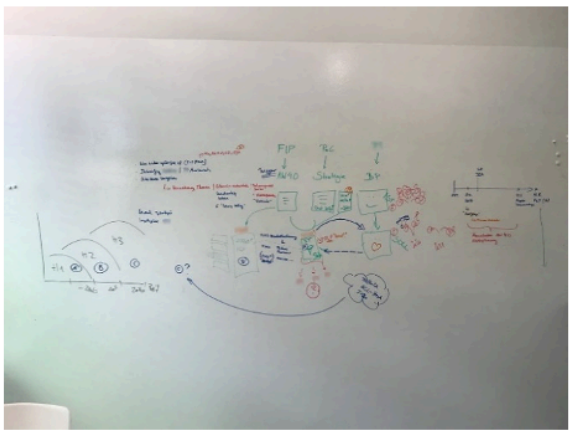
The second disadvantage shows that the presence of family and leisure activities during workdays in the periphery can also distract from work, as mentioned by John and George. In this regard, multilocal knowledge workers are not able to benefit from marginality as they become unfocused. In addition, David noted that digital connectivity makes it harder to gain a deep focus even while using marginality during workdays in the periphery. Being constantly digitally connected has the disadvantage that incoming new tasks or jobs can interrupt the work-

life balance, which, as Anna mentioned, would not be seen as an interruption during workdays in the center.

4.4 A recurring cycle of digital multilocality between center and periphery

The six participants primarily use marginality to work on accumulated work tasks without distraction, rather than for creative work. In this regard, using marginality by multilocal knowledge workers for creative activities can be questioned. Because we found that they mainly engage in creative work phases that predominantly take place at the workplace in the center. Based on that, we can describe an interesting recurring cycle of digital multilocal work between the workplaces in the center and alternative workplaces in the periphery.

Anna and Mark mentioned that they do creative work in both workplaces and sometimes during travel, which shows that the localization of creative activities is not clearly defined. Beyond that, we found that creative thinking such as the creation of new ideas or the combination of themes and lines of thought is quite limited during workdays in the periphery. Even though Laura, David and George mentioned that individual reflection of complicated work tasks is simplified by the solitude in the periphery, creative work is less of a topic: David explained that even if "such creative moments for development or projects are more likely to take place in the countryside", he still needs the city and other creative people to express his own creativity. The same is true for George, who explained that he creates "revolutionary ideas" during interactions with other people at the workplace in the center, as shown in one of his digital diary entries (Fig. 5).



Description (George):

"This morning we worked together as a team on a complex issue. It was very inspiring how we can create added value together."

Fig. 5. Digital diary entry by George: Teamwork at the central workplace for working on complex issues. (Anonymization blurring by authors)

He also does not specifically reserve time for creative work tasks while working in the periphery. In addition, John explained that working in the periphery can be a disadvantage in terms of creativity due to the low level of exchange with coworkers. These findings indicates that while creative work is not excluded at the peripheral workplace, it predominantly takes place at the central workplace.

Why is marginality only seldomly used for creative work? Marginality is used to work through tasks that were accumulated at the workplace in the center, as explained in a digital diary of George: "Today I was able to work off many old legacies. My to-do list is shrinking more and more. I was able to use the time here in the mountains for things that I don't get to do in the office." Working on accumulated work tasks during workdays in the periphery and strategically using marginality for this purpose was a common finding across all participants.

The reason for this is twofold. First, they do not feel distracted by coworkers and/or supervisors. David explained that coworkers do not communicate with him while he is working in the periphery, as they know that he is not around: "So I generally have trouble finding five hours to concentrate. And this is just a lot easier for me now in the mountains." Beyond that, Mark explained that it is the highest priority "to work in focus in the mountains" because of less disturbances. Second, the private workplace environment in the periphery has a sparser set up, which is more quiet and less distracting. There are fewer distraction opportunities available in the peripheral workplace and the participants have fewer obligations such as taking care of the household. Using marginality for work in the periphery serves as some sort of valve for multilocal knowledge workers in order to be more focused on accumulated work tasks, not for being more creative as the literature on marginality would have predicted (see, Grabher, 2018; Hautala and Ibert, 2018; Sgourev, 2019). The exploratory findings show that both center and periphery have their specific benefits and disadvantages for our multilocal knowledge workers and that they work on different tasks at both locations. In this regard, the use of marginality becomes a strategy in order to optimize work processes, but not one to make oneself or her/his work more creative. While in the center an accumulation of creative and non-creative tasks and inputs is taking place (often in teams), the periphery serves as a relieve when working through the accumulated tasks. After this, multilocal knowledge workers are ready again for new accumulation of work tasks and creative inputs in the center. This interplay results in a recurring cycle of alternating working between corporate workplaces in the center and private workplaces in the periphery (Fig. 6).

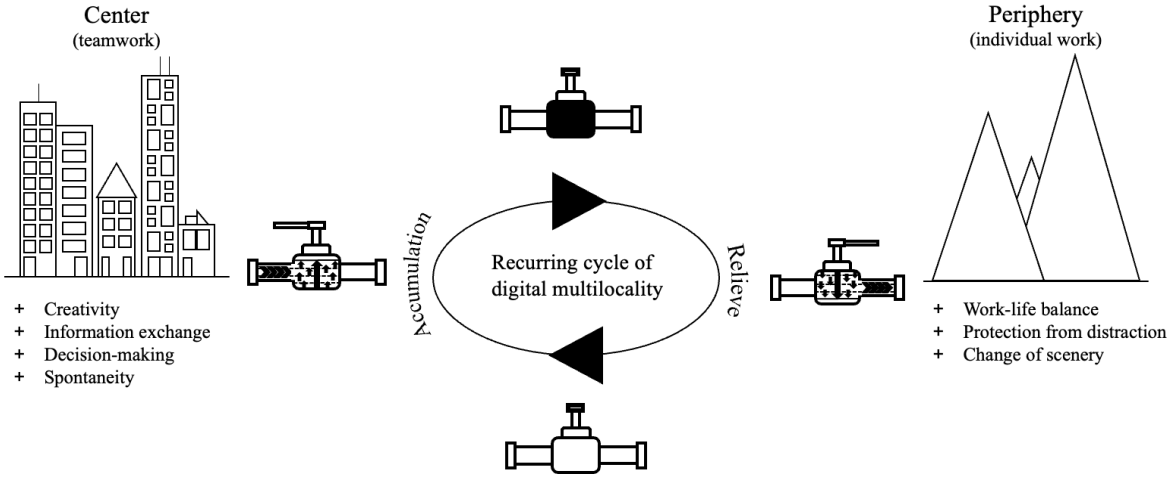


Fig. 6. Recurring cycle of digital multilocal work between the workplace in the center and in the periphery.

5 Discussion and conclusion

Our exploratory research offers a new approach for the analysis of flexible and multilocal work by examining the effects of the use of marginality for multilocal knowledge workers. It is clear that the exploratory results in this study cannot be fully generalized. Nevertheless, our findings offer new insights for the study of digital multilocality between the employer's premises and alternative workplaces in the periphery.

Responding to the quests to analyze different facets of multilocal work (Ojala and Pyöriä, 2018) and the findings regarding the effects of different work environments on work (Vesala and Tuomivaara, 2015), our study can be considered as an initial step towards a nuanced understanding on work practices in different workplaces. We add to this literature that the effects of different workplaces must be analyzed not only individually but also in relation to each other such as, for example, by considering a strategic recurring cycle of multilocal work between the employers' premises or home office in the center and private workplaces in the periphery. In this regard, we suggest to not uniquely focus on the effects of the peripheral workplace environment on work, but rather considering the interplay of workplaces (see, Burchell et al., 2020). This suggestion goes along with the finding that work processes of multilocal knowledge workers, at any given workplace, are not completely detached from the central workplace due to the use of ICTs.

The results also directly connect with recent literature on marginality. Against our expectations that resulted from the literature (Grabher, 2018; Hautala and Ibert, 2018; Sgourev, 2019), marginality is not so much used for creative work but rather for working undisturbed and without interruptions – another aspect of shielding from the mainstream. Our study illustrates that in terms of digital multilocal work between central and peripheral workplaces, creative work processes and outputs are mainly linked to the center, where the experimentation with ideas predominantly takes place in teamwork. We add to this literature that with regard to digital multilocality, the localization of creative activities may be reconsidered because the qualities of the central workplace (e.g., information exchange, teamwork) cannot simply be transferred to the periphery.

Furthermore, while marginality is understood in terms of self-chosen strategies in order to shield oneself from the dominance of the mainstream in the center (Grabher, 2018), using marginality in digital multilocal work arrangements indeed becomes a relevant and somewhat a shielding strategy. Nevertheless, based on our research we want to give impetus to go beyond the position of marginality in a center-periphery perspective by paying closer attention to the 'strategy' and what it exactly entails. The study participants showed that they strategically distance themselves from digital technologies and choose to organize their work more analog when in the periphery (Forman and van Zeebroeck, 2019; Pershina et al., 2019; Verstegen et al., 2019). This implies a conscious strategic isolation from the center through the creation of digital disconnection, which is not a disadvantage but can be seen as an opportunity (see, Simpson et al., 2003; Pyöriä, 2011).

The literature on rural development and digitalization has so far emphasized the importance of digital connectivity and the use of digital technologies for people working remotely in rural areas (Townsend et al., 2013; Wallace et al., 2016; Salemink et al., 2017; Philip and Williams,

2019). This study provides direct evidence for the relevance and the necessity for the development of digital infrastructure in non-central areas. As such, modern infrastructures such as broadband enable digital multilocal work arrangements between center and periphery. Furthermore, we suggest to put more emphasis on the actual work experiences at the micro level to get a more nuanced understanding of the value of digital connectivity in non-central areas for work practices.

Future research could deepen our exploratory findings by comparing marginality and multilocal work in other geographic contexts by, for example, looking at the home office experience during the Covid-19 crisis or focusing on the interplay between employers' premises and alternative workplaces such as (suburban) home office. Upcoming studies could also take a critical view and question digital multilocality as a privilege for the highly educated and financially better endowed workforce.

The exploratory study provides innovative methodological insights for researching multilocal aspects of knowledge-based work. Our study provides a novel and original approach for studying a rural phenomenon using multiple digital and analog methods that were intertwined. We suggest to further elaborate and use mixed methods approaches for researching the rural, as they can indeed analyze a phenomenon from different perspectives and in an even more focused way (Strijker et al., 2020). However, we are aware that the sample and the geographic perimeter must be extended in order to draw more generalized conclusions. Nevertheless, our mixed methods approach illustrates that digital work tracking data at the micro level can be a valuable source for analyzing the subtleties of work activities at multiple locations by bridging the qualitative/quantitative divide (Bathelt and Li, 2020). In addition, the digital methods applied in the first phase of the data collection also show original opportunities for field research under difficult conditions such as during Covid-19. We thereby contribute to ongoing discussions on the potential of mixed methods for economic geography research (Bathelt and Li, 2020) and 'e-Research' methods (Halfpenny and Procter, 2015).

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Article 3: ‘Far away and yet so close’: Urban-Rural Linkages in the Context of Multilocal Work Arrangements

Authors: Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug

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Abstract: Digital technologies allow knowledge workers to work from multiple locations both in urban and rural areas. When they work in these different locations, they create urban-rural linkages and information and communication technologies (ICTs) play a critical role. We used a novel mixed methods approach to combine quantitative data from laptop and smartphone tracking with qualitative data from ethnographic walk-along observations and semi-structured interviews to analyze the creation of urban-rural linkages and temporary proximity in multilocal work arrangements. The results show that multilocal knowledge workers create urban-rural linkages on demand and they thereby generate temporary proximity between the urban and the rural. Yet, the economic embedding of these workers in the rural is limited.

1 Introduction

Since the beginning of the 21st century, digitalization has fundamentally changed work practices, particularly those of knowledge workers. Advances in information and communication technologies (ICTs) and transportation enable multilocal work forms at varied workplaces while still being connected to coworkers and supervisors (Messenger, 2019; Nadler, 2014). In this regard, rural regions are coming into focus as places of work for knowledge-intensive work activities (Clark, 2018; Vesala & Tuomivaara, 2015). In Switzerland, an increasing number of knowledge workers from cities temporary seek to work in rural areas such as, for example, mountain regions. In turn, policymakers in mountain areas push to upgrade their broadband infrastructure and they have started to create a support infrastructure through for example co-working spaces (Bürgin & Mayer, 2020). These multilocal knowledge workers can be seen as pioneers as they engaged with multilocal work arrangements before the Covid-19 pandemic forced many employees to adapt such work practices.

There may be prospects that multilocal knowledge workers create urban-rural linkages through their technological practices and mobility patterns. Multilocal forms of work that alternate between two locations such as a city and a mountain region can connect the urban and the rural and technological advances play a key role (Lichter & Brown, 2011). In this regard, we focus on the creation of urban-rural linkages. In doing so, rural and urban areas are no longer seen as isolated from each other, but as economically and socially interwoven through various flows such as, for example, people, knowledge and information (Atterton, 2016; Davoudi & Stead, 2002; Tacoli, 1998). Therefore, the spatial attribution of economic activities and their effects become geographically broader and not limited to just the urban or just the rural. Indeed as the literature shows, economic linkages between urban and rural emerge through mobility patterns of highly skilled workers (Bosworth & Venhorst, 2018). However, it is not just mobility that creates and influences urban-rural linkages: In particular, technological advances through digitalization have also significantly strengthened urban-rural linkages (Lichter & Brown, 2011; Weber & Freshwater, 2016). These factors combined lead to a possible shift of economic activities from single to multiple urban and rural locations.

Urban-rural linkages can occur through the active use of digital devices, which not only brings the effects of the linkages but also the digital technology itself into focus. In addition, ICTs and specific communication applications create proximity at the touch of a laptop's or smartphone's button, which increasingly calls into question the relevance and the temporal nature of geographic proximity (Torre, 2008; Torre & Rallet, 2005). After all, since the digital age, knowledge and information are no longer simply bound to a single location but can easily be transferred across geographical distances through ICTs (Forman & van Zeebroeck, 2019). Until now, this focus on the technology itself and on empirical evidence related to it, have largely been absent from research on urban-rural linkages.

As a result, there is a need to better understand the creation of urban-rural linkages through ICTs and specific communication applications on digital devices in the current context of new multilocal work forms. In addition, there is also a research gap on the social and economic embeddedness of knowledge workers who work in the rural temporarily. Our study aims to address this gap by examining urban-rural linkages that are created through digital

communication activities of multilocal knowledge workers. We focus on the following research questions: To what extent and why do communication activities created through digital devices such as laptops and smartphones differ between the urban and the rural? How do multilocal knowledge workers deal with distance to their coworkers, supervisors and/or clients during multilocal work arrangements and the use of ICTs? How and to what extent are multilocal knowledge workers embedded in the local structure of the rural and which economic benefits does this entail?

To answer these questions, we analyzed the work patterns of six multilocal knowledge workers who transit and work between cities and mountain regions in Switzerland. We utilized a mixed methods approach that combines digital and analog methods (e.g., Crabtree et al., 2015). This exploratory research answers the quest for new methods in economic geography research (Bathelt & Li, 2020) and in rural studies (Strijker et al., 2020) by combining heterogeneous data sources such as digital work tracking (digital footprints of laptops and smartphones) and ethnographic walk-along observations and qualitative semi-structured interviews. Due to the exploratory and extensive nature of the field work and data gathering, the sample is limited to the six study participants. While the data cannot be generalized, we find interesting patterns in the qualitative and quantitative data. The data was collected between spring and autumn 2019 before Covid-19.

Our research contributes to emerging conceptualizations of urban-rural linkages (Akkoyunlu, 2013; Bosworth & Venhorst, 2018; Mayer et al., 2016; OECD, 2013; Weber & Freshwater, 2016; Woods & Heley, 2017). First, the study illustrates that ICTs need to be taken into account to analyze urban-rural linkages, as the creation of linkages is dependent on the availability of adequate digital infrastructure in the rural. The study shows that knowledge-intensive economic activities can temporarily shift from urban to rural areas due to ICTs, but the connection to the urban is still indispensable. Second, the creation of urban-rural linkages through ICTs enables proximity between urban and rural 'on demand' when needed. Proximity through ICTs is of a temporary nature which is either actively created or passively received. Third, multilocal knowledge workers are mostly well embedded in the rural local structure. Yet, their connection to the urban through ICT is more important for their work activity. Fourth, we illustrate that our mixed methods approach offers a novel way to research urban-rural linkages.

2 Literature review

Over the past decades, ICTs have significantly changed the way we work (Messenger, 2019). This came along through changes in the way knowledge-based work is performed in terms of time and space (Ojala & Pyöriä, 2018). These changes are based on technological advances that allow work-related activities to be performed in different locations and still be connected, also between urban and rural areas (Nadler, 2014). This article starts from the premise that multilocal knowledge workers create urban-rural linkages and through their particular use of ICTs they can create temporary proximity to coworkers, supervisors and/or clients.

Recent studies have shown, that knowledge-based work activities in particular have become increasingly location-independent and multilocal (e.g., Burchell et al., 2020; Koroma et al., 2014; Ojala & Pyöriä, 2018; Pajević & Shearmur, 2017). In this regard, ICTs are an essential component of multilocal work practices, which make working at multiple locations possible in

the first place (Hislop, 2013; Pyöriä, 2005), even in rural areas (Clark, 2018; Vesala & Tuomivaara, 2015). Such an increasing flexibilization of working practices may change the connections between urban and rural places 'as ICT and the immaterial character of 'brain work' should allow workers to locate everywhere and independently of place, thus equally including rural and remote areas' (Nadler, 2014, p. 54).

The specific focus on the interface of urban and rural implies that the rural economy cannot be seen as isolated but rather intertwined with urban economies through various types of flows such as flows of people, information, capital, goods, technology, etc. that connect urban and rural (Atterton, 2016; Davoudi & Stead, 2002; Tacoli, 1998). Given the increasing importance of ICTs (Weber & Freshwater, 2016), we see these as central mediating technologies that need to be incorporated in any analysis of urban-rural linkages. Insights about what kind of ICTs and communication applications specifically are able to connect urban and rural are missing.

Literature from the 1970s primarily questioned the dichotomy between urban and rural, providing a fruitful basis for research on urban-rural linkages (Funnell, 1988). Work-related migration from the countryside to the city may arise as a necessity, whereby in developing countries the poorer population benefits from the urban economic prosperity (Lipton, 1977). Such mobilities between urban and rural, however, can also be found today in industrialized countries, where work-related mobility on a daily basis from rural to urban takes place due to the economic incentive for high skilled workers (e.g., better jobs, higher wages in urban), while the social center of their life is located in the countryside (Bosworth & Venhorst, 2018). Such interregional commuting creates mobility-related linkages that lead to a restructuring of urban-rural relations (Shucksmith & Brown, 2016).

Furthermore, the literature on urban-rural linkages shows that the connection to the urban is relevant for economic actors such as entrepreneurs and enterprises who are located in the rural. In this respect, rural-to-urban linkages are important to access external knowledge sources that go beyond the regional rural context (Kalantaridis et al., 2019; Mayer et al., 2016). This implies that the urban is still the center of knowledge and suggests that economic actors in rural places do not reside in geographic isolation but are interwoven with other places despite their physical distance (Irwin et al., 2009; Kalantaridis et al., 2019).

The actual technology through which economic actors create urban-rural linkages is not well discussed in the literature. Yet urban and rural areas have never been more connected than nowadays because of the widespread use of modern infrastructures: 'Improvements in transport infrastructures and the rapid adoption of ICT by retailers, service providers and most other businesses have greatly expanded the linkages between urban and rural regions' (Weber & Freshwater, 2016, p. 162). As a consequence, ICTs and particular their Internet-based applications (e.g., digital communication, videoconferencing) as well as transportation (e.g., roads, rail lines) have the potential to shift economic activities to different locations if access to good broadband connection is available (Weber & Freshwater, 2016). These technological advancements and the widespread adoption – even pre-Covid-19 – illustrate the need to shift the focus of the analysis from examining the impacts of linkages to the technology through which linkages are created. In particular, we do not know what specific digital devices and

communication applications are used by economic actors who work between urban and rural locations.

Focusing on the use of ICT as a means to create urban-rural linkages also allows us to examine the ways in which proximity to other economic actors is enabled from any place at any time through ICTs (Graham & Anwar, 2019). This is important in the context of urban-rural linkages because proximity between economic actors can actively be created through linkages to, for example, customers in urban markets (Mayer et al., 2016). This implies that linkages not only connect urban and rural, but they can be utilized to create proximity. Therefore, proximity to geographically distant knowledge (but also to power) sources can be a motivation for the creation of linkages.

How can economic actors from different locations create proximity to each other? So-called 'temporary clusters' create temporary proximity between actors for example at business events such as fairs and meetings (Bathelt & Schuldt, 2008; Henn & Bathelt, 2015; Maskell et al., 2006). In this case, proximity only requires the transportation infrastructure to get the actors to the events. However, technological advances cast a critical light on the need for such geographic proximity (Torre, 2008; Torre & Rallet, 2005). New forms of proximity have developed through digital technologies that make physical encounters largely obsolete – this has even been more questioned during the Covid-19 pandemic. ICTs as linking technology can be used to create proximity across geographical distances (Forman & van Zeebroeck, 2019) through for example digital written, audio and video communication (Torre & Rallet, 2005). Because this form of digital communication is not permanent and only created when using digital devices, it can be assumed to be a temporary nature, not in the physical geographic location but in the digital space. This also raises the question of how ICTs enable proximity in time and space, when no specific location is necessary and proximity is independent of time.

Thus, the possibility to create urban-rural linkages and as a consequence of the creation of proximity between urban and rural through novel forms of communication questions the rural embeddedness of multilocal knowledge workers. Permanent migrants who move from an urban to a rural location can embed themselves in their destination community due to permanent settlement (Bosworth & Willett, 2011) and the establishment of social relationships (Jack & Anderson, 2002). We know that 'embeddedness is a process of becoming part of the structure' (Jack & Anderson, 2002, p. 483) but we do not know how multilocal knowledge workers embed themselves in the local structure of the rural, especially since they are only in the rural for a limited period of time due to their multilocal work style. Therefore, we are interested in examining to what extent multilocal knowledge workers who temporarily work in the rural are integrated in the rural local structure and how this affects their economic work activity.

3 Mixed methods research design

For this study, we utilized a mixed methods approach that combines digital with analog methods (e.g., Crabtree et al., 2015). The computer aided digital methods (e.g., Leszczynski, 2018) involved the collection of quantitative digital work tracking data from laptops and smartphones. The analog methods included qualitative ethnographic walk-along observation and qualitative semi-structured interviews. Thus, valuable primary microdata of ICT use in urban and rural

workplaces was generated and integrated in the mixed methods approach as the data built the basis for our qualitative inquiry.

3.1 Research context

Our field research was situated in Switzerland. We selected a sample of multi-local knowledge workers who work part of their time in the urban context and another part of their time in a mountain region. Swiss mountain regions suffer from disadvantageous developments such as structural change, aging society, outmigration of young people to cities, etc. However, digitalization seems to provide some potential (Bürgin & Mayer, 2020). Some mountain regions are proactively working on their communication and work infrastructures and offer mobile workers the opportunity to engage in multilocal work practices (miaEngiadina, 2020; NüGlarus, 2020).

Switzerland has one of the highest share of jobs that can be done remotely and flexible workplace models become increasingly popular (OECD, 2020; Weichbrodt et al., 2020). These emerging workplace flexibilities are favored by the advanced development of broadband infrastructure in non-urban areas. In 2019, Switzerland's overall fixed broadband coverage was 99.8% (EU28: 97.1%). Furthermore, 99.0% (EU28: 85.8%) of all Swiss households were connected to 'Next Generation Access' (NGA)[1] broadband and 80.4% (EU28: 44.0%) to 'Very High Capacity Networks' (VHCN)[2]. The overall rural fixed broadband coverage was 98.6% (EU28: 89.7%). The rural NGA coverage in Switzerland was 93.8% (EU28: 59.3%) and even 67.5% (EU28: 20.1%) of Swiss rural households had access to VHCN (European Commission, 2020). The high connectivity rate of Swiss rural areas provides an ideal setting to examine the use of ICTs in multilocal work arrangements.

3.2 Sample

For this exploratory study, we recruited a small sample of multilocal knowledge workers who had to fulfill the following criteria: (1) Have their main workplace in an urban area, (2) work for at least one work week (5 workdays) every three months (thus every season of the year) in a Swiss mountain region[3], (3) utilize laptops and smartphones in their daily communication activities and (4) agree with sharing their individual digital communication tracking data with the research team.

We recruited a total of 6 participants (Table 1). The advantages of this sample size is that the empirical fieldwork becomes better manageable: (1) The application of our mixed methods approach led to a high quantity of data that had to be processed and coordinated. (2) A greater effort from the participants themselves was required in comparison to a comparable study. Using this approach, we were able to generate and proceed all the data with utmost carefulness

[1] NGA coverage includes fixed-line broadband access technologies that can achieve 30Mbps download speeds (European Commission, 2020).

[2] VHCN coverage includes fixed-line broadband access technologies that can achieve gigabit download speeds (European Commission, 2020).

[3] This period was chosen to exclude daily commuters and people who work in the periphery by chance (e.g., during holidays).

which would have been difficult with an even larger amount of data. Thus, the data are not fully generalizable but provide exploratory insights into a possible pattern in the creation of urban-rural linkages through ICTs from pioneers that engaged in multilocal work arrangements even before the Covid-19 pandemic.

Table 1. Sample of multilocal knowledge workers.

Pseudonym	Profession	Employment status	Primary location of employment	Average multilocality frequency	Rural embeddedness
Susan	Virtual assistant	Freelance entrepreneur	Urban	1-2 days per week	Family (father, mother)
Robert	Product manager digital public services	Corporate employee	Urban	2 days per week in urban	Family (wife, children)
Matthew	IT specialist	Freelance entrepreneur	Urban and rural	1 week every two months	Family
Nancy	Innovation manager	Corporate employee	Urban and rural	Two to three times per month for three to four days each	Family (partner)
Daniel	Data & AI solution specialist/lecturer	Corporate employee	Urban	Every weekend	Family (of partner)
Joseph	Specialist for Human Resources and organizational development	Corporate employee	Urban	at least ten to fifteen times per year	None

3.3 Data collection and processing

The data collection consisted of two consecutive phases that involved different methods. In the first phase, digital methods were applied to collect quantitative digital communication tracking data of applications on laptops and smartphones for each five days in the urban and the rural. This data was statistically analyzed and, based on these statistics, the questions for the interview guide of the semi-structured interviews were created. In the second phase, we conducted qualitative ethnographic walk-along observations in combination with semi-structured interviews during the participant's journey from the urban to the rural workplace. The methods and their connections will be explained here in more detail (Figure 1).

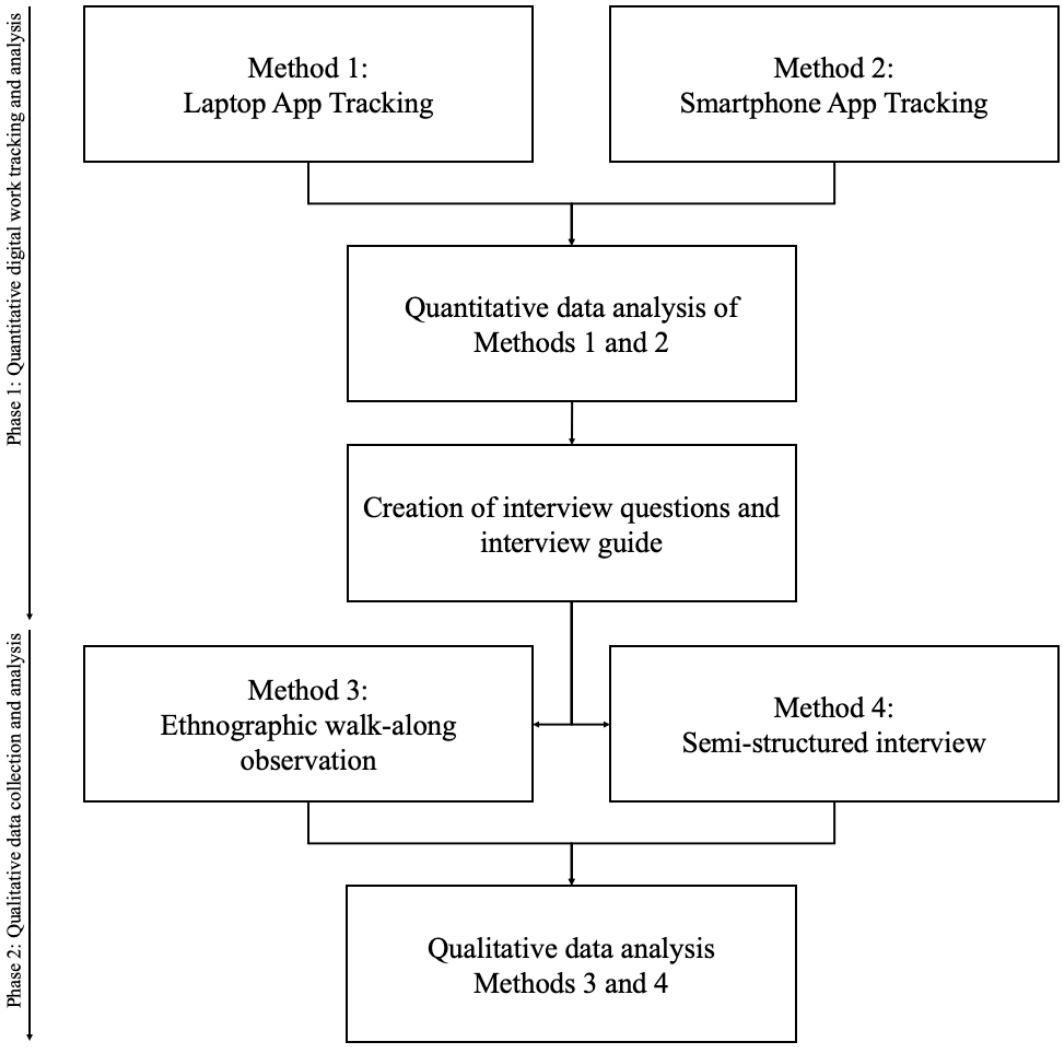

Figure 1. Mixed methods approach separated in two phases of data collection.

Communication activities on the laptop were tracked using the open-source time tracker 'ActivityWatch' which collects names of focused applications, window titles in a timeline of events, active user input and inactive periods. The participants run the application during their digital work tracking days and handed their data to us after the digital work tracking days were completed.

Simultaneously, smartphones were also tracked to collect logs of mobile communication activities (Birenboim & Shoval, 2017). Because Apple iPhones (all participants used this device) do not grant third parties to access the application usage data, the participants had to take screenshots of their battery usage (the durations of usage of applications is displayed within 24 hours on a minute basis) and send them to us.

The digital communication tracking data of laptops and smartphones was processed using Jupyter notebooks. The data was sorted and assigned to the urban respectively rural location. The smartphone battery screenshots were transcribed to a Microsoft Excel table for import into Python. Then the data was categorized, cleaned from unusable artifacts and sensitive data such

as window titles were removed. Based on that, the digital communication tracking data was extracted to generate statistical evaluations.

In the second phase, qualitative analog methods were applied. First, notes of ethnographic walk-along observations (Rose et al., 2010) were recorded in the researchers' notebooks. Second, we conducted qualitative semi-structured interviews during the walk-alongs to deepen the findings from the first phase and the walk-along. We used a semi-structured form of interviews that allowed to show the participants their own digital communication tracking data and ask precise questions. Together with the notes from the ethnographic walk-along observations, the interviews were imported into MAXQDA12 for transcription, coding procedure and qualitative content analysis (Mayring, 2015).

Ethical considerations were applied with the utmost carefulness during the research process (Anderson & Jirotka, 2015; Madge, 2007; Tiidenberg, 2018). Informed consent was granted by written and signed letters of consent between the research team and each participant individually. Confidentiality of the data was granted through secure data storage on the university's server infrastructure and keeping always secret the participants' identities.

4 Results

4.1 Creation of urban-rural linkages

In contrast to the literature, which highlights the differences in the effects of digitalization between urban and rural areas (Salemink et al., 2017), we found that our study participants can work at any rural place as long as digital infrastructure is available and they are able to create linkages from the rural to the urban. This finding is based on the almost identical digital communication activities between urban and rural (Table 2 and 3) that is also reflected in the qualitative interviews.

Table 2. Communication activities on laptop during digital work tracking days in urban and rural (averages of participants' averages).

Urban						
Type of communication	**Total**	**Percent**	**Daily average**	**Median**	**Std deviation**	**Std err of the average**
Email	43:01:13	62.87%	01:13:20	01:05:45	00:38:16	00:15:37
Hybrid communication	15:50:19	23.15%	00:27:16	00:24:34	00:24:01	00:09:48
Social media	05:34:11	8.14%	00:09:58	00:03:09	00:14:18	00:05:50
Audio/video communication	01:57:45	2.87%	00:03:16	00:02:11	00:04:18	00:01:45
Communication management	01:27:15	2.13%	00:02:49	00:00:00	00:06:15	00:02:33
Text messaging	00:34:52	0.85%	00:00:58	00:00:00	00:02:22	00:00:58
Combined average	68:25:38	100%	01:57:39	02:10:04	00:37:24	00:15:16

Rural						
Type of communication	**Total**	**Percent**	**Daily average**	**Median**	**Std deviation**	**Std err of the average**
Email	45:18:04	65.07%	01:23:50	01:18:34	00:44:28	00:18:09
Hybrid communication	15:28:58	22.24%	00:26:00	00:25:54	00:15:31	00:06:20
Social media	06:56:09	9.96%	00:11:49	00:01:33	00:24:18	00:09:55
Audio/video communication	00:28:25	0.68%	00:00:45	00:00:08	00:01:21	00:00:33
Communication management	01:17:05	1.85%	00:02:09	00:00:00	00:04:53	00:01:59
Text messaging	00:08:29	0.20%	00:00:10	00:00:00	00:00:25	00:00:10
Combined average	69:37:13	100%	02:04:47	02:02:50	00:56:43	00:23:09

Table 3. Communication activities on smartphone during digital work tracking days in urban and rural (averages of participants' averages).

Urban						
Type of communication	**Total**	**Percent**	**Daily average**	**Median**	**Std deviation**	**Std err of the average**
Audio/video communication	18:31:00	41.72%	00:40:37	00:29:00	00:37:10	00:16:37
Hybrid communication	15:15:00	34.36%	00:33:30	00:30:00	00:20:56	00:09:22
Social media	05:22:00	12.09%	00:12:13	00:13:10	00:07:53	00:03:31
Email	04:07:00	9.28%	00:08:54	00:07:30	00:04:55	00:02:12
Text messaging	01:08:00	2.55%	00:02:16	00:02:00	00:02:21	00:01:03
Communication management	00:00:00	0.00%	00:00:00	00:00:00	00:00:00	00:00:00
Combined average	44:23:00	100%	01:37:32	01:25:00	00:49:36	00:22:11

Rural						
Type of communication	**Total**	**Percent**	**Daily average**	**Median**	**Std deviation**	**Std err of the average**
Audio/video communication	17:29:00	38.50%	00:40:00	00:51:12	00:28:51	00:12:54
Hybrid communication	17:23:00	38.28%	00:35:52	00:34:30	00:26:10	00:11:42
Social media	06:21:00	13.98%	00:15:22	00:09:00	00:13:55	00:06:13
Email	03:14:00	7.12%	00:07:50	00:03:00	00:09:27	00:04:13
Text messaging	00:56:00	2.06%	00:01:59	00:01:30	00:02:12	00:00:59
Communication management	00:02:00	0.07%	00:00:04	00:00:00	00:00:08	00:00:03
Combined average	45:25:00	100%	01:41:09	01:52:15	01:04:03	00:28:39

Notes: 1.) 'Hybrid communication' includes audio, video and text. 2.) User-generated data is error-prone. Not all participants sent complete data.

The participants' quantitative data give preliminary insights into patterns of digital communication activities in the urban and the rural workplaces: The six study participants' communication activities on the laptop do only slightly differ between urban and rural on both laptops and smartphones. The difference in the total duration of communication activities on the laptop between urban and rural (07:08 minutes more on average in the rural) is mainly due to the use of more email (10:30 minutes on average) during workdays in the rural (Table 2). The other types of communication activities were approximately equally used on laptops in both locations, as they do not differ more than 3 minutes between urban and rural. Similar findings are drawn from the communication activities on smartphones (Table 3). Although the statistical analysis generally shows slightly higher use of communication activities (03:37 minutes on average) in the rural compared to the urban, this number is also very low and not significant. Other types of communication activities also do not differ more than approximately 3 minutes between both locations. One larger difference was detected by the median of the combined average that shows 27:15 minutes higher usage in the rural compared to the urban, which shows individual differences between the participants.

Based on this analysis, there were no overall statistically significant differences of creation of linkages through digital communication activities detected between urban and rural. However,

more in-depth knowledge on the digital communication activities was generated during the interviews. We showed the participants their quantitative digital communication tracking data and asked specific questions.

To create urban-rural linkages, fast and stable digital infrastructure must be available to access the Internet. This has become obvious through the interview data resulting from the walk-alongs: Robert is a product manager for digital public services and has a leading position. He lives in a mountain area and travels every week to the urban for two workdays (including overnight stay) as his work requires his physical presence at the urban workplace for half of the week. Robert, an example of a frequent multilocal worker, clearly pointed out the importance and necessity of stable and fast Internet connection also in the rural for working and being connected with coworkers:

> This is a must. Undoubtedly, you need a good... good internet connection. Otherwise, you're gone. […] That's really important a good connection to do desktop sharing or drawing on the screen directly with the partner or something. That helps a lot, yes. That means this is a must.

While Robert is working in the rural, he uses more frequently communication applications such as WhatsApp, Skype or phone calls to create linkages to coworkers and clients in the urban, where he usually meets them in person. Interestingly in this regard, Robert stated that communication applications such as 'Skype for Business' and specific tools such as screensharing also decrease the relevance of physical meetings in person, as information and knowledge can easily be shared over distance via ICTs. This is a practice that he has used pre-Covid-19 as our field work ended about four months before the first lockdown in Switzerland.

The digital infrastructure is also important that linkages can be created from the urban to the rural. This is nicely illustrated by innovation manager Nancy, who is working for different firms and needs to be reachable for her coworkers and/or supervisors: 'The reachability is just funnily enough the same everywhere. You also have to be extremely reachable here [in the mountains]. […] So that means that I am always available everywhere when they are on the phone.'

Susan is a virtual assistant and constantly in contact with her clients, regardless of where she is working. She enjoys the flexibility to visit her parents in the mountains on a weekly basis and can still be in constant contact with her customers due to good Internet connection. However, Susan has roughly used ICTs double the time in the rural compared to the urban and explained this fact on the basis that she needs to connect with her clients for clarifications or decisions, as she 'often just want to get an OK from them'.

Email connects multilocal knowledge workers to coworkers, supervisors and clients in the urban. This linkage was created slightly more during workdays in the rural. IT specialist and programmer Matthew uses email to transfer new orders or tasks to coworkers in the urban. Email is the most important communication tool to 'somehow also remind people to do something and then also to finalize something. And email is actually super suitable. When you use a chat, then it's too general'. Similar is true for Nancy who mentioned that due to lacking physical meetings in the rural, she coordinates tasks and informs her coworkers and supervisors in the urban through email or phone calls to initiate processes or to work on open tasks.

Furthermore, data and artificial intelligence (AI) specialist Daniel is a multilocal worker not only within Switzerland but also intercontinentally at times. Daniel preferably uses the application 'Microsoft Teams' to stay connected with coworkers and supervisors, which reunites text messaging, audio and video conferencing as well as file sharing.

Joseph is a specialist for human resources and organizational development. He stands out, as his digital communication activity differs from the other participants. Joseph consciously tries to keep the creation of linkages to the urban as low as possible during the workdays in the rural:

> I really try to do as much face-to-face as possible before [going to the mountains]. And if it is, then it is really still quickly to explain something. Or I pick up the phone if I have the feeling it's more efficient than doing a mail now.

The examples show that communication activities using ICTs can create linkages between workers even over large geographic distances insofar a good and stable Internet connection is available. Therefore, the rural can serve as an adequate work environment for multilocal knowledge workers given that it meets their technological requirements and there are hardly any restrictions on the way they work. Consequently, the creation of linkages from rural to urban and vice versa increasingly connects the rural to the urban through ICTs.

4.2 Temporary proximity through ICTs

We found two forms of proximity that were created by multilocal knowledge workers during workdays in the rural: Actively created proximity and passive proximity in terms of receptiveness. In doing so, multilocal knowledge workers can overcome distance through the creation of proximity via the use of ICTs even though they are geographically distant from the firm's office located in the urban. At the urban workplace, proximity is created through physical meetings with coworkers, clients and/or supervisors. As this is not possible in the rural, proximity is created 'on demand'.

The first form of proximity is of an active nature. There is general concern across our participants that during workdays in the rural there is less knowledge exchange with coworkers and/or supervisors taking place and input for work must be actively sought. Consequently, proximity to the urban is needed to access information and knowledge. The multilocal knowledge workers actively create temporary proximity through rural to urban digital communication activities, which is nicely illustrated by Robert:

> You have to do that more actively when you work remotely. […] And not always, but sometimes it's just a bit of chat somewhere start with someone. […] So, people notice that you're also working and then suddenly some questions come up and so on. […] With some coworkers I have more chat for smaller things. A little bit like small talk.

Thus, while working in the rural, Joseph communicates with his supervisor in the urban very short but purposefully. Despite he tries to clarify open questions before travelling to the rural workplace, sometimes he must actively create proximity to the source of power. In this regard, Joseph explained that he communicates with his supervisor when he needs decision-making power or to double-check his working steps:

> She wants to see certain decisions before I make them. I also appreciate her know-how, where I quickly say "hey, what do you think about this?" […] Picking up decisions in the sense of "yes, do we want to go in this direction as a team, or what do you think of that?" These are things like that. Just briefly before you take the next hurdle.

Similar is true for Nancy, who also creates proximity to her supervisors in the urban but slightly differs from the example above. Nancy is less dependent on her supervisor's decision-making power and explained that she and her supervisors seek proximity in a more informal ways: 'It has both, we are looking for a bit of proximity and friendship. My supervisors and I. An exchange. Also information that is sometimes on the meta level. Not such a key information, but still an important information.'

Susan is a freelance entrepreneur and is not dependent on supervisors' decisions. The decision-makers are her clients, with whom she also actively searches for exchange or information and therefore creates proximity using phone calls and WhatsApp. Though, this contact is more informal and also can come from the incentive of loneliness during her workdays: 'You know it yourself, if you can't exchange somehow, you are like empty.'

The second form of proximity is of a passive nature. This is evident for the maintenance of the connection between urban and rural through ICTs by showing the willingness to be receptive for proximity for coworkers, supervisors and/or clients from the urban. This passive form of proximity differs from the active form in that multilocal knowledge workers do not actively seek out information, but they show that they can be contacted.

The aim is to maintain the connection to the urban. In this regard, Nancy explained that 'of course, I have to maintain the connection to the people I am in contact with'. She shows availability by being online and is therefore receptive for proximity coworkers and supervisors at any time and at any place, as 'always everywhere when they call, I am available'.

Data and AI solution specialist Daniel uses clearly less communication applications on his smartphone while working in the rural. Nevertheless, creating linkages through ICTs mainly becomes a strategy for showing passive proximity in terms of online availability to his coworkers in the urban if they need him and to maintain the proximity to the urban power center:

> Yes, it is then simply... that is more so a bit also to mark presence. In the sense of: "Hey, I'm not... I'm not just offline", or "I'm here". And then you have to write a quick 'mässi' [message] again: "Hey, I'm working on this and that and I have this", or "if you need something, I'm available", and so on. That people still know the people are available. […] That's more a bit of the political… let's say political approach.

In addition to these two forms of proximity, we also found a practice to deliberately prevent proximity. In this regard, laptops and smartphones are put aside to strategically disconnect from coworkers, supervisors and/or clients in the urban to be more focused for work, as mentioned by Daniel. Furthermore, mountain sports-loving participants such as Susan, Nancy and Joseph highlighted a more extreme type of disconnection by not taking the smartphone with them during leisure activities in the rural. On the one hand, they gain the power over their activities to create proximity whenever they need them. On the other hand, they also gain power over

proximity coming from the urban reaching them while they are in the rural by not allowing receptiveness for those ICT linkages by their coworkers, supervisors and/or clients.

4.3 Rural embeddedness

The increasing popularity of multilocal work arrangements between urban and rural raises the question of the rural embeddedness of multilocal knowledge workers coming from urban areas. We found (1) that the linkages created from urban to rural are mainly on a personal respectively family level through which the multilocal knowledge workers become embedded in the local structure even if they are not in the rural and (2) this embeddedness in the rural has limited effects on the economic activity (Jack & Anderson, 2002), except when the study participants worked for a company located in rural or they actively seek for the expertise of family members living in the rural.

Linkages from urban to rural are rarely created for work. Only Matthew und Nancy who both work part-time for a firm that is located in a mountain region created work-related linkages from urban to rural. They permanently maintain the connection regardless of whether they are currently working in urban or rural using, for example, email applications, 'Microsoft Teams' (Matthew) or 'Slack' (Nancy). Consequently, both of them are embedded in the rural even if they are not permanently on site.

For the other study participants, the urban to rural linkages are mainly of personal nature and not directly work-related, because they are not involved in specific work activities in the rural. The reason for this is that the important work contacts are located in the urban area. In this regard, Robert explained that in the urban 'are more such contacts that I have informally or formally. And that is logically a bit more than in the mountains, yes'.

While in the urban workplace, the study participants created linkages to the rural to communicate with family members or friends. With the exception of Joseph, all of our study participants maintained personal contact with people in the rural. These linkages are created daily or once to several times a week using text messages via WhatsApp direct messages, WhatsApp groups or phone calls. This is nicely illustrated by Nancy's statement:

> So, these are really people that I just got to know through that I was much now in the same villages. And really on the village square and other young families, those I write maybe let's say already weekly or I ask them "hey, when are you there? I come then and then". Or "do you have time to maybe then quickly, when I bring my child, look at my daughter?". Or "I look at your children, you can bring it to me. I'm here".

Nevertheless, the personal contact in the rural can have a positive impact on work, insofar as the study participants actively contact their personal contacts in the rural that have a different perspective on issues. This is illustrated by the example of Daniel, who views the family in the rural also as a 'test laboratory' where he receives feedback on his work from people who are not familiar with it. Daniel considers this a great advantage because this procedure forces Daniel to make and present his work more focused, because 'if they understand it, I'm sure my customers will understand it too'.

Similar is true for Susan, who benefits from the contact with her parents that live in the rural and support her work by giving feedback and technological assistance. For example, she tests

the comprehensibility of graphics by asking her mother for feedback. Furthermore, she works closely with her father and benefits from his movie editing and proofreading skills: 'I benefit from him extremely. Indeed, he helps me. He sometimes proofreads for me, edits my videos for me.' Nevertheless, despite the contacts with her parents, Susan mentioned that she does not benefit from contacts with other people living in the rural for her work.

In contrast to the examples of Daniel and Susan, Joseph does not actively connect with other people living in the rural area where his second home is located. He mentioned that contacts with neighbors come by chance when he is in the rural in leisure time. The example of Joseph shows that it is also possible that a multilocal knowledge worker can own a secondary residence in the rural but only show scarce embeddedness in the rural local structure, whereby no benefit for work can be drawn:

> Yes, with some you talk a little more and with some a little less. But basically, you get along very, very well with all of them. […] You sometimes look "hey, are you ordering wood for the winter?" for example. Or now there have been a few young people with whom you go out for a beer or where you can improve your French. Something like that. But no, it's really nothing for work now.

However, we found that most study participants are embedded in the local social structure of the rural work destination due to strong family ties and relationships. Although most participants in the study are well embedded socially, they rarely derive an economic advantage. It is rather the people themselves and the social networks that help them, but new economic opportunities with actors or firms in the rural did not emerge. This shows that a stronger embedding of the work in the rural local structure is not necessary, as linkages from rural to urban maintain the embeddedness of work in the urban.

5 Discussion and conclusions

The aim of this paper was to analyze the ways in which multilocal knowledge workers create urban-rural linkages, how they utilize proximity to the rural respectively urban and to what extent they are embedded in the rural. This exploratory study provides novel insights and starting points for future research in terms of methodology and conceptualizations of urban-rural linkages in the digital age.

Multilocal knowledge workers create urban-rural linkages through ICTs to maintain the connection to the workplace in the urban respectively the family in the rural. Earlier works on urban-rural linkages suggested that people's mobility patterns and ICT increasingly connect urban and rural economies and societies with each other (Bosworth & Venhorst, 2018; Lichter & Brown, 2011; Weber & Freshwater, 2016). Our study suggests a more nuanced understanding of urban-rural linkages in the digital age. The examination of the technology itself through which linkages are effectively created (ICTs) illustrates that urban and rural are not linked in simply ways and all the time. Linkages should be understood as dynamic and flexible particularly because ICTs can be used in strategic ways. Thus, linkages must be understood as strategic means that can be created independent of place and time and particularly 'on demand' due to digitalization. Therefore, our study adds to existing studies of urban-rural linkages through transportation (e.g., Bosworth & Venhorst, 2018) or accessing extra-regional

knowledge (e.g., Kalantaridis et al., 2019; Mayer et al., 2016) and incorporates considerations of modern work practices and increasingly popular ICT-based multilocal work forms. The latter must be taken into account particularly in a post-Covid-19 context.

In addition, our findings illustrate that a sufficient ICT infrastructure must be available to create urban-rural linkages, so that knowledge-intensive economic activities can also spread into the rural environment (Weber & Freshwater, 2016). Therefore, we point out that specific preconditions, in our case a stable and fast broadband connection, must be given. If these preconditions are present, then there are hardly any differences in digital communication activities in work practices between urban and rural. This suggests that multilocal knowledge workers do not experience any disadvantage with regard to their work in rural areas.

Through analyzing the linking technology, we detected nuances in the ways proximity between the urban and the rural is created. Proximity is actively created, passively maintained or strategically avoided. Focusing on the work practices of multilocal knowledge workers and on the ways they use ICTs to create temporary proximity (Torre, 2008; Torre & Rallet, 2005) allows for a more nuanced perspective on the concept proximity and in particular on the means how proximity is created. In our study, temporary proximity is created through ICTs and not through physical events.

The study shows that multilocal knowledge workers are embedded in the local social structure but not in the local economic structure of the rural (Jack & Anderson, 2002; Bosworth & Willett, 2011). In the case of our study participants, embeddedness in the local structure is mainly family-related and not job-related. Embeddedness in the local economic structure could not be determined, as linkages from the rural to the urban can be created through ICTs. Therefore, in today's context of more flexible and multilocal work in the digital age, embeddedness should be reconsidered as the temporary duration of the stay in the rural does not lead to increased economic work activity within the rural context. This is because digitalization enables the creation of urban-rural linkages and therefore allows for distant connections to actors in the urban. Consequently, digitalization and novel multilocal work forms shed light on the (probably) decreasing importance of embeddedness in the rural for work.

This study is limited by its sample and the Swiss national context in which rural and peripheral areas are well connected and broadband infrastructure and access is of high quality. However, the study provides an analysis of urban-rural linkages and extends the repertory of methods in economic geography (Bathelt & Li, 2020) and rural studies (Strijker et al., 2020). Future research could build on our findings by analyzing other technologies and practices that create urban-rural linkages such as for example cargo or delivery services. Subsequent studies could also examine the creation and effects of urban-rural linkages of home office during the Covid-19 pandemic.

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Article 4: Analysing digital multilocality: Combining and integrating digital and analogue research methods

Authors: Reto Bürgin, Heike Mayer, Alexander Kashev, Sigve Haug

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Abstract: The application of mixed methods in researching digitalisation and rural development has numerous benefits in terms of the integration of various data sources. In this article, we present a novel mixed methods approach that combines digital and analogue methods. We investigated multilocal work arrangements of knowledge workers in Switzerland who mainly work in a central urban area but occasionally withdraw themselves to peripheral mountain regions in order to conduct their work in a concentrated and undisturbed environment. To analyse such multilocal work arrangements, we used a mixed methods approach that incorporated six integrated methods: geotracking, laptop and smartphone tracking, self-administered digital diaries, ethnographic walk-along observations and qualitative semi-structured interviews. Our study illustrates that mixed methods in digitalisation research provide in-depth insights, but that they also have limitations. Furthermore, we show how ethical standards can and should be used to create a basis of trust with the study participants and how this affects the recruitment of the sample.

1 Introduction

In recent decades, digitalisation changed the spatial and temporal aspects of knowledge work. The use of information and communications technologies (ICTs) and the Internet allows people to work in multiple locations (Koroma/Hyrkkänen/Vartiainen 2014; Ojala/Pyöriä 2018) but still be connected to coworkers, supervisors and clients (Messenger 2019). Consequently, co-presence in a firm's office has become increasingly obsolete for selected knowledge workers (Nadler 2014; Messenger 2019). However, even though knowledge work is mostly associated with urban areas, multilocal work is not geographically limited and can also be performed in rural areas (Nadler 2014; Vesala/Tuomivaara 2015). In the case of Switzerland and in the context of our study, temporary work in the rural periphery (mountain areas in the Swiss Alps) became increasingly popular for knowledge workers who mainly work in an urban centre (metropolitan areas) (e.g. Schilliger/Steiger 2020; Dreyfus 2021). This dynamic has started even before the Covid-19 pandemic forced many workers to adopt home office and multilocal work practices. Through our research we came to describe such digital forms of work that is distributed between multiple locations as 'digital multilocality'. Such multilocal work arrangements between urban centres and rural peripheries allow to reflect on digitalisation in rural areas in the context of work flexibility. Moreover, in this article we highlight the methodological challenges involved in conducting research in the context of digitalisation and rural development. More specifically, we present our research design and methods and discuss the lessons learned from implementing a mixed methods approach that combines and integrates digital and analogue methods.

Our study is in the context of spatially and temporally flexible work forms. We were interested in exploring digital multilocality of knowledge workers who work predominantly at the employer's premises or in their home office in the urban centre but go to a periphery to work from time to time. In this respect, we were interested in how multilocal knowledge workers use ICTs (laptop and smartphone) in their work activities, how and why they use self-chosen marginality in the mountains for work and how they create urban-rural linkages through their use of ICTs. In this article, we describe our innovative and experimental mixed methods approach that combines quantitative and qualitative data and utilises microdata from digital sources as well as subjective insights from qualitative, analogue sources.

To research aspects of digital multilocality, heterogeneous data sources were required with which we were able to analyse and compare the interaction of multilocal knowledge workers with ICTs in different locations. In this regard, the use of a mixed methods approach was useful as it allowed us to generate deeper insights into the phenomenon of digital multilocality through the combination and interaction of qualitative and quantitative research methods (Tashakkori/Creswell 2007). We were thus able to bridge the qualitative/quantitative divide (Bathelt/Li 2020). Mixing qualitative and quantitative methods deemed more suitable than to only apply one singular method (Strijker/Bosworth/Bouter 2020).

Examining work practices and the use of ICTs in different locations called for novel digital methods. Digital methods open new possibilities particularly when it comes to researching human interaction with digital technologies. Digital devices such as smartphones, laptops, tablets, smartwatches, GPS devices, cameras, etc. produce valuable and precise microdata of

people's everyday lives and especially of their interaction with digital technologies (see Halfpenny/Procter 2015). Therefore, digital technologies have the potential to combine digital and analogue methods and thus heterogeneous data sources (Crabtree/Tennent/Brundell et al. 2015). Yet, such digital methods require the adaptation and strict application of ethical considerations due to the sensitive and personal nature of the data (Madge 2007; Anderson/Jirotka 2015; Tiidenberg 2018).

In our view, conventional methods are not fully adequate to examine multilocal work arrangements and people's interaction with ICTs in different locations. We elaborated a mixed methods approach to collect microdata from a select sample of six multilocal knowledge workers. We combined heterogeneous data sources that resulted from six different methods: Geolocation tracking, laptop application tracking, smartphone application tracking, self-administered digital diaries, ethnographic walk-along observations and semi-structured qualitative interviews. Those methods were truly mixed and built on each other during a two-phase research process. The study participants' interaction with ICTs was tracked during five workdays each in the central and in the peripheral workplace. We collected the data in summer and autumn 2019, a time that was not yet affected by changing work patterns due to the Covid-19 pandemic.

This article contributes to ongoing discussions on mixed methods and digital methods for social science research. Our study shows that mixed methods enable deeper insights into work practices in different locations. In doing so, the integration of the methods and the ways we were able to produce insights and results represents a key element in our study. In this regard, the division of the fieldwork into consecutive phases of data collection is important in order to better integrate the methods (Bryman 2007). In this article, we report on the lessons learned from using such a methodological approach in terms of data processing and analysis, sample recruitment and the consideration of ethical standards. We show that strict adherence to ethical standards when using digital methods (Madge 2007; Anderson/Jirotka 2015; Tiidenberg 2018) can be beneficial rather than inhibiting especially during the recruitment phase.

2 Background of our study

Our research project is embedded in the context of the literature on flexible and multilocal working. ICTs allow knowledge workers to work in multiple locations (Koroma/Hyrkkänen/Vartiainen 2014; Ojala/Pyöriä 2018). They can fulfill their work tasks in different locations ranging from the city to the most remote rural places as the immaterial character of knowledge work can be relocated (Nadler 2014). Working in a more rural environment can also have positive effects such as increasing work satisfaction, fewer interruptions and the feeling of less stress (Vesala/Tuomivaara 2015). Based on such new multilocal work practices, rural areas are increasingly able to capture non-traditional economic activities. As a result, the view on the rural society and economy has been changing insofar as the rural is no longer perceived as a picturesque environment for leisure or an environment for extracting resources, but as a setting that can also be the location for diverse economic functions and opportunities (Scott/Gallent/Gkartzios 2019).

These observations led us to the hypothesis that in Switzerland knowledge workers are able to utilise technological progress and temporarily work in a multilocal setting (urban and rural) and

that they utilise different work patterns when working in an urban centre compared to a rural periphery[1]. We addressed this topic utilising an economic geography perspective that builds on the concepts of marginality and urban-rural linkages[2]:

- By focusing on marginality, we were interested in how the alternation of working in the central workplace and temporarily in the peripheral workplace influences work activities. Temporary work in a rural environment can have positive mental effects for workers and consequently increase well-being (Vesala/Tuomivaara 2015), it can entice creativity (Grabher 2018; Hautala/Ibert 2018) or even encourage the radicalization of new ideas (Sgourev 2019). We were interested in the following research questions: To what extent and why does the use of digital applications on the laptop and smartphone for work differ between the workplace in the centre and in the periphery? How do multilocal knowledge workers utilise marginality in their work? What are the benefits and limitations of using marginality for work and why do the study participants decide to work in a multilocal setting between center and periphery?
- Through our focus on urban-rural linkages, we examine the creation of urban-rural linkages (Mayer/Habersetzer/Meili 2016; Bosworth/Venhorst 2018), especially through the use of ICTs (Weber/Freshwater 2016). Furthermore, we also examine temporary proximity created through ICTs (Torre/Rallet 2005; Torre 2008) as well as aspects of the embeddedness (Jack/Anderson 2002; Bosworth/Willett 2011) of multilocal knowledge workers in the local economic and social structure of the periphery. The following research questions guided our study: To what extend and why do communication activities on digital devices, such as laptops and smartphones, differ between the urban and the rural? How do multilocal knowledge workers deal with distance and proximity during multilocal work arrangements using ICTs? How and to what extent are multilocal knowledge workers embedded in the rural?

In addition to these research questions, we explored how different data sources can be combined to gain deeper insights into the interaction with digital technologies in different locations (e.g. Forman/van Zeebroeck 2019). We thus took into account that traditional methods in rural studies and economic geography were not sufficient to examine multilocal work and the use of ICTs in different locations and that we had to go beyond the classical quantitative and qualitative paradigms. We also were interested in exploring new types of digital methods and integrating them with analogue methods involving a mixed methods approach.

[1] In our study we understand a centre as larger metropolitan areas that are characterized by high social, political and economy activities, which are the main areas of employment for knowledge workers (see Florida 2005). A periphery in turn is understood as the counterpart to a centre which is distant from it or located at its fringe, such as for example a mountain area (see for further reading Kühn, 2015; Hautala and Ibert, 2018).

[2] The two strands of literature rely on different conceptional approaches. Literature on marginality uses the concept of centre-periphery. Literature on urban-rural linkages uses the concept of urban-rural. In this methodological contribution we use the terminology of centre-periphery, which is used synonymously to urban-rural.

In recent years, digitalisation has fundamentally extended the repertoire of research methods and led to the emergence of digital methods[3]. This is particularly evident in the variety of digital technologies that can be utilised such as digital devices (e.g. smartphones, laptops, GPS devices, cameras) and software applications (e.g. statistics, geographic information system, GIS, automated data collection). Particularly geography-related research has benefited from the extension of methods into the digital field (Ash/Kitchin/Leszczynski 2019). New data sources include, for example, user generated digital records (logs, digital footprints) that document human interaction with digital devices. In this regard, people's behaviour, networks and mobility in space can, for example, be researched using GPS data on mobile phones (e.g. Christensen/Mikkelsen/Nielsen et al. 2011; Birenboim/Shoval 2017) and through specific communication applications on smartphones (e.g. Truong 2018; Buchal/Songsore 2019). Such methods make it possible to generate microdata, which would be difficult to collect using (traditional) analogue methods (Halfpenny/Procter 2015). Yet, digital methods require the application of ethical considerations such as informed consent, data privacy, confidentiality and data storage and sharing (Madge 2007; Birenboim/Shoval 2017; Tiidenberg 2018), something that we will explore in this article.

The emergence of digital methods also raises questions related to the benefits and limitations of mixing and integrating analogue and digital methods. Studies that combine different heterogeneous data sources are scarce in social science research (Halfpenny/Procter 2015). However, an innovative way to combine different data sources was provided by Crabtree/Tennent/Brundell et al. (2015) using the Digital Replay System (DRS) (see also e.g. Greenhalgh/French/Rennent et al. 2007; Brundell/Knight/Adolphs et al. 2008). In their study, the fieldwork tracker software was used to collect digital records[4] (log files[5]) of people's interaction with digital technologies. The DRS software was used to combine this data with more traditional data (audio, video, transcripts). For our study, we wanted to replicate elements of the study conducted by Crabtree/Tennent/Brundell et al. (2015). As the applications DRS and fieldwork tracker were no longer available and because there is by now better access to tracking applications and data, we created our own mixed method approach to collect microdata of people's work practices in different locations.

3 Research design: combining digital and analogue methods

Our research design integrated six methods that were closely integrated with each other. This required that the methods built on each other sequentially and were not simply applied individually. In order to integrate the methods, the data collection was divided into two consecutive phases: The first phase consisted of the collection of microdata for the six study participants and involved a set of digital research methods. The second phase integrated the

[3] Due to the variety of terminologies (e.g. e-Research, digital research methods, methods for Internet research, online research methods, digital methods), in this study we use the term 'digital methods' (see Rogers 2013; Leszczynski 2018) for computer aided methods.

[4] Digital records are activities (e.g. movement, interaction) that were consciously and also unconsciously recorded through the use of digital infrastructures and digital devices (Crabtree/Tennent/Brundell et al. 2015).

[5] Log files (or 'logs') are showing the activity on a digital device and show the traces of human interaction with it (e.g. timestamp, URL, GPS, user name) (Crabtree/Tennent/Brundell et al. 2015).

results of the digitally generated microdata and its analysis and utilised this for our analogue methods. Figure 1 gives an overview of the two phases and the methods applied in our approach that will be explained in more detail in the following.

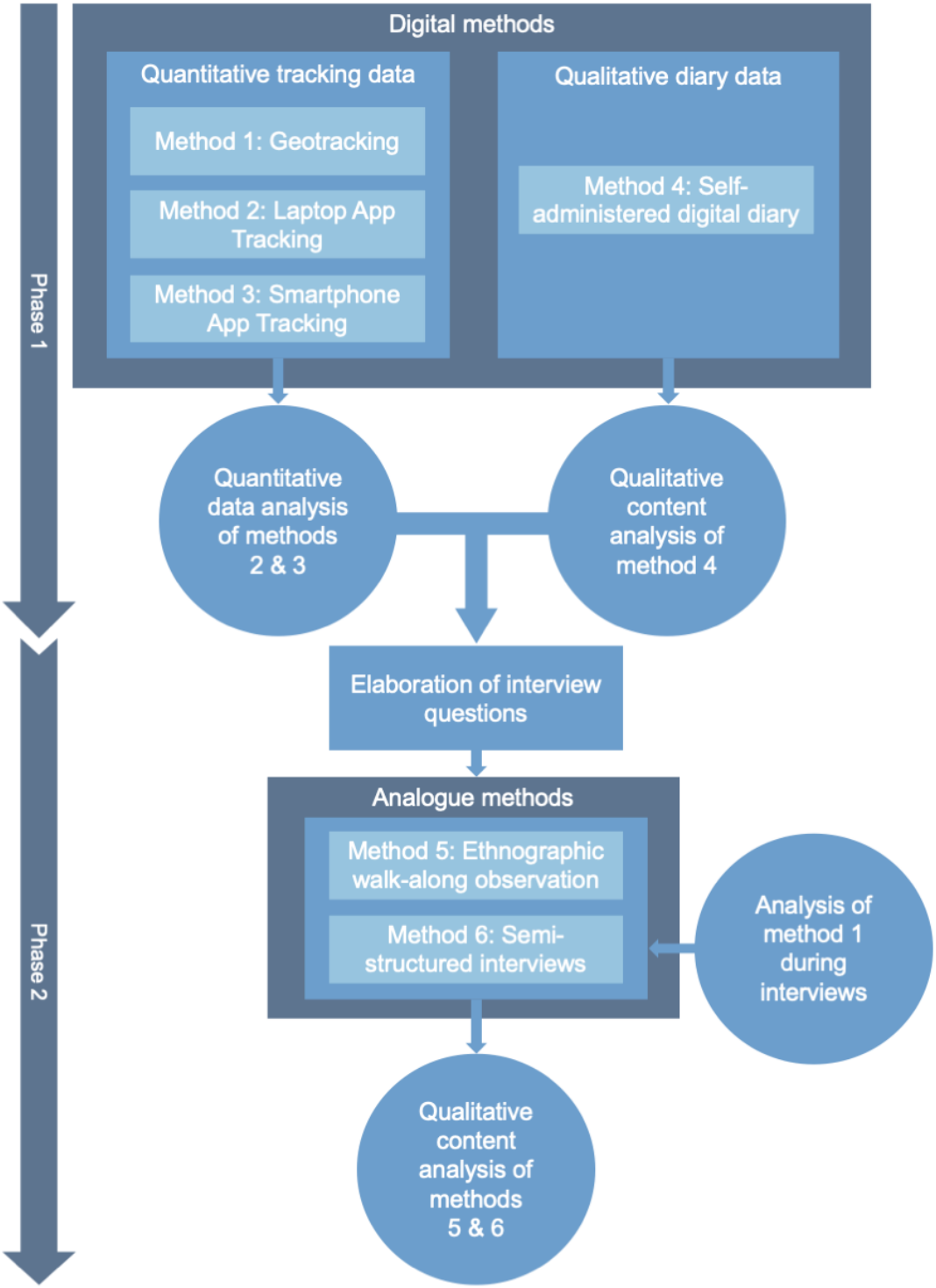

Figure 1. Research design "Digital Multilocality"-study. Source: Authors

In the first phase, digital work tracking methods that allowed automated data collection and a self-administered digital diary were applied. This data was collected during five[6] digital work tracking days, each in the central and the peripheral workplace. In this phase, geotracking was used in order to collect the participants' location data. Collecting location data using GPS has become a novel data source in recent years (e.g. Birenboim/Shoval 2017; Christensen/Mikkelsen/Nielsen et al. 2011). We used the geotracking application 'OwnTracks' (2020). OwnTracks collects time stamps of the participants' locations and movements. We also tested 'Google Maps' but selected OwnTracks due to anonymisation and security reasons as no third parties are involved. The participants downloaded OwnTracks and installed it on their iPhones (all participants were iPhone users). During a digital work tracking day, OwnTracks had to be opened by the participants only once and could then automatically run in the background. This and all the other data were collected automatically on a secure university server, to which only the research team had access to.

Simultaneously with the geotracking, laptop application tracking was used to gain deeper insights about the ways in which the multilocal knowledge workers interact with their laptops during workdays in the centre and in the periphery. We were interested in how much time they spend on their laptops on a workday and what applications are used, for how long, when they were opened and when they were closed. After testing different applications, we selected the tracking application called 'ActivityWatch' (2021). This application works on both Windows and Mac operation systems. The participants downloaded the application and had to run it during their digital work tracking days. The tracking data resulting from ActivityWatch is stored locally on the participant's laptop. After the tracking phase was completed, the participants had to transfer the data to the research team.

In parallel to the two methods mentioned above, smartphone application tracking was added because many work-related tasks are completed using smartphones (e.g. phone calls, email, text messages, voice messages, video calls). Similar to the laptop application tracking, we were interested in the duration of use of the applications on the smartphone. A special focus was on communication activities. We assumed that through those activities multilocal knowledge workers create urban-rural linkages when they get in contact with coworkers, supervisors and/or clients in the centre during their workdays in the periphery and vice versa. Unfortunately, the iPhone does not allow to export this kind of application use data – not even from the built-in application 'Screen Time'. Therefore, the participants were asked to take screenshots of their battery usage (the duration of all applications used are presented within a time period of 24 hours) after a digital work tracking day was completed.

During this tracking phase, we also included a qualitative digital method. Participants were asked to keep a digital diary and to fill it out on each digital work tracking day. Self-administered digital diaries were added to obtain subjective information about the individual workdays. The participants took notes and photos and stored them in the self-administered

[6] This number was selected to obtain data from one working week and to keep the workload low for the study participants in order to reduce the likelihood of dropping out.

digital diary, which they then shared with us digitally. During each digital work tracking day, the participants were asked to fulfill three tasks: First, take a picture of something inspiring during the workday. Second, add a short-written description of the picture and explain the reasons why this was inspiring. Third, write a short description about the work tasks of that day using keywords. To simplify this task for the participants as well as for data processing, we searched for a digital solution. We used the application 'Day One' (2021), which works on Windows and Mac as well as on Android and iOS. Day One allows to combine 'written diaries' and 'photographic diaries' (Latham 2016). After the participants completed the digital work tracking days, they had to export the diary data and send it to us. Supplementing the quantitative digital work tracking data with written and visual materials helped to gain a better impression of the multilocal work practices. Diaries serve as a valuable source for collecting qualitative data, also concerning the use of ICTs and Internet (Crosbie 2006). The diaries allowed the participants to reflect on their lives (Latham 2016), in our case their work practices, and they provided explanations about personal sensitive and emotional issues. We assumed that such self-administered digital diaries can enhance the participants' participation (Geoghegan 2019), as they become more involved in the research process (Meth 2003).

The statistical analysis of the tracking data and the qualitative content analysis of the self-administered digital diary formed the basis for the analogue part of our research design and for the qualitative methods that followed in the second phase. We chose ethnographic walk-along observations (e.g. Rose/Degen/Basdas 2010) to gather qualitative insights into the work practices during the study participants' transition from the centre to the periphery or vice versa. Participant observation is a common ethnographic research method to examine everyday geographies (Watson/Till 2010). During the walk-alongs, we were 'talking whilst walking' (Anderson 2014) respectively in our case 'talking whilst traveling' between workplaces (by car or train). This allowed us to gain a better understanding and a direct impression of the participants' work behaviour in the multilocal context. Consequently, we gained a heightened sensitivity for the participants' working lives due to our involvement and attachment that went beyond a one-hour interview (see Dowler 2001). We recorded in our handwritten research notebooks the 'unspoken aspects of work and workplaces' (McMorran 2012: 493).

During and also after these walk-alongs, we conducted qualitative semi-structured interviews. These interviews integrated the initial analyses of our quantitative tracking data and the data from the self-administered digital diaries. We also included spontaneously conceived themes from the ethnographic walk-along observation. During the interviews, we showed the participants the quantitative analysis of their own data and were able, on the one hand, to let the participants comment on and interpret their own digital work tracking data and, on the other hand, to ask precise follow-up questions about the data and the visual materials of the self-administered digital diaries. We developed our questionnaire not only based on the literature (marginality and urban-rural linkages), but also based on the results from the digital methods gained in the first phase. The research focus was given, which is why a semi-structured form of the interviews was appropriate (Bryman/Bell/Teevan 2012). Through such interviews, personal perspectives and thoughts can be better explored, as participants can answer questions with their own words instead of only say yes or no (Longhurst 2010). In doing so, such interviews allow for flexibility during the interview situation in terms of unplanned topics and

new questions (Bryman/Bell/Teevan 2012). We conducted the interviews in person and in the participants' native language (Swiss German). They lasted around 73 minutes on average and were recorded using the researcher's smartphone.

In retrospect, we can see two major advantages resulting from a consecutive and integrated research design: On the one hand, this procedure enabled the integration of the methods and results (Bryman 2007) and, on the other hand, it helped us gain detailed and additional in-depth insights by generating different perspectives on digital multilocal work practices (Watkins/Gioia 2015; Kern 2018). In the following, we will illustrate these advantages by highlighting the data gained from one participant.

4 Insights from one participant

In the following, we illustrate the research design presented above by showcasing the data we gained from one of the six participants. The data we show is interesting for various reasons: First, the insights we gain from our study participant illustrate well the variety of qualitative and quantitative data gained from different sources. Second, we highlight the two consecutive phases of data collection and how they are applied in the fieldwork. Third, the data illustrate how digital and analogue methods are integrated to gain deeper insights about work practices of multilocal knowledge workers.

For our study, we recruited a sample of multilocal knowledge workers who work in central and peripheral workplaces. We were able to recruit a total of six participants from different professions and who work in different industries. At the time of our study, four were employees and two were freelance entrepreneurs. All of them had the primary location of their jobs in one of Switzerland's central metropolitan regions, but two of them were also employed in a firm in the periphery. Table 1 gives an overview of the study participants of our research project.

Table 1. Sample

Participant ID	Profession	Employment status	Industrial branch of the firm	Primary location of employment	Average multilocality frequency
1	Virtual assistant	Freelance entrepreneur	Secretarial and writing services	Centre	1-2 days per week
2	Product manager digital public services	Corporate employee	Logistics	Centre	2 days per week in the centre
3	IT specialist	Freelance entrepreneur	IT services, telecommunication	Centre and periphery	1 week every two months
4	Innovation manager	Corporate employee	Commerce, telecommunication	Centre and periphery	Two to three times per month for three to four days each
5	Data & AI solution specialist/lecturer	Corporate employee	IT services	Centre	Every weekend
6	Specialist for Human Resources and organizational development	Corporate employee	Logistics	Centre	At least ten to fifteen times per year

Source: Authors

To illustrate the application of our mixed methods approach and the integration of the digital and analogue methods in this article, we will highlight the case of participant 4. This multilocal knowledge worker shows a high frequency of multilocal work practices in the centre and in the periphery. This is in part due to the family being located in both locations. Participant 4 is also an experienced multilocal worker and has to change the workplace regularly because of the employment in different firms located in the centre and in the periphery.

Through the application of our mixed methods approach, we recognised that digital geotracking data can be augmented using analogue qualitative data from interviews. The digital geotracking data of participant 4 shows an interesting pattern of the movement in the central and peripheral environment. Through the projection of the movement lines on a GIS-based maps, it is possible to visualise precisely which places participant 4 has visited and thus also recognise movement patterns. However, this digital geotracking data does not provide information about the reasons for the corresponding movements and the places visited. We obtained this qualitative information during the walk-along and interviews with participant 4 when we showed this person an image of the geotracking map. Thus, participant 4 was able to explain the reasons behind the movement patterns as illustrated on the maps and tell us more about the places that were visited. In doing so, we were able to gain insights about everyday work and leisure practices. The data illustrate that the three places of home, work and leisure are geographically further apart in the periphery than in the centre. This seems to indicate greater spatial separation of activities in the periphery (Figure 2).

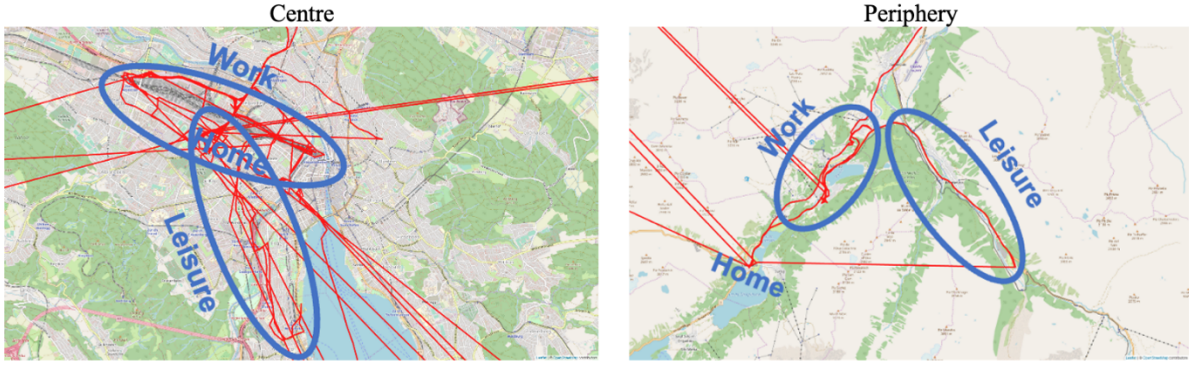

Figure 2. Geotracking of participant 4 (note: the straight lines show errors from the OwnTracks application that can emerge due to lost GPS signals or switched off smartphone) Source: Authors

Data we gained on the differential use of laptop and smartphones in the different locations by participant 4 illustrate further our integration of digital and analogue methods. The statistical analysis of the quantitative digital work tracking data of laptop shows that participant 4 works less (17:05 minutes on average) on the laptop during workdays in the periphery compared to the centre (Table 2). The laptop tracking data makes it possible to identify different types of work activities based on the different use of applications. Thus, participant 4 carries out more activities in the centre using applications for documents (06:50 minutes), browser (07:01

minutes), miscellaneous that could not be assigned to the other categories (01:03 minutes), communication (02:33 minutes), media (14 seconds) and showed more lockscreen times (27 seconds). In contrast, participant 4 used more applications for email at the workplace in the periphery (01:03 minutes on average).

Table 2. Type of activities on laptop in the central and the peripheral workplace of participant 4

	Centre		Periphery		
Type of activity	**Average per day**	**Percent**	**Average per day**	**Percent**	**Delta**
Documents	01:48:27	57.39%	01:41:37	59.13%	00:06:50
Browser	00:34:36	18.32%	00:27:35	16.05%	00:07:01
Email	00:33:08	17.54%	00:34:11	19.89%	00:01:03
Miscellaneous	00:07:39	4.05%	00:06:36	3.84%	00:01:03
Communication	00:03:07	1.65%	00:00:34	0.33%	00:02:33
Lockscreen	00:01:32	0.81%	00:01:05	0.63%	00:00:27
Media	00:00:26	0.24%	00:00:12	0.12%	00:00:14
Total	03:08:55		02:51:50		00:17:05

(note: 'Miscellaneous' was not further analysed during the interviews, because the data are too heterogeneous. Also 'Lockscreen' was not further analysed as differences are small and not very meaningful). Source: Authors

The data resulting from the digital work tracking shows that participant 4 works more on the laptop in the centre and that the activities differ, but this data does not provide information about the reasons for the differences. Therefore, we presented this data to participant 4 in the interview for comments. As with geotracking, the advantage of dividing the fieldwork into two phases became apparent: the data from the first phase could be processed and then used in more detail during the qualitative phase. Participant 4 was initially very surprised about the amount of time spent on the laptop. In addition, participant 4 explained, for example, that in a central workplace one is more distracted by "a kind of a marathon of interruptions" from coworkers and teamwork, which may lead to slightly higher lockscreen times. In the interview, participant 4 also explained that more activities are done with document applications in the centre because, for example, more presentations are prepared with PowerPoint at the central workplace and these are also discussed with the team. The reason why participant 4 works less on the laptop during the workdays in the periphery is that more analogue work is done, for example, with pen and paper or sometimes pursuing a thought during a hike. In sum, the quantitative digital data provided the descriptive basis, which could then be analysed and deepened by the analogue qualitative data gained through the interview.

We were also able to show the digital work tracking data of laptop for participant 4 on chronological timelines (Figure 3). In this representation, we see that the workday in the centre is more closely tailored to the times between 08:00 am and 18:00 pm and there are fewer gaps (breaks). In comparison, the timeline of the workdays in the periphery shows that there are many more gaps between activities. Furthermore, the more saturated the colour, the more similar the work activities are between the digital work tracking days in the corresponding location. The timeline of the centre shows a slightly greater saturation here, which suggests that

the workdays at the central workplace are stricter and less freely arrangeable. The communication activities on the laptop also prove this, whereby more interruptions can be detected in the periphery (Figure 4). We see from these timelines that there are different working patterns in the central and in the peripheral workplace.

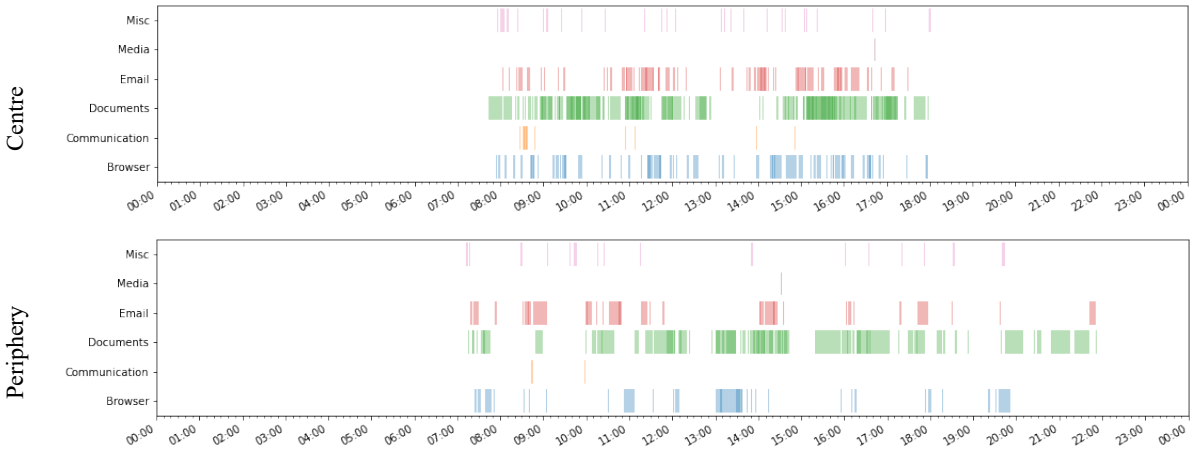

Figure 3. Timeline of types of activities on laptop during workdays in the centre and in the periphery of participant 4
Source: Authors

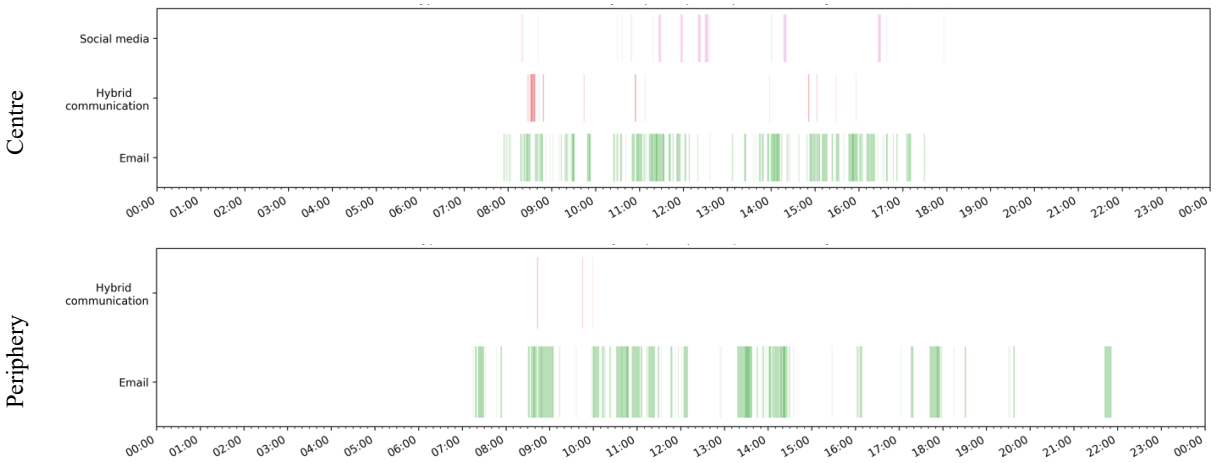

Figure 4. Timeline of communication activities on laptop during workdays in the centre and in the periphery of participant 4
Source: Authors

The statistical analysis of the smartphone data (Table 3) shows that participant 4 uses the smartphone on average for longer time periods in the periphery than in the centre (01:05:56 hours). In addition, participant 4 shows in the periphery on average longer activities of communication (27:08 minutes), media consumption (16:28 minutes), social media (15:46 minutes), email (07:10 minutes), browser (16:08), media creation (6 seconds), work organisation (03:12 minutes), travel (02:02 minutes), personal (6 seconds) and documents

(01:14 minutes), but shorter use of miscellaneous applications (23:08 minutes) and finances (16 seconds). Here, too, the smartphone data was augmented by the analogue qualitative interview. Participant 4 was surprised about the high overall use of the smartphone in both the centre and periphery, which was commented with a loud „oh my god“. Participant 4 explained that the smartphone is also a “gap filler”, because the person cannot meet someone spontaneously in the periphery, for example for a coffee. Furthermore, participant 4 explained the higher usage by the need to maintain connection with other contacts such as coworkers: „I have much less exchange with people. In the Engadine, of course, I have much less density in everyday life and less input from outside. And we are so used to being able to feed in one thing after another. Information comes in, something funny comes in, some phone call come in and then you are more on it, yes.“ This is corroborated by the researcher’s notes from the analog and qualitative ethnographic walk-along observation: During the train journey, participant 4 made phone calls and worked on the laptop. However, this confirms that the smartphone is important as soon as participant 4 becomes spatially distant from coworkers.

Table 3. Type of activities on smartphone in the central and the peripheral workplace of participant 4

	Centre		Periphery		
Type of activity	**Average per day**	**Percent**	**Average per day**	**Percent**	**Delta**
Communication	01:41:40	37.70%	02:08:48	38.38%	00:27:08
Miscellaneous	01:15:20	27.94%	00:52:12	15.55%	00:23:08
Media consumption	00:26:20	9.77%	00:42:48	12.75%	00:16:28
Social media	00:17:50	6.61%	00:33:36	10.01%	00:15:46
Email	00:16:50	6.24%	00:24:00	7.15%	00:07:10
Browser	00:16:40	6.18%	00:32:48	9.77%	00:16:08
Media creation	00:05:30	2.04%	00:05:36	1.67%	00:00:06
Work organisation	00:05:00	1.85%	00:08:12	2.44%	00:03:12
Travel	00:03:10	1.17%	00:05:12	1.55%	00:02:02
Finances	00:00:40	0.25%	00:00:24	0.12%	00:00:16
Personal	00:00:30	0.19%	00:00:36	0.18%	00:00:06
Documents	00:00:10	0.06%	00:01:24	0.42%	00:01:14
Total	04:29:40		05:35:36		01:05:56

Source: Authors

As it was the case for the laptop tracking analysis, the smartphone tracking analysis provides a descriptive overview of smartphone use at the central and the peripheral workplace. However, these data needed to be further elaborated on through our interview. We can conclude from this data that the greater distance to the central workplace increases the use of the smartphone, especially of applications such as communication, social media and email, which allow participant 4 to get in touch with other people.

The self-administered digital diaries provided us with more personal insights into participant 4’s workdays. And they allowed the person to reflect upon their work experiences. During

workdays in the periphery, this participant took pictures of landscapes (mountains) while this person chose pictures of the work desk environment or specific work events that took place in the centre. The following entry in the self-administered digital diary of participant 4 provides information about the peripheral work environment and the study participant's own words about the connection between work-life balance during workdays in the periphery (Figure 5).

This view inspires me, frees me and I always have a bit of a feeling in the Engadine that I experience the seasons much more intensely! Here, life = work and work = life

Figure 5. Entry in the self-administered digital diary from participant 4

The participant chose a picture with an expansive view of the natural landscape of the mountains, such as the wide green meadows, the lake, the wooded hill and the snow-covered mountains. In the description of this picture, participant 4 explains that one feels free in the periphery, one experiences the seasons intensely and there also seems to be a merging of life and work in the periphery. In order to understand the picture and the description in this entry and thus why life and work are more closely aligned in the periphery, we showed participant 4 this entry during the interview and asked for an explanation. This allowed participant 4 to reflect as follows:

> „Now you can fully rely on me [laughs]. Yes, I believe when you get up in the morning and you […] you don't feel like you have to enlist like in the army at eight o'clock. […] But it just starts like „I could do something so beautiful to this content", thinking up in the brain and then and then you think: „Ah OK, now I'll ask the person if they are here, then they can mirror my idea, if it's correct for them". And then you get much more from A to B to C, instead of perhaps already knowing the result. And it also has a lot to do with recreational activities in free time, because maybe you don't have to go into the office in the classical way. And then you have the feeling of, well, […] this is my working world, so to speak, that's where I sit down and now the working hours start and now I start working. And then I have to work until ah [sighs] no later, after work I can finally go to Lake Zurich, like that. There is no such thing as there [in the mountains].

> […] It could be that it has something to do with the fact that ... I don‘t have a fixed room there, an office, an assigned workplace, no fixed working hours that someone dictates to me. That I have freedom there.“

This sequence shows that the qualitative data (visual material and written text) we gained from digital methods can be further deepened using interviews. The topics such as flexible working time (“don‘t feel like you have to enlist like in the army at eight o‘clock”, “no fixed working hours”), clearer and more efficient workflows (“from A to B to C”), leisure (“recreational activities in free time”) or free choice of workplace (“don‘t have a fixed room”) could be linked to the material from the diary entry through the interview and thus deepened in more detail. Here, the notes from the ethnographic walk-along observation can help to better understand for example the free choice of workplace: During the walk-along, it turned out that participant 4 knows how to use the infrastructure on the train by putting the laptop on the ski racks and thus converted it into a standing desk, something that this participant obviously perfected to their needs.

The example of participant 4 showcases the wealth of data and the benefits of integrating different methods. Utilising only one single method (such as qualitative interviews) would have left more room for interpretation but would not have offered an analytical insight. The individual analysis of the qualitative diary data would not have provided clear evidence that the free working style is reflected for leisure time due to several breaks during the workday in the periphery. We learned from our mixed methods approach that the integration of quantitative and qualitative as well as digital and analogue methods can thus allow for more accurate descriptions and generate greater analytical understanding, which also strengthens the accuracy of the data and our interpretation.

5 Lessons learned

5.1 Data processing and analysis

The data analysis presented above illustrates the need for diverse methodological knowledge. The mixed methods approach requires different competencies for data collection and analysis due to the heterogeneous nature of the data. Therefore, we built a research team that combined different methodological competencies. Two team members are data science experts and familiar with quantitative statistics and programming. The other two are human geographers and familiar with qualitative methods.

The data analysis involved various steps that were dependent on these different yet complementary competencies. The geotracking data from ‘OwnTracks’ was displayed in a map section that shows the movement of the study participants. We created one map section showing the movement in the center and one showing the movement in the periphery and show them to the study participants in the interview. The tracking data resulting from ‘ActivityWatch’ was processed using Jupyter notebooks and required programming skills. The data was sorted by workdays in the central respectively in the peripheral workplace. In a next step, the data were cleaned from artifacts and highly sensitive data such as for example the window titles. After this step, the cleaned data was classified into categories. We identified nine different activity types: browser, documents, email, communication (non-email), programming & development,

work organization, lockscreen, media, miscellaneous[7]. In a next step, the periods of user activity were filtered and individual and overall statistics were created. A similar data procedure and analysis was used for the smartphone tracking data. The battery screenshots were transcribed into Microsoft Excel. In a next step, the smartphone tracking data from Excel were imported into Python for analysis with Jupyter notebooks. The data was cleaned from artifacts and categorized for the statistical analysis. The data (text and pictures) from the self-administered digital diaries from 'Day One' were imported into the analysis software MAXQDA12 and coded (see Cope/Kurtz 2010). The same procedure was also applied for the recordings from the qualitative semi-structured interviews. Those interviews were carefully transcribed in the original language (Swiss German) and parts that were used in publications were transcribed to English. The fieldnotes from the ethnographic walk-along observations were added. This qualitative material was analysed according to a qualitative content analysis (Mayring 2015).

We learned that the heterogeneity of the data requires different evaluation techniques and different methodological knowledge and competences proved to be necessary. Through a heterogeneous team constellation, different methodological competences could be unified. This team constellation was very fruitful for the application of our mixed methods approach, as it also made possible to work in parallel. If one researcher had to conduct the research alone, it would have taken up a considerable amount of time. In addition, conducting research in such a diverse research team requires regular consultation with each other and careful planning, organisation and implementation of the fieldwork. Only this made it possible to master different research techniques that were applied in our mixed methods approach.

5.2 Recruitment of the sample

Finding willing and suitable participants who would take part in our study was a major challenge. This was primarily due to the fact that our research design demanded a significant commitment and willingness on behalf of the study participants. In addition, participants had to fulfill a set of criteria in order to qualify to take part. We were not interested in daily commuters but rather knowledge workers who deliberately decide to work temporarily in the periphery. Therefore, study participants had to fulfill the following criteria: First, they needed to primarily work in an urban agglomeration at the employers' premises or in home office while also being able to work multilocal in a Swiss mountain region. Second, because there is no fixed definition of how many days someone has to work in different places to be classified as a multilocal worker, we decided that they should spend at least one work week (5 days) every three months (thus in every season of the year) in a Swiss mountain region. In doing so, daily and weekly commuters were excluded, as well as people who work by chance during their holidays. Third, the study participants must work with laptop and smartphone in their daily work activities. Fourth, and most important, the participants must be allowed by their employers to be tracked for ten workdays and willing to collaborate with the research team during the study period.

[7] The category 'miscellaneous' combined those work activities that did not fall into any other category. This heterogeneous data was not statistically analysed and excluded from the interviews.

Generally and in Switzerland in particular, there is no register or census of multilocal knowledge workers who work temporarily in the periphery. We therefore had to use a snowball method to find study participants. Initial expert interviews indicated that co-working spaces in the mountains would be good places to recruit. Therefore, we got in contact with all co-working space in the Swiss mountain regions (at the time of recruitment in 2019: n=12) that participate in the Swiss national coworking association 'Coworking Switzerland' (2020). As a result, we were able to recruit two participants. At the same time, we were also in contact with the 'Work Smart Initiative' (2021), an initiative that is supported by a number of large employers in Switzerland and which aims to promote location-independent work. We were able to recruit two participants from this network. We also got in touch with the association of digital nomads in Switzerland. They allowed us to post our call for study participants on their Facebook site. One participant was recruited from this outreach effort. The final participant was recruited from private contacts of the research team. Our initial goal of recruiting between 10 to 12 participants was not fulfilled and we had to settle with a total of six participants.

In this study, we learned that recruitment of study participants is much more difficult when digital methods are used compared to when traditional methods are involved. This has to do in particular with the fact that the data collected is very personal and sensitive which can deter potential study participants. Moreover, the phenomenon of multilocal working between centre and periphery is still new, at least it was before Covid-19 when we planned and implemented the study. The criteria of the sample could therefore not be too restrictive, which is why we did not impose any restrictions regarding profession, employment status, business size or industrial branch of the firm they were employed.

Despite the small number of study participants, the amount of data collected was large due to the extensive nature of our research design. This allowed us to go into more depth. Even though we can only make statements about six multilocal knowledge workers, we can highlight interesting patterns that emerged from the data and generate in-depth insights about a novel phenomenon.

5.3 Taking ethical considerations seriously to elaborate a basis of trust

We strictly followed ethical considerations during the research process because we worked with highly personal and sensitive digital data that our study participants entrusted in us (Madge 2007; Anderson/Jirotka 2015; Tiidenberg 2018). We learned that although following ethical considerations of digital methods takes more effort (e.g. writing letters of consent, searching for tracking applications with no third-party providers involved), it can be a key factor to successfully conduct and finish such a study. This advantage is highlighted in the development of high levels of trust between the research team and the study participants.

It was our concern to be transparent from the beginning and to clearly explain the study's risks and benefits to the study participants. To do that, we developed a lengthy letter of consent that outlined what data will be collected and how it will be processed. Gaining informed consent was important (see Madge 2007; Birenboim/Shoval 2017; Tiidenberg 2018). During the recruitment phase, we provided a fact sheet that indicated the aim of the study, the methodology, data procession, data use, funding information, information of the research team as well as

information on the compensation[8]. After their declaration of interest, we sent them a personal letter with more detailed information on data accessibility and storage, data security and privacy policy of the tracking applications. In some cases we followed up by phone to explain the details of our study design and the methodological steps. Each member of the research team and the participants signed the informed consent letter. This procedure illustrates that informed consent creates a basis of trust which in turn positively influenced the motivation of the study participants.

Confidentiality was taken serious in terms of data protection by using secure data servers for data storage (see Kinsley 2013; Tiidenberg 2018). Interestingly, it turned out that we as researchers were more concerned about data security and protection than the participants themselves. For example, we offered the study participants to collect their data through a face-to-face handover. However, this was not necessary for any of the participants, as they all sent us their sensitive and personal data by email or their company's cloud software. This may again be due to the good basis of trust.

Furthermore, confidentiality was also addressed by taking data privacy serious (Tiidenberg 2018). Therefore, the collected data was anonymised at the beginning of the data processing procedure and kept anonymised for publication. In doing so, the protection of personal and company identity was guaranteed. This also meant that information on the pictures from the self-administered digital diaries were anonymised by blurring, such as for example the participants' names in notes or the firm logo that appeared on the screen of the laptop. Anonymisation gives trust and thus encourages the willingness to participate.

6 Conclusions

It was the aim of this article to show that research on digitalisation and urban-rural development can benefit from a mixed methods approach combining digital and analogue methods. With the six methods applied, we tried to explore the work activities of multilocal knowledge workers in central and peripheral workplaces. Mixed methods generated more explanatory power (Elliot/Purdam 2015). This could be achieved by bridging the qualitative/quantitative divide, which made it possible to enhance rigour by using microdata (Bathelt/Li 2020). However, based on our mixed methods approach, we suggest to put more emphasis on the integration of the different methods (Bryman 2007). In this regard, we point out that the integration has to be considered especially with regard to the timing of the field research. This is because consecutive phases of data collection, in which different methods are applied, can further deepen data and provide more analytical insights.

Our research also extends the knowledge of mixed methods in terms of the combination of digital and analogue research methods and data (Crabtree/Tennent/Brundell et al. 2015). We strongly recommend integrating these methods. On the one hand, the descriptive quantitative tracking data and the descriptions and visual material resulting from the self-administered digital diaries provide a wealth of information, but this can lead to assumptions or misinterpretations. Through the analogue methods (ethnographic walk-along observations,

[8] A voucher of the Switzerland Travel Centre AG (myswitzerland.com) was offered for the participants' effort.

qualitative semi-structured interviews), an analytical element was added because we confronted the study participants with the data gained through our digital methods. This allowed us to be more precise about work practices because study participants had to go beyond subjective perceptions and experiences and interpret factual data.

Careful consideration of ethical standards is required when using digital methods that offer the possibility to collect highly sensitive and personal microdata (Madge 2007; Anderson/Jirotka 2015; Tiidenberg 2018). Our study shows that ethical considerations are not only important in data collection and analysis, but also in other stages of a research project. As such, in the recruitment phase, strict and careful adherence to ethical considerations can be beneficial. By transparently communicating the research objectives and explaining how the data will be collected, processed, stored and published, trust can be created between study participants and researchers. Our study thus contributes to the debate that ethical considerations should be central to the planning, implementation and evaluation of field research (not just field research involving digital methods).

However, our mixed methods approach also has limitations. The data collected can only provide a snapshot of multilocal work arrangements and cannot fully capture it – particularly also with regard to widespread changes in work practices due to the Covid-19 pandemic. In addition, our study dependent heavily on the participants, which is reflected in the fact that we had to trust that they carry out the tracking consciously and correctly. Furthermore, laptops and smartphones are also used for private purposes, which we were not able to filter out. There is also the question of whether the participants worked differently when they knew they were tracked. This uncertainty is difficult to avoid and thus must be accepted to some degree. In addition, the use of methods that collect highly sensitive and personal data, as well as the number of methods used, has an impact on the recruitment of study participants. We thus recommend not overloading mixed methods approaches to keep the effort for the participants manageable.

Future research could further extend and refine our exploratory mixed methods approach. For example, one single application that combines all tracking methods could simplify the data collection. Furthermore, other data sources could be added (e.g. video material) and others removed (e.g. geotracking). Nevertheless, digital methods are a good opportunity to conduct field research at a distance, even in times of Covid-19, where social interaction is limited.

Our study illustrates that mixed methods and the collection of heterogeneous data, which involves digital and analogue methods, is very useful in the study of digitalisation in rural areas. Particularly analyses of new and flexible ways of working benefit from the integration of digital research methods as workers utilise ICTs. Methods can be viewed as individual pieces of a puzzle. By using mixed methods, we can try to get as close as possible to creating a complete picture of a puzzle. The key to solving the puzzle in the context of our study is: the integration of various methods, the unification of heterogeneous methodological knowledge, a suitable sample of participants and the strict consideration of ethical standards. In doing so, the ‘mix’ must be reflected profoundly and adapted to different research purposes. Thus, it is not only a matter of what methods are mixed but also how they are mixed.

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6 Conclusions

From the perspective of urban dwellers, mountain areas may well be viewed in a romanticized way. This is somewhat understandable as the idyllic landscape, the identity-forming culture and numerous hiking trips continue to contribute to this image. Nevertheless, the aim of this dissertation is to understand and recognize the mountain areas as a living and economic space, focusing on digital transformations and digital multilocality. In this conclusion, I address the four research questions that discuss epistemological as well as methodological findings and contributions. I then provide further reflections that go beyond the research questions and an overview of policy recommendations that can be derived from this dissertation. Afterwards, I discuss the limitations as well as possible future research avenues.

6.1 Main findings and contributions

This dissertation provides novel insights into digital transformations in mountain areas, with a special focus on digital multilocality. In doing so, this dissertation contributes to current debates in economic geography and rural studies as well as mixed methods for social science research. Below, the main findings from this dissertation are summarized and the overarching research questions are discussed.

RQ1: How do peripheral mountain communities experience digital transformation and how does this affect the realities of changing rural economies?
Main findings: Digital transformation is not a uniform process but experienced individually. Digital connectivity offers novel opportunities for rural economies in terms of new business opportunities and urban-rural linkages.

This dissertation has revealed that the individual experiences of actors with the effects of digital transformation in rural peripheries must be understood in a nuanced perspective. In this regard, Article 1 highlights that digital transformation is not a uniform process. While some actors benefit from it, smaller and financially weaker businesses and institutions face new challenges. This shows that there is no such thing as 'the single' digital transformation. Rather, digital transformation should be understood in the plural (as digital transformations).

Hence, this dissertation suggests that research on digital rural development should continuously focus on the effects of digitalization at the micro level. Therefore, digital transformations in rural areas should not only be looked at from an exclusively economic viewpoint, but also through socio-economic (digital) transformations and thus individual demands should be taken into account. Based on this finding, this dissertation confirms the suggestion by Salemink et al. (2017) that the integration of connectivity and inclusion issues is beneficial for the analysis of digitalization in rural areas. In doing so, a much more detailed and nuanced picture on digital transformations in rural or peripheral areas can be created, whereby the technological focus on supply can be critically questioned by means of individual demands.

Furthermore, this dissertation contributes to the ongoing discussion on the resisting, shrinking or widening of the urban-rural digital divide (e.g., Blanks Hindman, 2000; Farrington et al.,

2015; Pant & Hambly Odame, 2017; Philip et al., 2017; Salemink et al., 2017; Skerratt & Warren, 2003). Based on the unusual case of the peripheral mountain community in Switzerland in article 1, which is connected to fast broadband, it can be shown that a shrinking urban-rural digital divide in terms of connectivity does not directly imply a shrinking of the digital divide in general. The availability of the technology alone does not imply that it will be used and that all actors will benefit from it. Rather, new problems and challenges emerge, especially in terms of finance and organization, which shift the focus of digital divides in the context of urban-rural to digital divides within the peripheral mountain community itself. In this community, the urban-rural digital divide is widening and shrinking at the same time, depending on the individual experiences of the different actors. This shows that the urban-rural digital divide should be seen as a dynamic concept that must be adapted to the different realities of various actors within rural communities.

These findings are also apparent in the reflection of changing rural economies in the digital age. Indeed, new economic opportunities are emerging for actors in rural areas due to digitalization (Woods, 2019). As highlighted in article 1, business, retail and tourism in particular benefit by adding value to, and thus marketing, the landscape. This also allows urban activities, such as coworking, to be relocated to rural areas (De Souza, 2017), which is reflected by the increasing number of coworking spaces in Swiss mountain areas in recent years or new offers to attract knowledge workers through individual or team retreat offerings (miaEngiadina, 2021). In this respect, the digital multilocality studied in articles 2 and 3 exemplifies how digital connectivity in rural peripheries leads to the discovery of mountain areas as workplaces for urban workers, with the amenities of the landscape and rural idyll playing an important role. It is thus shown that digitalization leads to a reorientation of the rural production system, whereby rural and urban economies intertwine through digitalization, as illustrated by the example of digital multilocality.

At the meta scale, this dissertation shows that digitalization indeed has the potential to link rural and urban economies (Atterton, 2016; Weber & Freshwater, 2016). This is particularly evident in urban-rural linkages in digital space through the use of the Internet and ICTs. In this way, social and economic connections can be maintained or created at a distance (e.g., access to new markets, access to distant knowledge sources), as illustrated in articles 1 and 3. Nevertheless, the effects of digitalization on the rural economy should be considered in a differentiated manner and therefore changing rural economies in the context of digitalization should not be viewed in a generalized perspective but rather by their subtleties and thus small diversities of economic changes at the micro level.

As a small mental excursion, it would be interesting to study the urban-rural digital divide during the Covid-19 pandemic and afterwards. Based on the findings from this dissertation, I would assume that this pandemic has a positive effect on the urban-rural digital divide in terms of shrinking even within rural communities, as digitalization became a major priority in politics and economics since the beginning of the first lockdown in spring 2020. This may also affect changing rural economies and thus enable further new economic opportunities in rural areas that could remain after the pandemic.

RQ2: What opportunities does digitalization in mountain areas offer for multilocal work practices and what changes of digital work organization in alternating workplaces does this entail?
Main findings: Digital connectivity in mountain areas is a prerequisite for digital multilocality, as it allows multilocal knowledge workers to work temporarily in mountain areas. Digital work organization differs between alternating workplaces in urban centers and rural peripheries in terms of decreasing use of digital technologies for work and increasing flexibility in the organization of workdays in rural peripheries.

Digitalization enables the relocation of economic activities of knowledge work to different locations – for example from the city to the mountains. So far, the literature has shown that rural areas are suitable work environments for knowledge workers (Nadler, 2014), which have a positive influence on their work (Vesala & Tuomivaara, 2015). This dissertation has shown that also mountain areas are indeed possible workplaces (e.g., in coworking spaces or second homes) for multilocal knowledge workers due to digitalization. The digital connectivity due to broadband coverage in mountain areas and thus the possibility to have access to the Internet is a prerequisite for multilocal work practices, because they need ICTs such as laptops and smartphones and access to the Internet for their work (e.g., Green, 2002; Hislop, 2013; Hislop & Axtell, 2007; Pyöriä, 2005), which is shown in articles 2 and 3. With regards to increasing digital connectivity in mountain areas, a new attraction for knowledge workers to temporarily pursue their work there is emerging.

This is thus a new opportunity for multilocal work practices but also an economic opportunity for rural peripheries. With these basic requirements of digital connectivity, knowledge workers have the opportunity to temporarily use self-chosen marginality as a strategy (Grabher, 2018) to distance themselves physically and cognitively from the workplace in the urban center. Article 2 has shown that this strategic use of self-chosen marginality in mountain areas is a valuable new opportunity for knowledge workers enabled by digitalization but also for the rural economy itself. Nonetheless, contrary to the literature that attributes the use of marginality in the periphery as supportive to creativity (Grabher, 2018; Hautala & Ibert, 2018) or the experimentation with exotic ideas (Sgourev, 2019), it has been found in article 2 that the qualities of the urban workplace such as information exchange, networking or creative teamwork cannot simply be relocated to the rural periphery despite digital connectivity. In this regard, the new opportunity must be reconsidered and further developed.

Furthermore, this dissertation contributes to the analysis of digital and analog work organization (Pershina et al., 2019) in different locations (Forman & van Zeebroeck, 2019; Verstegen et al., 2019), specifically in the context of urban centers and rural peripheries. In this regard, it is found in article 2 that although digital connectivity to the urban center is important, it is interesting to note that work organization changes in the rural periphery, as digital work is decreasing and analog work is increasing. Furthermore, article 2 showed that workdays are organized more flexible in terms of time management during workdays in the rural periphery. Digitalization in this context should not be overestimated, because the self-chosen marginality

in the rural periphery is also reflected in the strategic self-isolation, which is based on a conscious distancing from digital technologies and thus self-chosen partial disconnection from the urban center. These findings would also be interesting for the analysis of work organization in multilocal work practices and home office during the Covid-19 pandemic and, in particular, what will remain of it once the pandemic ends. Less density of people in rural or mountain areas may be viewed as a triumph of the periphery in the context of digitalization, as a critical reference to the 'Triumph of the City' by Glaeser (2011), which can be attractive for multilocal workers but also teleworkers during a pandemic and a new economic opportunity for rural peripheries.

However, this dissertation highlights the importance of understanding multilocal work practices in a strategic interplay of working not only at multiple workplaces but also considering their interplay, whereby workplaces in mountain areas also play a central role due to enhanced digital connectivity. Article 2 has shown that due to the self-chosen marginality in rural peripheries, multilocal work should be considered in a more differentiated way, where workplaces are not randomly but strategically chosen according to their advantages. This is illustrated in the recurring cycle of digital multilocality, whereby new opportunities and changes of work organization for employees and employers can emerge.

RQ3: How does digital multilocality and in particular the use of ICTs affect the relationship between urban centers and rural peripheries?
Main findings: Multilocal knowledge workers create urban-rural linkages by their mobilities and through the use of ICTs to create temporary proximity. Urban centers and rural peripheries become more closely linked within digital space, which makes embeddedness in the rural local structure obsolete.

This dissertation uses the digital multilocality studied in articles 2 and 3 as an example to illustrate that the spatial flexibilization of knowledge work due to the use of digital technologies can lead to an increasing spatial distribution of economic activities. In this context, it suggests that urban centers and rural peripheries are not to be understood as isolated from each other but in relation to each other due to urban-rural linkages. This thus raises a new perspective on the closer relationship between urban centers and rural peripheries for economic activities of knowledge work arising from novel multilocal work practices in the digital age.

Urban-rural linkages are created through the alternation of workplaces, whereby multilocal knowledge workers are 'creators' themselves of urban-rural linkages through their mobility patterns in the physical space. This is shown in the recurring cycle of digital multilocality identified in article 2. In this cycle, urban centers and rural peripheries are to be understood as complementary. This finding is based on the different qualities and functions that the respective workplaces provide. In multilocal work arrangements, work in the urban center and in the rural periphery is not to be understood as isolated from each other, but in relation. This thus goes beyond simplistic analyses, which only examine the qualities of individual work locations and do not consider their alternation.

In addition, this dissertation also confirms that ICTs strengthen the relationships and connections between urban centers and rural peripheries, as their use can create urban-rural linkages (Lichter & Brown, 2011; Weber & Freshwater, 2016). In doing so, article 3 illustrates that urban-rural linkages can be created through digital communications activities using ICTs in multilocal work practices. These linkages show that urban centers and rural peripheries can be connected by linkages in digital space, which are used to create temporary proximity (Torre, 2008; Torre & Rallet, 2005) to actors in other locations. Hence, the concepts of urban-rural linkages and temporary proximity seem to be compatible due to digitalization.

Furthermore, based on the literature on embeddedness (Bosworth & Willett, 2011; Jack & Anderson, 2002), it can be argued that due to the creation of urban-rural linkages through the use of ICTs, embeddedness in the rural local economic structure is not significant for multilocal knowledge workers. This indicates that, even in the digital age, multilocal knowledge workers are likely to remain economically embedded in the urban center, but that due to urban-rural linkages, a temporary shift of economic activities to rural peripheries can take place. However, article 3 has shown that this shift must be critically questioned with regards to a hoped-for benefit for actors in rural peripheries. Because of the embedding of multilocal knowledge workers in the local social structure in rural peripheries and not in the local economic structure, it can be understood that the economic relationship between urban centers and rural peripheries is merely temporary and, in the case of digital multilocality, based on the individual practices of creating urban-rural linkages by the multilocal knowledge workers. Thus, it can be derived that the closer relationship of urban centers and rural peripheries in the digital space through the use of ICTs can also be questioned, with regard to the temporary nature of multilocal work practices, by also looking at who exactly is being connected. However, stationary telework in rural peripheries could possibly lead to increased economic embeddedness, whereby the relationship between urban centers and rural peripheries could be intensified.

In a nutshell, the dissertation shows that due to digital connectivity in rural peripheries, new forms of urban-rural linkages emerge in the form of mobilities between alternating workplaces and digital communication activities that strengthen the relationship between the urban centers and rural peripheries. Nevertheless, the question must also be asked for whom the relationship is intensifying. However, it would be interesting to re-explore the findings of articles 2 and 3 in the context of the Covid-19 pandemic, possibly changing and thus increasing slightly the practice of creating urban-rural linkages, which might also affect the embeddedness in the rural local structure and thus affect the relationship between urban centers and rural peripheries.

RQ4: How can digital transformations in rural peripheries, and specifically digital multilocality between urban centers and rural peripheries, be researched in more depth?
Main findings: Community case studies and mixed methods research designs allow to analyze digitalization at the micro level, which permits a deeper understanding of digital transformations and multilocal work practices in rural peripheries.

The central contribution of this methodological block is the discussion of research designs and methods that allow the investigation of digital transformations and specifically digital multilocality in rural areas (including mountain areas). It is acknowledged that qualitative and quantitative methods are especially used to study rural phenomena, with the share of mixed methods approaches growing continuously but still being very small (Strijker et al., 2020). In this dissertation, both methodologies aimed at studying a rural phenomenon and thus contribute to methodological discussions in rural studies (Strijker et al., 2020) and economic geography (Bathelt & Li, 2020). However, from a methodological point of view, little is discussed about which research designs and methods are suitable to study a particular digital phenomenon in the rural. Digital transformations are based on the interaction of humans with digital technologies, as showed in article 1. Due to this, I argue that technological issues such as broadband coverage should always be examined against the backdrop of their actual use by people in the areas or communities of interest and vice versa.

The first empirical block of the community case study has shown that experiences and effects of digital transformations in rural peripheries can be explored in-depth by following a community-based approach (Salemink et al., 2017). I conclude that conducting a community case study is a promising approach to address the phenomenon of digital transformations in rural areas and to generate a better picture of their impacts. With the community case study based on an embedded single case study design (Gustafsson, 2017; Neergard, 2007; Yin, 2014) and using the method of qualitative interviewing, article 1 shows that digital transformations in rural peripheries can indeed be researched in more depth. This is due to the possibility to explore and compare subtleties of the effects of digitalization at the micro level. In this regard, article 1 contributes to the 'integrated research agenda for digital rural development' by Salemink et al. (2017, p. 368) that an embedded single case study lends itself to the application of the community-based approach. Nevertheless, the community-based approach by Salemink et al. (2017) left open questions about how to interpret the 'community' as such, what sample size is appropriate, whether qualitative or quantitative methods are appropriate or what forms of case studies (single or multiple) are appropriate. To find answers to these questions, more studies are needed.

This dissertation also contributes to discussions on mixed methods in rural studies (Strijker et al., 2020) and to the quest to build better methods in economic geography (Bathelt & Li, 2020). In the second empirical block, this dissertation went one step further by using a mixed methods approach to research digital multilocality. This approach shows an innovative and original approach to the study of the use of digital technologies in multiple locations. Through digital tracking methods, it was possible to effectively analyze 1.) how digital technologies are used in rural areas and 2.) how they are used in urban areas, thereby providing in its comparison a more nuanced epistemological understanding of the urban-rural differences in terms of digital work organization. Thus, experiences and effects of digitalization in rural peripheries were not only reconstructed on the basis of views and attitudes, as in article 1, but additionally underpinned with microdata collected through the application of digital methods.

This mixed methods approach shows that by integrating digital and analog methods, it is possible to overcome the qualitative/quantitative divide (Bathelt & Li, 2020). In this empirical

block, all methods are closely integrated and build on each other (Bryman, 2007), which is also reflected in the combination of qualitative and quantitative research questions in articles 2 and 3. The mix of methods allowed for different perspectives on a research subject, which are very valuable and can examine a digital phenomenon in rural areas indeed more precisely and thus more adequately (Strijker et al., 2020). This shows that such research methods are forward-looking and mixed methods should indeed be applied in rural studies (but can also be applied to study urban phenomena) and economic geography in the future – regardless of whether they are primarily concerned with digitalization or not.

Nevertheless, there were also difficulties in the application of the digital methods, which were reflected in the recruitment of the sample and in the collection and analysis of the tracking data. Yet, it is also shown in article 4 that the rethinking of ethical standards in digital methods (Anderson & Jirotka, 2015; Burbules, 2009; Madge, 2007; Tiidenberg, 2018) could turn into an advantage and be used profitably. I would like to encourage researchers not to be deterred, but to continue experimenting with mixed methods, especially with digital and analog methods. Such methods are a way to improve research and to generate unprecedented knowledge. Research means discovery and for that we need suitable methods and a good portion of courage to experiment. Maybe not all methods are adequate for this research purpose, but we can all learn from good and also from bad practice.

Furthermore, the experiences from the mixed methods approach also show that digital methods such as tracking methods and self-administered digital diaries are also suitable for field research in times of limited physical social interaction, such as during the Covid-19 pandemic. In this way, new methods can be experimented and tested, which might also become established after the pandemic. Covid-19 can therefore be viewed as an opportunity to expand the repertoire of social science research methods, especially when studying rural peripheries that are distant from the researchers' workplaces.

6.2 Further reflections of main findings

In this section, I provide further reflections at the meta level and thus food for thought that goes beyond the research questions. This provides an opportunity to also reflect on the findings of this dissertation and the concepts used against the backdrop of digital geographies (section 2.1).

Changing rural economies. In the literature dealing with changing rural economies, it is considered that digitalization leads to increasing integration between urban and rural economies and societies (Atterton, 2016; Weber & Freshwater, 2016), which consequently leads to fluid urban-rural boundaries due to increasing interconnectedness (Lichter & Brown, 2011; Shucksmith & Brown, 2016). It thus follows that digitalization leads to a closer interconnectedness of actors from different locations in digital space (Zook, 2007). This is reflected in one of the conclusions of this dissertation that, due to digital connectivity, rural economies should no longer be seen as isolated, but rather as interconnected with urban economies due to urban-rural linkages. However, such linkages should not be considered imaginary, but rather as real connections in the digital space to be taken seriously (Boellstorff, 2016; McLean, 2020). On the one hand, this can be observed in article 1 in the new, online

sales strategies of retailers in rural peripheries or the practice of accessing new and geographically more distant sales markets. On the other hand, the interconnectedness is also shown in more detail in multilocal knowledge workers' mobility in article 2 and also in article 3, which specifically addresses urban-rural linkages in the digital space based on the use of ICTs. However, the interconnectedness of actors from different locations in digital space must be regarded in a differentiated manner, as neither urban-rural linkages in digital space are permanent nor the interconnectedness of actors in different physical locations. In doing so, digital advances do not create imminent digital connection in digital space, but rather points of contact between economic actors and thus urban and rural economies, which are both flexible and temporary in nature. Therefore, I partly argue against the theses of the 'death of geography' (Bates, 1996) and the 'death of distance' (Cairncross, 1997), but do not reject them completely, since urban-rural linkages in digital space indeed shorten the distance between actors and economies whilst not removing it completely as a factor. In doing so, the traditional Euclidean understanding of geography and distance must indeed be questioned in the digital age (Zook et al., 2004) but it should not be considered obsolete in the urban-rural economic context.

Digital rural development. Literature on digital rural development shows that the urban-rural digital divide resists or is even increasing (e.g., Blanks Hindman, 2000; Salemink et al., 2017; Townsend et al., 2017). The divide is particularly evident in access to the Internet and the use of ICTs, which is usually lower in rural areas compared to urban areas. The Euclidean understanding of geography and distance seems to provide interesting starting points for a superordinate understanding, whereby distance and inequality are associated with each other. Distance thus can be understood as an economic indicator, whereby, starting from an urban center and heading towards rural peripheries, more distance can lead to technological sparseness and thus economic disadvantage. In doing so, the concept of the urban-rural digital divide suggests that indeed digital space is not egalitarian (Kitchin, 1998). This is particularly evident in the literature on digital rural development, where the non-egalitarian argument is generally reflected in the unequal access to the Internet between urban and rural areas and thus the ability to blend spaces (Zook, 2007). Consequently, the unequal distribution of access to digital space and thus blended spaces can be particularly reflected in an urban-rural context. This shows that general considerations of digital geographies can also be oriented towards relational spatial concepts (e.g., urban-rural, center-periphery) of the analog world. The blending of spaces can thus be understood as a practice, which manifests differently in urban and rural areas, and not as an ontological reality.

Digital Multilocality. The digital multilocality researched in this dissertation exemplifies that flexible practices of the blending of spaces (Zook, 2007) emerge in multilocal work arrangements. In doing so, article 3 shows that this practice is not to be considered detached from physical space, but that the blending of spaces can be practiced from different locations, also in mountain areas. Thereby, the recurring cycle of digital multilocality identified in article 2 also becomes the focus of interest, which illustrates that circumstances in the physical world (in this case the qualities of different workplaces) can lead to different locational patterns of this practice such as alternating work between urban centers and rural peripheries. However, this seems to be particularly interesting with regards to the Covid-19 pandemic, which forced many people to stop working at their employer's premises and instead work from home. In

Switzerland, mountain areas became recognized as potential workplaces for urban dwellers who could just as well relocate their home office to the mountains. This idea also attracted greater media attention (Benz & Fulterer, 2020; Bühler, 2021; Dreyfus, 2021; Ehrbar, 2021; Pauli, 2021; Wildi, 2021). Considering mountain areas as potential workplaces during Covid-19 indicates that due to multilocal work practices, a possible new opportunity for rural peripheries could arise due to digital connectivity. Based on the findings of article 3, this would imply that if the home office in the mountains becomes a trend, more digital and physical urban-rural linkages between different offices in cities, rural areas and the mountains would be created, thus a further blending of spaces. On the superordinate level of digital geographies since the Covid-19 pandemic, this also indicates that it can be assumed that digital space is gaining importance over physical space in terms of work that can be done using ICTs. Consequently, there is thus an increased practice of blending of spaces (Zook, 2007), with digital space gaining prominence but still being dependent on the location and mobility of actors within physical space.

6.3 Policy recommendations

At the beginning of this dissertation, I was surprised to find that research lags behind practice concerning the topic of digitalization in mountain areas. This is particularly evident in the way that digital policies of regional development in mountain areas (section 3.3) and applied literature (section 3.4) are on the verge of promoting digitalization, while the scientific knowledge of digital development in mountain areas is scarce. With this dissertation, a scientific contribution is made that is hopefully of interest to policy makers.

Digitalization is not a random process, rather it can be shaped insofar as knowledge and possibilities for action are available (Haefner & Sternberg, 2020). Therefore, this dissertation points out that policies should not blindly aim to push digital transformation in mountain areas. Digital transformations should occur carefully, deliberately and not in a rush. Digital connectivity through broadband development is important but technology alone will not solve any problems. It is more a matter of looking at what is being done with the technology and thus promoting such activities (e.g., accessing new markets, enhance networking, accessing knowledge sources). As identified in the community-based approach of article 1, digital transformation is not a uniform process. Thus, it is recommended that in a first step, the demands and needs are to be evaluated and analyzed, based on which, possible actions can be discussed by a diversity of stakeholders and consequently be implemented. Therefore, a micro perspective should be preferred to a macro perspective, which would also have a beneficial effect on the acceptance of technological change.

Policy makers have also recognized that work and leisure became increasingly flexible and multilocal and are responding to digital multilocality in terms of working tourism with coworking spaces in rural and mountain areas (von Stokar et al., 2018). In this regard and based on the results of the study on digital multilocality in this dissertation, it should be noted that attention should be paid to what needs are actually expressed by which actors in which areas. This helps to evaluate at which locations a rural coworking space is actually needed and would make sense. As shown in this dissertation, not all multilocal knowledge workers are working

in coworking spaces but they seek them out specifically when exchange and networking is required. In doing so, the work style of coworking should be rethought in the rural context. Nonetheless, care should be taken here to ensure that the gap within rural peripheries does not widen, whereby some rural areas cannot profit if they do not jump on the hype.

I argue that general digital policies, such as the federal government's 'Strategy Digital Switzerland', should pay more attention to geography. This dissertation has shown that digitalization is indeed a spatial process and thus digital transformations should also be placed in the geographical context, which takes geographical disparities into account. For example, the relevance of topics such as eHealth or eGovernment should be considered in a more differentiated way in rural peripheries compared to urban centers due to less public service agencies and larger physical distances. In addition, it should be emphasized that although Switzerland has relatively good rural broadband access compared with other countries, an increase in Internet speed in rural peripheries would be desirable, particularly in order to ensure that services such as eHealth or eGovernment can continue to be provided adequately in rural areas in the future. However, the technology to be used for this (e.g., 5G, fiber optic broadband) still requires discussion.

With regard to the change of work in the digital age, policy makers should increasingly consider the geographical context as well. Policy makers could thus evaluate exactly how much digital and how much non-digital (face-to-face) proximity is needed in multilocal work practices and how this needs to be thought of together with mobility and distance. This should also be viewed against the background of the Covid-19 pandemic, which is an opportunity to question traditional working models (e.g., working nine to five at the employer's premises) and make them spatially and temporally more flexible in the future. It thus raises the question of to what degree the corporate office is still necessary after the pandemic, since many workers have now become used to work from home (e.g., Bürgler, 2021). Policy makers could use this experience of working remotely, acquired as a result of Covid-19, as an opportunity to attract more people back into rural villages (e.g., Keane, 2021). Furthermore, the Covid-19 pandemic may also have changed the expectations of employees in terms of work organization, which could be an opportunity for mountain areas, for example, because young people no longer need to migrate to employers in urban centers if they can also work on computers in the mountains. This means that the employers themselves also have a new responsibility with regard to the spatial organization of the company.

In general, Covid-19 can be seen as an opportunity to rethink digital policies (and generally all kinds of regional policies, see for further reading: Martin, 2021), due to the increase of home office and teleworking during lockdown. In my opinion, the opportunity is manifested precisely in the fact that we are not pursuing a 'back to normal' approach any further but are now using this occasion to rethink the future of work, which I consider to be digital and multilocal – at least for those who can pursue such work practices. This should be conducted on a superordinate national level, after which strategies tailored to the different regions and their challenges could be developed. In this way, digital policies at the national level could also be incorporated more efficiently into regional digital policies.

However, scientific research should also be more proactive in providing a basis for policymakers and not vice versa. This would slow down the speed of the digitalization hype but would most likely lead to more adapted digital policies and thus to successful digital rural development, including in mountain areas. This could also be of further interest for digital policies at a larger scale across Europe (e.g., European Commission, 2021) and especially with regards to rural areas in the digital age (Pelucha & Kasabov, 2020).

6.4 Limitations

The dissertation does not claim to be holistic and comprehensive. This is reflected in the limitations, which are explained here so that the results can be classified more precisely. I deliberately do this in more detail, although it makes my findings more vulnerable. Yet, one can learn from limitations, which is important for future research, explored in the next section.

This dissertation provides a selective perspective on digital transformations in mountain areas. On the conceptual level, it should be noted that the focus on changing rural economies, digital rural development (urban-rural digital divide) and digital multilocality only selectively examines digital transformations in mountain areas. Thus, other concepts may also contribute to the discussion, such as entrepreneurship or (social) innovation. In addition, digitalization is the subject of investigation in numerous disciplines, which means that a fully comprehensive exploration of digital transformations is difficult to achieve.

While the concept of urban-rural linkages was useful to explore digital communication activities of multilocal knowledge workers, this gives little information about the multitude of linkages that take place between urban and urban as well as between rural and rural. In the digital age, focusing on the context of urban-rural can be too limiting, as linkages can extend far beyond the urban-rural context and from rural to rural or from urban to urban around the globe. Nevertheless, the concept of urban-rural linkages is a useful analytical tool to understand connections between actors in urban and rural areas and thereby allow for a dialectical perspective.

Furthermore, the dissertation cannot conclusively determine whether digitalization is a success story for the rural economy in mountain areas, although multilocal knowledge workers can benefit from it. For this, the time horizon would have to be extended far into the past and all technological developments and industrial revolutions would have to be included in the analysis. Nevertheless, with the accompanying articles, this dissertation provides a foundation for future in-depth study.

Another limitation is based on the chosen geographical context of this dissertation. As shown in section 3.2, Switzerland is an unusual case in terms of high nationwide broadband coverage. It thus plays a special role in the debate about digital rural development and the urban-rural digital divide, which is mainly influenced by other national contexts in the Western world. Furthermore, peripheries in Switzerland are not quite as peripheral as they are in other national contexts. Even considering the political organizational principle of Swiss federalism with the subsidiarity principle, the findings from this dissertation cannot simply be transferred to other

national contexts. Yet the dissertation has shown that digital transformations in rural peripheries are not a uniform process. This insight can in turn be transferred beyond national borders.

Limitations also arise from a methodological point of view. The first empirical block with the community case study is based on a single-case design. This research design makes it difficult to generalize the results due to their very context specific nature. More case studies, across both regional and national contexts, are needed for proof and comparison to draw more general conclusions. Nevertheless, this approach permits to analyze digital transformations more deeply – but less broadly.

In the second empirical block with the mixed methods approach, several limitations are detected. First, limitations arise due to the size of the sample. It is hardly possible to draw conclusions about the entire phenomenon of digital multilocality from six study participants, but preliminary insights into patterns of digital multilocality were identified. Second, the data from ten total workdays per participant are merely a snapshot, albeit one that goes into analytical depth. Third, the digital methods in the mixed methods approach were heavily dependent on the study participants. Thus, a lot of trust is placed by the researchers in the study participants. This risk was accepted, but was mitigated as much as possible by the development of a relationship of trust between researchers and study participants.

In general, it might be argued that the results should be reevaluated or reinterpreted because of the Covid-19 pandemic. This may well be true, as the data collection of both empirical blocks took place before the pandemic started. Nevertheless, it is important to understand that the data are of particular value precisely because they do not come from the accelerated hype of digitalization due to Covid-19 and, in the case of digital multilocality, from pioneers.

Finally, at academic and non-academic events, I was asked again and again whether digitalization can stop the outmigration in mountain areas. This seemed to be one of the most important questions, with digitalization being considered a great ray of hope. Unfortunately, the dissertation cannot answer this question conclusively, because this was not the main research interest. However, I will venture out on a limb here and assert that new economic opportunities by digitalization must be further exploited. I doubt that connecting the most peripheral mountain valleys with fiber optic broadband will stop outmigration. In my opinion, this causality would fall short because it is too one-sidedly based on technological advances and excludes the life and career plans of young people. Nevertheless, digitalization can be a driver for economic development in mountain areas and can potentially lead to immigration into these areas. The only question now is whether we know how to harness it.

6.5 Future research avenues

This dissertation contributed to the study of digital transformation in mountain areas with a specific focus on digital multilocality and the application of a new methodological approach. However, the dissertation also raises other questions that scholars may address in the future, which will be discussed in this section.

Broadband is available, what's next? Future research could examine and critically question different and new technologies of broadband in rural peripheries. Technological advances are

giving rise to new technologies, such as 5G. This technology sheds new light on the availability of broadband in rural peripheries, which means that the urban-rural digital divide and thus economic change should be questioned anew. Nevertheless, it still seems important to think about connectivity and inclusion issues together (Salemink et al., 2017) and not through a purely technological lens. The example in the region of Engiadina Bassa/Val Müstair, where planned 5G antennas on two church towers led to a controversial debate, shows that technological development in the rural periphery can also meet resistance (Hofmann, 2019b, 2020). Such responses from the rural periphery provide an interesting avenue for research on digitalization in these areas.

How to see the big(ger) picture? The study of digital transformations in mountain areas is not limited to the Swiss context or to the discipline of economic geography. To broaden the focus, future studies could, on the one hand, study other geographical and national contexts. In doing so, comparative studies could also lead to a bigger picture. On the other hand, this dissertation offers several points of interest for other disciplines to engage with digitalization in rural peripheries. This would generate new perspectives on the research object, which could enrich the overall picture piece by piece. In this regard, for example, aspects of gender, spatial planning, sociology (e.g., organizational sociology in terms of digital multilocality) and cultural anthropology could be of further interest.

What other kinds of urban-rural linkages are emerging in the digital age? The concept of urban-rural linkages offers an approach to a relational understanding of space. This is important because in a modern and connected world, spaces and their actors should not any longer be viewed as isolated from each other, despite some exceptions of course. However, digital multilocality is only one way to study urban-rural linkages in the context of digitalization. Future studies on urban-rural linkages could investigate avenues such as social and economic networks and relationships, delivery services, cargo, tourism or innovation practices.

Is digital multilocality a privilege? This question has to be understood critically and is twofold: First, multilocal work practices are predominantly performed by knowledge workers, most of whom also have a tertiary education. Thus, future research in this area could also address other multilocal work biographies from non-knowledge workers. Second, the study participants either had a second home or access to a free bed in the mountains. Future research could examine multilocal work arrangements while being permanently on the move beyond the urban-rural context (e.g., digital nomadism), analyze the frequency of digital multilocality in terms of productivity, focus on firm size and its financial resources to foster such multilocal work practices or analyze digital multilocality of workers who cannot count on the luxury of a property in the mountains. Thus, further studies could critically question digital multilocality in the context of the relevant infrastructure.

How to extend the method repertoire? On the one hand, future studies could apply the community-based approach (Salemink et al., 2017) in a multiple case study research design to generate comparative findings. On the other hand, the mixed methods approach could be extended or modified as desired in the future. For example, using payment data from credit cards, a new perspective on digital multilocality and its economic impact on rural peripheries could be generated. Additionally, other tracking methods could be applied to analyze work and

well-being in different locations. This could be done, for example, with heart rate measurements (for which smartwatches and other easy-to-use tracking devices for the wrist are now available), whereby the effects of the rural environment on work (Vesala & Tuomivaara, 2015) could be further analyzed. This would generate new methods for economic geography by taking advantage of interdisciplinary thinking. However, the most obvious way to apply the mixed methods approach in the future would be to create a single application that could combine different digital methods. This would also have a positive impact on the recruitment of the sample.

How does the Covid-19 pandemic affect digital multilocality and digitalization in mountain areas? The Covid-19 pandemic had a profound impact on society and economy. In particular, digitalization got a decent push, which can be attributed, among other things, to increasing telework in the home office. Future research could thus investigate the changing working conditions of telework in the rural and digital multilocality in home offices or second homes. In addition, the Covid-19 pandemic could also be viewed as an opportunity for the rural periphery due to the lower density of people and interaction.

This dissertation has shown that digitalization is an ongoing process that is not finished. It affects many areas of life and thus constitutes a research desideratum for numerous disciplines. This leads to the result that new questions and avenues for research are raised continuously.

Afterword

Digitalization is possibly the megatrend of our time. It continues to change our everyday lives. While children used to play with marbles in the playground or with their model railroad in the garden, today they play games on tablets or smartphones. Be that as it may, digitalization is a process and this dissertation has illustrated its numerous implications in mountain areas.

In the preface, I presented a simple but central question: Are cities and mountains that far away from one another? If you, dear reader, have continued to read up to this point, you hopefully have developed your own answer to this question. This is good. If this dissertation has inspired you to reflect on this question and on the topic of digitalization in mountain areas in general, its goal has been achieved.

However, I would like to share my personal answer to this question. Due to my dialectical way of thinking, I answer the question simultaneously with a yes and a no. The 'yes' is based on the new possibilities that digitalization enables for linkages between actors in mountain areas and elsewhere in the world. Even if those linkages are not permanent, as illustrated in this dissertation, digital technologies still enable punctual connections within the digital realm. The 'no' is based on the notion that, despite digitalization, I cannot simply teleport my body through digital space to the mountain areas. It is possible virtually to a certain extent, because I can, for example, hold a Zoom meeting with a person in the mountains, whereby we can see each other via webcams. However, in doing so, I cannot pick up the aroma of the mountain meadows, nor can I feel the soft snow under the soles of my shoes as I would on a hike. Thus, the mountains can be so close, but still so far away.

This dissertation has taught me to question the hype of digitalization. In the time of the Covid-19 pandemic, a critical view seems to be as important as ever. However, such questioning of digitalization is not necessarily expressed as negative criticism, but rather as a search for traces, which tries to understand digitalization in mountain areas with a nuanced perspective. Personally, I have succeeded in doing this with this dissertation.

In conclusion, digitalization is not simply an end state that can and should be elevated to a pedestal without reflection. Rather, it is about understanding the socio-economic implications behind this technological revolution. In doing so, it is important to always understand digitalization in the context of human interaction. This helps to understand digital transformations more deeply within the context of changing rural economies and societies.

Reto Bürgin, Bern, June 22nd 2021

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8 Annex

Annex article 1: Digitale Peripherie? Eine Fallstudie über den digitalen Wandel in der Bergregion Unterengadin/Münstertal

Authors: Reto Bürgin, Heike Mayer

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Abstract: Der digitale Wandel führt zu grundlegenden Veränderungen in den Schweizer Berggebieten. In diesem Bericht analysieren wir die sozio-ökonomischen Auswirkungen des technologischen Wandels auf die Berggemeinden in der Region Unterengadin/Münstertal. Es interessiert, welche Erfahrungen die unterschiedlichen Akteur_innen mit der Digitalisierung machen und welche Veränderungen ihres beruflichen Alltags damit einhergehen. Der schweizerische Kontext ist in dieser Hinsicht zentral. Denn obwohl die Schweiz eine Vorreiterrolle in der flächendeckenden Erschliessung von Breitbandinternet einnimmt, sind Transformationen ländlicher Ökonomien aufgrund der Digitalisierung noch unzureichend erforscht, insbesondere in den Berggebieten. Für unsere Fallstudie führten wir im Sommer und Herbst 2018 insgesamt 46 Interviews mit den unterschiedlichsten lokalen Akteur_innen in der Region Unterengadin/Münstertal durch. Die Interviewdaten illustrieren, dass der digitale Wandel in den Berggebieten ganz unterschiedlich wahrgenommen wird und die Bedürfnisse an digitale Technologien stark variieren. Auf einer übergeordneten Ebene lässt sich zudem feststellen, dass Digitalisierung die kognitive Distanz zwischen Zentrum und Peripherie verringert, während physische Distanzen nach wie vor unverändert bleiben.

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Reto Bürgin
Heike Mayer

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CRED
Universität Bern
Schanzeneckstrasse 1
Postfach
CH-3001 Bern

Tel. +41 031 631 37 11
info@cred.unibe.ch
www.cred.unibe.ch

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CRED-Bericht* Nr. 20

Reto Bürgin
Geographisches Institut Universität Bern, CRED

Heike Mayer
Geographisches Institut Universität Bern, CRED

Zusammenfassung

Der digitale Wandel führt zu grundlegenden Veränderungen in den Schweizer Berggebieten. In diesem Bericht analysieren wir die sozio-ökonomischen Auswirkungen des technologischen Wandels auf die Berggemeinden in der Region Unterengadin/Münstertal. Es interessiert, welche Erfahrungen die unterschiedlichen Akteur_innen mit der Digitalisierung machen und welche Veränderungen ihres beruflichen Alltags damit einhergehen. Der schweizerische Kontext ist in dieser Hinsicht zentral. Denn obwohl die Schweiz eine Vorreiterrolle in der flächendeckenden Erschliessung von Breitbandinternet einnimmt, sind Transformationen ländlicher Ökonomien aufgrund der Digitalisierung noch unzureichend erforscht, insbesondere in den Berggebieten. Für unsere Fallstudie führten wir im Sommer und Herbst 2018 insgesamt 46 Interviews mit den unterschiedlichsten lokalen Akteur_innen in der Region Unterengadin/Münstertal durch. Die Interviewdaten illustrieren, dass der digitale Wandel in den Berggebieten ganz unterschiedlich wahrgenommen wird und die Bedürfnisse an digitale Technologien stark variieren. Auf einer übergeordneten Ebene lässt sich zudem feststellen, dass Digitalisierung die kognitive Distanz zwischen Zentrum und Peripherie verringert, während physische Distanzen nach wie vor unverändert bleiben.

*In den CRED-Berichten werden Ergebnisse von Forschungsarbeiten und anwendungsrelevanten Projekten publiziert.

1. Einleitung

Die Digitalisierung[2] entwickelte sich zu einem zentralen Bestandteil unseres alltäglichen Lebens. Im Beruf wie auch in der Freizeit sind digitale Kommunikations- und Informationstechnologien (IKT[3]) wie Laptops, Smartphones, Tablets und das Internet kaum noch wegzudenken (Anderson & Tracey 2001; Schwanen & Kwan 2008; Townsend et al. 2013, 2017; Graham & Dutton 2014; Ashmore et al. 2015). Nichtsdestotrotz haben nicht alle Teile der Gesellschaft denselben Zugang zum Internet und können somit auf dieselbe Art und Weise davon profitieren. Ein Blick auf den Schweizer Breitbandatlas zeigt, dass gegenwärtig eine ungleiche Abdeckung mit Breitband[4] zwischen urbanen und ländlichen Regionen sowie den Berggebieten besteht (Bakom 2020). In den vergangenen Jahren konnten die Städte die Breitbanderschliessung und Nutzung von IKT weiter ausbauen und sich somit einen Vorsprung gegenüber den nichtstädtischen Regionen verschaffen (Medaglia & Petitta 2014). Dadurch erhält der Begriff des 'digitalen Grabens'[5] zwischen Stadt und Land bzw. Zentrum und Peripherie[6] geographisch eine neue Bedeutung und auch im Rahmen der Neuen Regionalpolitik (NRP) vor dem Hintergrund der Breitbanderschliessung in deren Zielgebieten vermehrt Beachtung (Kuster et al. 2019; Setz et al. 2019).

Ganz allgemein scheint die Angst zu bestehen, dass die Schweizer Berggebiete, insbesondere ausserhalb von Einzugsgebieten von Städten sowie touristischen Zentren, das Nachsehen haben gegenüber den städtischen Regionen (vgl. SAB 2017, 2018a; von Stokar et al. 2018). In dieser Hinsicht ist insbesondere die Digitalisierung breit diskutiert und wird als Hoffnungsschimmer gehandelt, um so den wirtschaftlichen Aufschwung in den Berggebieten anzukurbeln. Dadurch entsteht die Hoffnung, dass die Schweizer Berggebiete über die digitalen Kanäle wieder Anschluss an die städtischen Zentren gewinnen können (vgl. Müller-Jentsch 2017; Niederer 2018; von Stokar et al. 2018). Die Bergregion Unterengadin/Münstertal ist in der vorliegenden Studie von besonderem Interesse. Die dort entstandene lokale Initiative 'miaEngiadina' zielt darauf ab, den digitalen Wandel mit

[2] Unter dem Begriff 'Digitalisierung' verstehen wir einerseits die Umwandlung analoger Technologien (insbesondere IKT) in digitale Formate. Andererseits als Prozess, der die rasante Entwicklung der IKT und die Verbreitung und Nutzung des Internets sowie deren Infrastrukturen beinhaltet (vgl. Bendel 2018).

[3] 'IKT' ist die Kurzform für Informations- und Kommunikationstechnik. Darunter versammeln sich Festnetz, Mobilfunk, Internet und Breitbandzugang sowie digitale Endgeräte wie Mobiltelefone, Laptops, Desktop PCs, Server und LAN-Infrastrukturen (vgl. Böcker & Klein 2012: 11-13).

[4] Unter 'Breitband' wird eine Hochgeschwindigkeits-Internetverbindung verstanden, die sich von der traditionellen Telekommunikationsinfrastruktur unterscheidet (Czernich et al. 2011: 505). Mit Breitband werden hohe Bandbreiten für den Datentransfer in kürzester Zeit ermöglicht (vgl. z.B. OECD 2008: 7). Breitband ist imstande kombinierte Daten aus mehreren Kanälen in einem einzigen Kommunikationsmedium zu kombinieren (Moseley & Owen 2008).

[5] Unter dem 'digitalen Graben' oder der 'digitalen Kluft' ist der ungleiche Zugang zu digitalen Technologien zu verstehen (Anderson et al. 2016). Er unterscheidet zwischen den Informationsreichen und den Informationsarmen. Auf internationaler und nationaler Ebene kann dies auch als wirtschaftliche Disparitäten verstanden werden (Willson et al. 2009). Der digitale Graben beschreibt Ungleichheiten des Zugangs zu IKTs und deren Nutzung, der durch eine ungleiche Bereitstellung von IKT-Infrastrukturen entstehen kann. Dies kann unter anderem auch zu neuen Formen sozialer und ökonomischer Ausgrenzung führen (Alam & Shahiduzzaman 2015: 8).

[6] Peripherien bzw. periphere Region können als Gebiete verstanden werden, die sich ausserhalb der Hauptwachstumsgebiete von Metropolen befinden (Mayer & Baumgartner 2014: 18). Dies wiederspiegelt eine prozessorientierte Perspektive auf die Unterteilung von Zentrum-Peripherie (insbesondere ländliche Regionen und Berggebiete). Die Schweizer Berggebiete werden in dieser Hinsicht als periphere Regionen betrachtet (vgl. Mayer & Baumgartner 2014). Peripherien werden auch als Randgebiete definiert. In der Geographie wird der Begriff auch auf dünn besiedelte ländliche Regionen, Grenzregionen oder suburbane Stadtrandgebiete angewendet (Kühn 2015: 368-369). In dieser Fallstudie verstehen wir die Fallstudienregion als Teil der Peripherie.

Glasfasererschliessung[7], Wifi Hot-Spots und Co-Working Spaces (sogenannte 'Mountain Hubs') in der Region weiter voranzutreiben. Dadurch soll sich das Unterengadin zu einem 'Third Place'[8] entwickeln, das als attraktiver temporärer Arbeitsort für digitale Nomad_innen aus den Städten fungieren soll (miaEngiadina 2019; Müller 2016).

Trotz allen Bemühungen und Digitalisierungsprojekten wurde die Digitalisierung und deren Chancen sowie Risiken für die Berggebiete bis anhin nur unzureichend untersucht. Obwohl sich die Schweiz aufgrund ihrer vergleichsweise hohen Breitbandabdeckung (vgl. Eurostat 2018; Fellenbaum 2017; Joiner 2018; SuisseDigital 2016) dafür anbieten würde. Nichtsdestotrotz scheinen digitale Technologien ein möglicher Schlüssel für den positiven Wandel ländlicher Ökonomien zu sein (Woods 2019: 623). In der vorliegenden Studie wird der Begriff der ländlichen Ökonomie auch als Synonym für die Ökonomie in den Berggebieten verwendet. Denn durch die digitale Erschliessung der Berggebiete können neue wirtschaftliche Möglichkeiten entstehen, die deren Abhängigkeit vom primären Sektor verringert. Um gerade diese und weitere Auswirkungen des digitalen Wandels und die damit verbundenen Erfahrungen in den Schweizer Berggebieten tiefgründiger zu verstehen, führten wir eine Fallstudie in der Region Unterengadin/Münstertal durch. Dabei orientierten wir uns an folgenden Forschungsfragen:

- Wie erfahren die unterschiedlichen Akteur_innen in den Berggemeinden der Region Unterengadin/Münstertal den digitalen Wandel und welche Veränderungen gehen damit einher?
- Inwiefern reflektiert die Fallstudie den digitalen Wandel ländlicher Ökonomien?

Um diese Fragen zu beantworten, führten wir im Sommer und Herbst 2018[9] insgesamt 46 Interviews mit den unterschiedlichsten regionalen Akteur_innen und Expert_innen. Mit der Vorgehensweise eines Community-Ansatzes (Salemink et al. 2017), der multiple Perspektiven auf der Ebene der Akteur_innen in einer Gemeinde zulässt, konnten wir die Unterschiede sowie Feinheiten individueller, subjektiver Erfahrungen von Akteur_innen verstehen sowie Auswirkungen digitaler Transformationen erhellen.

Im Folgenden gehen wir auf den theoretischen Rahmen der Fallstudie ein. Danach stellen wir die Methode sowie die Fallstudienregion vor. Darauf aufbauend präsentieren wir im Analyseteil die Ergebnisse der Fallstudie und schliessen den Bericht mit einem Fazit und Ausblick für mögliche Forschungsvorhaben ab.

[7] Glasfasernetze sind Breitbandverbindungen, die die Datenraten von gängigen Brandbandtechnologien (Kupfer, Koaxial, Satellit) um ein Vielfaches übersteigen. Anstelle der Kupferkabel werden Glasfaserkabel in den Boden verlegt, was in den Städten stark ausgeprägt ist. Die Verlegung von Glasfaserkabel ist sehr kostspielig, insbesondere bei längeren Strecken in ländlicheren Gebieten. Letztere sind im Hinblick auf Glasfasernetze nach wie vor unterversorgt (Malecki 2003: 205; von Bergen 2018).

[8] Der Begriff 'Third Place' wurde vom amerikanischen Soziologen Ray Oldenburg eingeführt und ist ein soziales Umfeld oder eine öffentliche Umgebung, die den 'First Place' (das Zuhause) und den 'Second Place' (den Arbeitsplatz) miteinander im alltäglichen Leben vereint (Oldenburg & Brisset 1982: 270). Third Spaces sind auch informelle Orte der Begegnung, an denen sich Menschen treffen, aufhalten und die Gesellschaft anderer geniessen sowie durch deren Teilhabe auch profitieren. Somit sind Third Spaces auch Assoziationsforen, in denen neue Erfahrungen und Beziehungen entstehen, die ansonsten nicht zustande gekommen wären (Oldenburg & Brisset 1982: 267-270). Die Schlüsselelemente der Third Spaces sind aktive Teilnahme am Geschehen, Konversationen sowie der soziale Austausch (Oldenburg & Brisset 1982: 272). Restaurants, Cafés, Parkanlagen oder Co-Working Spaces sind Beispiele für Third Spaces (Schopfel et al. 2015: 70).

[9] Die Resultate der vorliegenden Studie basieren auf der empirischen Datensammlung im Sommer und Herbst 2018 und stammen somit noch vor der Ausbreitung von COVID-19.

2. Theoretischer Rahmen

Die Digitalisierung ist in sämtlichen Forschungsdisziplinen allgegenwärtig. Auch in der Human- und Wirtschaftsgeographie hat das Interesse am digitalen Wandel stets zugenommen (vgl. Zook et al. 2004; Zook 2007; Schwanen & Kwan 2008; Graham & Zook 2011; Tranos 2013; Graham & Dutton 2014; Ahas et al. 2015; Blank & Groselj 2015; Graham et al. 2015). Nichtsdestotrotz ist die Literatur über die Digitalisierung im Kontext der Berggebiete noch relativ überschaubar (vgl. Podber 2003; Chakraborty & Bosman 2005; Aitkin 2006; Bucciol et al. 2007; Arai & Naganuma 2010; Gyabak & Godina 2011; Ruth 2012; Zavratnik et al. 2018). Diese Studien stellten fest, dass die Nutzung des Internets und der IKTs einerseits auf die finanzielle Erschwinglichkeit und andererseits auf kulturelle Unterschiede zurückzuführen ist. In ihren Forschungsresultaten heben sie weiterhin hervor, dass Berggebiete weitere Investitionen für die Entwicklung der digitalen Infrastruktur benötigen, damit sie aus ihrer abgekoppelten, isolierten Position hervorkommen und wieder Anschluss an das moderne gesellschaftliche Leben finden können. In dieser Hinsicht sind auch politische Programme (*Regional Policies*) nötig, um den 'digitalen Graben' zwischen diesen Gebieten und ihren städtischen Gegenstücken erfolgreich zu überwinden.

Neben diesen Studien gibt es eine Reihe von Strategieberichten, politischen Agenden und Zeitungsartikel, die den digitalen Wandel in den Berggebieten explizit im schweizerischen Kontext diskutieren (vgl. Gerster & Haag 2003; Miller 2016; regiosuisse 2016, 2018; Müller 2016; Müller-Jentsch 2017; SAB 2017, 2018b; Niederer 2018; von Stokar et al. 2018). Aber auch auf EU-Ebene ist die Digitalisierung in den Berggebieten ein relevantes Thema, so wie beispielsweise in der 'Agenda digitale delle Alpi' (Medaglia & Petitta 2014). Die grosse Mehrheit dieser Literatur teilt eine optimistische Sichtweise auf die Chancen der Digitalisierung für den ländlichen Strukturwandel. Kritische Perspektiven scheinen hingegen kaum auffindbar zu sein.

2.1. Wandel ländlicher Ökonomien vor dem Hintergrund der Digitalisierung

Aus einer traditionellen Perspektive galten bzw. gelten die Berggebiete als Freizeit- und Urlaubsorte für die städtische Bevölkerung. In dieser Vorstellung dominieren noch vorwiegend die von KMUs dominierte Landwirtschaft, Innovationslosigkeit, fehlendes Wissen und wenig Vernetzung, tiefe Produktionszahlen, wenig Unternehmertum, schwache Finanzkapitalausstattung, etc. (vgl. Tödtling & Trippl 2005; De Souza 2017; Eder 2018, 2019). In jüngerer Zeit haben sich solche Zuschreibungen grundlegend verändert, wobei der Digitalisierung und ganz allgemein dem technologischen Wandel eine wichtige Rolle zugeschrieben wird. Abgelegene, periphere Gebiete fungieren nicht mehr nur als eine malerische Kulisse, sondern als Orte mit unterschiedlichen Funktionen und neuen ökonomischen Möglichkeiten (Scott et al. 2019: 633-634).

Technologische Verbesserungen führten zu einer Wiederentdeckung der Berggebiete. Nicht nur für die Freizeit, sondern auch für die Arbeit. Dies führt zu neuen wirtschaftlichen Möglichkeiten für ländliche Regionen, Umgestaltungen ländlicher Dienstleistungserbringungen, Veränderungen im ländlichen Alltagsleben sowie eine Neugestaltung der landwirtschaftlichen Praxis und Geographie (Woods 2019: 623). Kurz zusammengefasst heisst das, dass der technologische Wandel, dem auch die Digitalisierung beizumessen ist, zu tiefgreifenden Veränderungen der Ökonomien und Gesellschaften in den Berggebieten führt.

Nichtsdestotrotz scheint der digitale Wandel in den ländlichen und peripheren Regionen kaum mit dem Laufschritt der Städte mithalten zu können (De Souza 2017: 122). Im schlimmsten Fall werden sie abgehängt (Grimes 2003: 175). Dann käme eine Abwärtsspirale zustande. In der digitalen Wirtschaft könnten dabei der offene Wettbewerb und die

Konkurrenz von ausserhalb für ländliche KMUs noch weiter ansteigen, wodurch die Marginalisierung noch weiter zunehmen würde (Grimes 2003: 181). Dies zeigt, dass durch Digitalisierung auch widersprüchliche – um sie nicht negativ zu nennen – Entwicklungen zum Vorschein kommen können, weil nicht alle peripheren Akteur_innen den digitalen Wandel auf dieselbe (positive) Art und Weise wahrnehmen bzw. erleben können. Deswegen scheint es relevant zu sein, die Entwicklungen und Veränderungen des 'Hypes' im Telekommunikationssektor auch aus ländlicher Perspektive kritisch zu hinterfragen (Grimes 2003: 188-189).

2.2. Digitaler Graben zwischen Stadt und Land

Es besteht eine rege Diskussion um den digitalen Graben. Auch die Geographie setzt sich vermehrt mit diesem Thema auseinander. Aber digitale Gräben existieren nicht nur zwischen arm und reich oder jung und alt, sondern auch in ihrer geographischen Ausprägung zwischen Zentren und Peripherien bzw. zwischen Stadt und Land (vgl. Blanks Hindman 2000: 556; Skerratt & Warren 2003; Farrington et al. 2015; Pant & Hambly Odame 2017; Philip et al. 2017; Salemink et al. 2017; Townsend et al. 2017). Aus dieser räumlichen Perspektive lässt sich der digitale Graben auch als Kluft zwischen Stadt und Land verstehen, die insbesondere auf die Exklusion ländlicher Teile der Gesellschaft abzielt (Philip et al. 2017: 394). Der Stadt-Land-Kontext wird in diesem technologischen Konzept somit zur Herausforderung. Insbesondere auch darum, weil neu entwickelte Technologien vorwiegend für den städtischen Kontext gestaltet sind, ohne der ländlichen Umgebung genügend Beachtung zu schenken (Salemink et al. 2017: 363). Das wiederum bewirkt, dass die ländliche Bevölkerung die Potenziale der Digitalisierung nicht auf dieselbe Art und Weise für sich nutzen kann und dadurch einen Nachteil gegenüber ihren städtischen Gegenstücken erfährt (Philip & Williams 2019: 308).

Die Debatte stützt sich auf die Vermutung, dass die ländlichen Regionen weiter zurückfallen aufgrund von fehlender digitaler Anbindung (Wallace et al. 2016). Ein daraus resultierender Status der Abgeschiedenheit führt folglich zu ökonomischen und sozialen Nachteilen, wie zum Beispiel Einschränkungen in Bereichen wie Social Networking, E-Banking, Online-Shopping oder digitale Arbeitsweisen (Townsend et al. 2013: 581). Als logische Konsequenz davon könnten Personen, die in abgelegenen Regionen arbeiten und leben nicht von den Annehmlichkeiten digitaler Dienstleistungen profitieren (Medaglia & Petitta 2014: 20). Im Grunde genommen führt dies zu einem Paradox, in dem die Regionen, die die digitale Anbindung am dringendsten notwendig hätten, am geringsten angeschlossen sind (Salemink et al. 2017: 367).

Doch ob die ländlichen Regionen bei einer Anbindung wirklich von der Digitalisierung profitieren würden scheint noch unklar zu sein. Denn obwohl die (allfälligen) Potenziale und Vorteile des digitalen Wandels für die ländlichen sowie peripheren Regionen breit diskutiert und hochgehalten werden, ist es dennoch unklar, inwiefern die dort lebenden Akteur_innen effektiv von der digitalen Anbindung profitieren könnten (vgl. Alam et al. 2018). Das heisst, selbst wenn die modernste digitale Infrastruktur vorhanden wäre, ist das noch lange keine Garantie dafür, dass sämtliche Akteur_innen diese auch gewinnbringend nutzen würden (vgl. Townsend et al. 2013: 581; Correa & Pavez 2016; Pavez et al. 2017).

Auf einer übergeordneten Ebene lässt sich jedoch feststellen, dass sich die Nutzung von IKTs auf die Wahrnehmung von Distanzen auswirkt (Johnson 2001: 5). Insbesondere Verbesserungen in den Bereichen Telekommunikation und Transport führen zu kognitiv verringerten Distanzen zwischen Zentrum und Peripherie (Anderson 2000: 97) und zu mehr Interaktion zwischen städtischen und ländlichen Gebieten (van Leeuwen 2015: 273-274). Durch die digitale Erschliessung im digitalen Raum können abgelegenere Gebiete somit näher an die Zentren rücken und werden dadurch nicht mehr als 'Hinterland' wahrgenommen. Kurz zusammengefasst bedeutet dies, dass digitale Innovationen helfen,

physische Distanzen digital zu überwinden und folglich Räume sowie Gesellschaften näher zusammenrücken (Anderson 2000; McIntyre 2009: 241, ref. Barnes & Hayter 1992). Das hat zur Folge, dass die bis anhin dichotome Perspektive auf Stadt und Land, als zwei unabhängige räumliche Einheiten, überholt ist (vgl. Bulderberga 2014: 157), wenn nicht sogar obsolet wird (vgl. Lichter & Brown 2011).

3. Methodisches Vorgehen

In diesem Abschnitt erklären wir die Motivation hinter der vorliegenden Fallstudie und begründen deren methodische Vorgehensweise. Dabei geben wir Einblicke in den der Studie zugrundeliegenden Community-Ansatz. Darauffolgend stellen wir die Fallstudienregion Unterengadin/Münstertal mit den wichtigsten Eckdaten vor und erklären, warum diese Region und allgemein die Schweizer Berggebiete für eine Studie über die Digitalisierung und den Wandel ländlicher Ökonomien von besonderem Interesse sind.

3.1. Community-Ansatz

In der vorliegenden Fallstudie orientierten wir uns am Community[10]-Ansatz von Salemink et al. (2017), der multiple Perspektiven auf einer Akteur_innen-Ebene sammelt und integriert. Konkret heisst das, dass sich die Fallstudie nicht einseitig auf eine Art von Akteur_innen (z.B. Unternehmer_innen) stützt. Im Community-Ansatz versammeln sich die Sichtweisen diverser Akteur_innen einer Gemeinde, wodurch es möglich ist, ein differenziertes Abbild derer Bedürfnisse aufzunehmen und zu reflektieren. Dies ist gerade deswegen so wichtig, weil die Bedürfnisse und das Angebot an die Digitalisierung zwischen den lokalen Akteur_innen stark variieren können.

Bisherige Studien über Digitalisierung in ländlichen Regionen fokussierten sich vorwiegend auf Angebot oder Nachfrage. Selten wurden beide Seiten miteinander in Konversation gebracht. Diese Studien lassen sich in zwei Forschungsstränge unterteilen (Salemink et al., 2017):

- **Konnektivität**: Studien in diesem Bereich untersuchen die digitale Anbindung von Orten und Regionen. Dabei kommt auch dem ökonomischen Nutzen eine zentrale Bedeutung zu. Die Literatur in diesem Bereich ist 'place-based' (am Ort orientiert) und erforscht vorwiegend die Angebotsseite. In dieser Hinsicht sind auch die Versorgung von ländlichen Regionen und Haushalten mit digitaler Infrastruktur wie zum Beispiel Breitbandanschlüssen sowie deren Kosten von Interesse.

- **Inklusion**: Dieser Forschungsstrang fokussiert auf Fragen der sozialen Ungerechtigkeit in Bezug auf die Nutzung von IKTs sowie die Möglichkeit an der modernen Informationsgesellschaft teilzuhaben. Die Forschung ist 'people-based' (personenorientiert) und erforscht die Nachfrageseite. Es interessiert, welche Faktoren und Mechanismen sich hinter der individuellen Aneignung digitaler Technologien verbergen.

[10] Unter dem Begriff 'Community' ist eine Reihe unterschiedlicher Akteur_innengruppen zu verstehen. Diese wiederum vereinen Personen mit ähnlichen Interessen und Praxen (z.B. Clubs, Organisationen, Unternehmen, soziale Gruppen, Vereinigungen) (Kulke 2017: 18-19; Spektrum 2018).

Die Forschung entlang des Community-Ansatzes vereint beide Forschungsstränge. Dies ist gerade darum wichtig, weil zu allgemein formulierte Policies bis anhin den digitalen Graben zwischen Stadt und Land nur unzureichend lösen bzw. aufheben konnten (Salemink et al. 2017: 369). Vor diesem Hintergrund erhält die Forschung auf der Community-Ebene besondere Aufmerksamkeit, weil dort die allgemeine und die individuelle Ebene miteinander konvergieren und in Konversation treten. Als Konsequenz daraus treffen im Community-Ansatz soziale und ökonomische Aspekte sowie Angebot- und Nachfrageseite direkt aufeinander (Abb. 1).

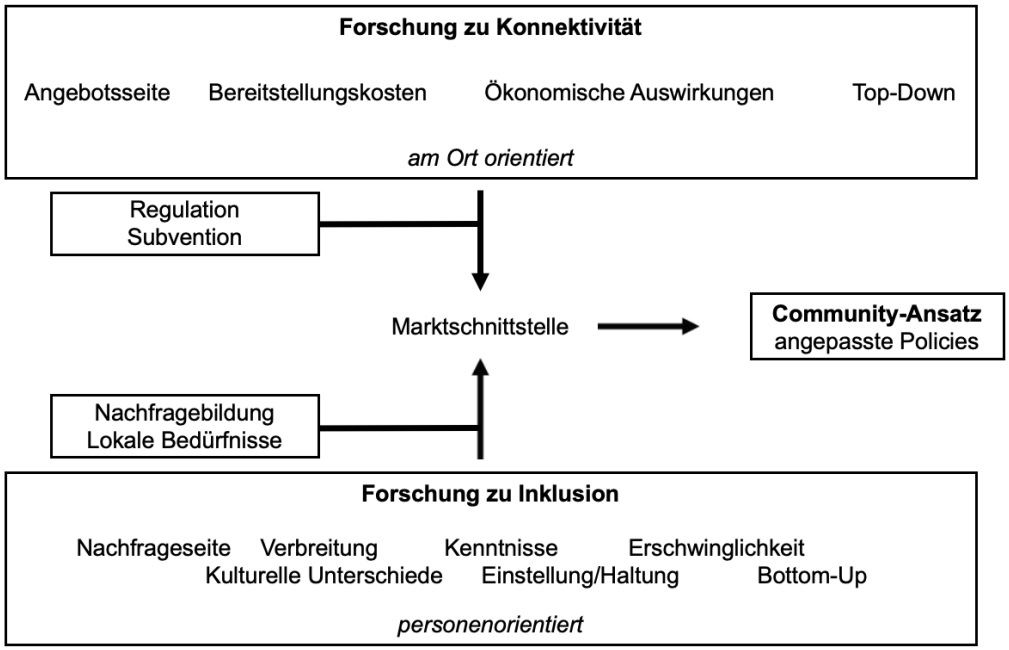

Abb. 1: Kombinierte Forschung zu Konnektivität und Inklusion für die Etablierung des Community-Ansatzes. Grafik nach Salemink et al. (2017: 368, eigene Übersetzungen).

An der Marktschnittstelle von Forschungen zu Konnektivität und Inklusion kristallisiert sich der Community-Ansatz heraus. Er eröffnet eine neue Perspektive auf Digitalisierung und ländliche Entwicklung, was wir als grundlegenden Impuls für die vorliegende Studie aufzugreifen versuchten. Damit ist es möglich, individuelle Erfahrungen und deren Nuancen zu verstehen sowie kritisch in Kontext zu setzen.

3.2. Qualitative Datensammlung & -analyse

Wir verfolgten in unserer Fallstudie den erwähnten Community-Ansatz, in dem wir die unterschiedlichsten Akteur_innen ins Forschungsdesign integrierten und zu Wort kommen liessen. Im Sommer und Herbst 2018 führten wird insgesamt 46 halbstrukturierte Leifadeninterviews mit Akteur_innen und Expert_innen in der Fallstudienregion Unterengadin/Münstertal. Dazu kommen zahlreiche informelle Gespräche während den Forschungsaufenthalten im Feld.

Die Interviewpartner_innen suchten wir im Schneeballverfahren aus. Zunächst interviewten wir Schlüsselpersonen, die uns Empfehlungen für weitere Interviewpartner_innen abgaben. In Kombination mit Dokumentenanalysen war es folglich möglich, die relevanten Akteur_innengruppen zu erfassen und die Interviews zu planen.

Wir identifizierten insgesamt neun Untergruppen der Akteur_innen in der Fallstudienregion: Firmen und Entrepreneuer_innen (KMUs), Gemeindeorganisation und Planung (Gemeindepräsidenten und Planer), Religion (Pfarrer), Gesundheitswesen (Human- und Veterinärmedizin), Schulwesen (Lehrer_innen und Schüler_innen), Service-Anbieter, Zweitwohnungsbesitzer_innen, Tourismus (Organisation und verwandte Betriebe) und kulturelle Institutionen (National- und Naturparks, Kunstzentrum, Archäologie)[11].

Sämtliche Interviews haben wir vollständig transkribiert und einer qualitativen Inhaltsanalyse unterzogen. Dieses Vorgehen erlaubte es, das Datenmaterial systematisch zu analysieren und allgemeine Erkenntnisse zu generieren (vgl. Mayring 2009, 2010).

3.3. Fallstudienregion

Ein Grossteil der Schweizer Landesfläche befindet sich auf bergigem Terrain. Während die Schweiz als ein hochurbanisiertes Land gilt, sind die Berggebiete nicht minder wichtig und ein Tresor für Identität, Kultur, Freizeit und dienen als wichtige Umweltressource zugleich. Der Strukturwandel in Form von Abwanderung, Überalterung oder ökonomischem Wandel ist in den Berggebieten allgegenwärtig (vgl. Medaglia & Petitta 2014; Müller-Jentsch 2017; SECO 2017; Perlik & Membretti 2018).

In zahlreichen Berggemeinden entstehen neue Initiativen und Programme, um den negativen Auswirkungen des Strukturwandels entgegenzuwirken. Ein prominentes Beispiel dafür ist die Initiative ‘miaEngiadina’, die im Jahr 2014 in der Region Unterengadin ins Leben gerufen wurde. miaEngiadina verfolgt das Ziel, die Region mit Glasfaserinternet zu versorgen sowie zusätzliche Angebote anzubieten, beispielsweise in Form von Co-Working Spaces. Es ist deren Vision, das Unterengadin in einen Ort für Rückzug, Inspiration und zum ‘Networken’ zu verwandeln. Dadurch sollen bestehende Arbeitsstellen bewahrt und zeitgleich neue geschaffen werden. miaEngiadina verfolgt Ziel, mithilfe der Digitalisierung eine alternative Vision für eine nachhaltige Entwicklung zu schaffen (miaEngiadina 2019).

Die Region Unterengadin/Münstertal besteht aus insgesamt fünf Gemeinden. Ungefähr 9'300 Personen leben auf einer Fläche von 1'197 km^2 (rund 23 Mal die Fläche der Stadt Bern). Die Region ist stark vom Tourismussektor abhängig, in dem auch ein Grossteil der Beschäftigen in KMUs tätig ist. Ausserdem ist die Region mit Abwanderung (-3,3% zwischen 2010-2016) und abnehmenden Beschäftigtenzahlen konfrontiert (BFS 2019).

Aber warum sind die Region Unterengadin/Münstertal und ganz allgemein die Schweizer Berggebiete von Interesse für eine Studie über Digitalisierung und deren Auswirkungen auf den Wandel ländlicher Ökonomien? Erstens sind die Digitalisierung und deren Auswirkungen in den Schweizer Berggebieten noch unzureichend geographisch erforscht. Zweitens besteht eine grössere Forschungslücke im Hinblick auf die Analyse der Effekte und Folgen der Breitbanderschliessung sowie die Nutzung von IKTs in den Berggebieten. Drittens eignet sich die Pionierinitiative miaEngiadina besonders dafür an, um den digitalen Wandel in einem geographisch konkreten Gebiet *in situ* zu untersuchen. Und viertes eröffnet der schweizerische Kontext die Möglichkeit, auch einen kritischen Blick auf die Auswirkungen der Digitalisierung in den Berggebieten zu werfen, da die Schweiz und die Fallstudienregion, mit einem Blick über die Landesgrenzen, vergleichsweise überdurchschnittlich mit Breitbandinternet erschlossen ist.

[11] Anzahl Interviews pro Akteur_innengruppe (n): Firmen und Entrepreneuer_innen (13), Gemeindeorganisation und Planung (5), Religion (1), Gesundheitswesen (4), Schulwesen (7), Service-Anbieter (3), Zweitwohnungsbesitzer_innen (2), Tourismus (5) und kulturelle Institutionen (4), zusätzliche Expert_inneninterviews (2).

4. Zentrale Ergebnisse

Die Digitalisierung macht sich in den Berggebieten bemerkbar. Zusammengefasst konnte die Fallstudie erhellen, dass während sich einerseits neue ökonomische Möglichkeiten eröffnen, andererseits viele Akteur_innen mit neuen Einschränkungen und Konflikten konfrontiert sind. Dies zeigt sich unter anderem im Zugang zur digitalen Technologie. Grössere Firmen, Organisationen oder Institutionen haben meist bessere Chancen die neuen Potenziale der Digitalisierung gewinnbringend für sich einzusetzen. Dies ist unter anderem auf die hohen Kosten für digitale Infrastrukturen und deren Wartung zurückzuführen. Für finanziell schwächere Akteur_innen kann dies zur Herausforderung werden.

In den folgenden Abschnitten führen wir die hier nur kurz erwähnten Ergebnisse noch weiter aus. Dabei präsentieren wir zunächst die neuen Chancen der Digitalisierung für die Berggebiete und deren Ökonomien. In einem weiteren Schritt analysieren wir die Auswirkungen der Digitalisierung auf das geographische Verhältnis zwischen Zentren und Peripherien. Im darauffolgenden Abschnitt interessiert, wie die Digitalisierung auch zu widersprüchlichen Entwicklungen in der Peripherie führen kann. Darauf aufbauend fokussieren wir uns auf die unterschiedlichen Erfahrungen und Feinheiten des digitalen Wandels innerhalb der untersuchten Fallstudienregion.

4.1. Neue wirtschaftliche Chancen für das Berggebiet

Breitbandinternet ist in der Fallstudienregion kein neues Phänomen. Glasfaserleitungen gab es schon vor der Initiative miaEngiadina. Nichtsdestotrotz waren die meisten Interviewpartner_innen (noch) nicht an ein Glasfasernetz angeschlossen. Zum Zeitpunkt der Fallstudie war die Glasfaserschliessung von miaEngiadina in vollem Gange.

Während die Infrastruktur weiter ausgebaut wird, sind durch miaEngiadina schon diverse neue Projekte entstanden. Die Initiative stellte mittlerweile vier Co-Working Spaces auf die Beine. Diese befinden sich im Zentrum von Scuol, in der Bergstation Motta Naluns, am Hochalpinen Institut Ftan und in Ardez, das rund zwölf Busminuten von Scuol entfernt liegt (miaEngiadina 2019). Die Etablierung neuer Co-Working Spaces geht mit dem ökonomischen Strukturwandel ländlicher Räume im digitalen Zeitalter einher. Das Aufkommen der Co-Working Spaces (auch in anderen Berggebieten in der Schweiz) zeugt davon, wie sich ein vorwiegend urbanes Phänomen wie Co-Working in nichtstädtische Gebiete auslagert (vgl. De Souza 2017: 224). Annehmlichkeiten wie die Abgeschiedenheit oder die Schönheit von Landschaft und Natur werden dadurch neu in Wert gesetzt und können als Impulse für neue Geschäftsmöglichkeiten dienen. Die Initiative und das zur Verfügung stellen dieser Arbeitsräumlichkeiten verstärken diese Veränderungen, indem sie darauf abzielen, neue Besucher_innen ins Berggebiet zu locken. Der Arbeitstourismus ist eines der erstrebenswerten Hauptziele von miaEngiadina, so wie der Co-Initiator im Interview betont:

> *Im Bereich Co-Working läuft sehr viel. Wir haben jetzt in Scuol im Co-Working immer mehr Leute, die es nutzen. Parallel haben wir jetzt noch in Ardez, Ftan und im Skigebiet von Scuol weitere Co-Workings eröffnet. Wir haben immer mehr Anfragen von Partnern, die eigene Co-Workings mit uns zusammen aufmachen wollen.*

Mit den Co-Working Spaces kann miaEngiadina ein neues Angebot in der Fallstudienregion anbieten. Die neuen Arbeitsstationen zeugen von neuen Geschäftsmöglichkeiten in den Berggebieten, indem städtische Arbeitsstrukturen und Lebensstyle dorthin verlegt werden. Co-Working Spaces scheinen heute auch im Rahmen der Neuen Regionalpolitik (NRP) zentral für die zukünftige Entwicklung von Gebieten ausserhalb von städtischen Zentren zu sein (vgl. von Stokar et al. 2018).

Die Digitalisierung bringt nicht nur neue Angebote mit sich. Sie eröffnet auch neue Möglichkeiten für etablierte, traditionellere Unternehmen im Berggebiet. So zum Beispiel in der Hotellerie. Der Besitzer eines grossen Hotels verriet im Interview, dass er vom digitalen Wandel enorm profitiert. Insbesondere interne Organisationsabläufe und Buchungen laufen vermehrt nur noch digital ab. Er ist so sehr davon überzeugt, dass er ein komplett digitales Hotel plant und dadurch weiter zu expandieren versucht:

> *Also wir wollen ein ganz modernes, zeitgemässes digitales Hotel machen. [...] Wir möchten dort ganz ein modernes Hotel machen, wo man eben 24 Stunden buchen kann über AirBnB, Selbst-Check-In machen kann, man kann dort ein Zimmer mit Reinigung ohne Reinigung; das kann man alles digital buchen. Die Ski kann man voraus digital buchen und den Skilehrer kann man buchen und das Ski-Abonnement. Alles über digital. So ein 24-Hours Hotel von den Bergen ist unsere Idee. Und wir sind dort dran.*

Dieses Beispiel zeigt, dass Digitalisierung auch innovatives Denken etablierter Akteur_innen fördern kann, um so schon bestehendes Gewerbe weiter auszubauen. Dies wurde auch beim Besitzer eines Kleiderwarengeschäfts in der Fallstudienregion ersichtlich. Er wagte sich schon früh in den Onlinehandel, der sich bis heute zu einer wichtigen Stütze seines Geschäfts entwickelte:

> *Wir haben vor mehr als 15 Jahren unseren ersten Online-Shop programmiert und ins Netz gestellt. Es war ein einfacher, aber übersichtlicher Shop, aber natürlich nicht vergleichbar mit den heutigen Shop-Modulen. Die Online-Umsätze waren bescheiden, sind aber stetig gewachsen. Heute ist der Online-Anteil existentiell. In einer Bergregion mit sinkenden Einwohnerzahlen ist damit zu rechnen, dass der Kauf im Laden vor Ort weiter abnehmend sein wird. Deshalb setzen und glauben wir stark an den Online-Handel.»*

Das Beispiel des Kleiderwarengeschäfts zeigt, dass auch traditionelle Geschäftskonzepte in der Verkaufsbranche mit digitalen Technologien durchaus die Möglichkeit haben, online expandieren zu können. Gerade im Berggebiet mit wenig Laufkundschaft, so wie der Besitzer im Interview betonte, sei dies eine willkommene Möglichkeit, neue Kund_innen zu generieren und die Umsätze anzukurbeln.

Nichtsdestotrotz scheint dies nicht auf alle Verkaufsgeschäfte in der Fallstudienregion zuzutreffen. So erklärt der Besitzer eines Foto- und Souvenirgeschäfts, dass einerseits durch den Onlinehandel die Konkurrenz viel zu gross wurde, um als kleines Geschäft erfolgreich in dieser Branche zu bestehen. Aber andererseits sind beispielsweise Social Media-Kanäle gewinnbringend, um Eigenwerbung zu machen, mit Kund_innen in Kontakt zu bleiben sowie neues Klientel zu erreichen.

Die hier kurz angedeuteten Beispiele erhellen einerseits, dass der technologische Wandel (vgl. Woods 2019: 623) durchaus neue Geschäftsmöglichkeiten wie Co-Working Spaces und damit einhergehende neue, ortsungebundene Arbeitsformen im Berggebiet vorantreiben kann. Des Weiteren stellten wir fest, dass auch schon bestehendes Gewerbe, wie beispielsweise die Hotellerie und der Detailhandel, sich die Vorteile der Digitalisierung zunutze macht, um so den Mangel an Laufkundschaft zu kompensieren oder Kund_innen in geographisch entlegeneren Gebieten zu erreichen und zu beliefern. Andererseits scheinen auch negative Auswirkungen des digitalen Wandels ins Rampenlicht zu rücken, so wie Beispielweise die erhöhte Konkurrenz im Onlinehandel von ausserhalb des Berggebiets (vgl. Grimes 2003: 181). Dazu kommen wir in einem späteren Abschnitt noch im Detail.

4.2. Wie die Digitalisierung Distanzen zwischen Zentrum und Peripherie herausfordert

Digitale Technologien eröffnen neue Möglichkeiten ortsunabhängiger Arbeitsweisen. Immer wie mehr Arbeitnehmende benötigen lediglich einen Laptop und eine stabile Internetverbindung, um ihrer täglichen Arbeit nachgehen zu können. Folglich sind sie in der Lage, ihrer Arbeit von fast überall nachzugehen. Somit könnten sie nicht nur zuhause im Homeoffice, sondern auch im Berggebiet arbeiten und dennoch über das Internet und die IKTs nahe am Zentrum sein. Das Internet und insbesondere IKTs beeinflussen somit Distanzen zwischen Zentrum und Peripherie (vgl. Anderson 2000; McIntyre 2009; van Leeuwen 2015). Ebenfalls gaben die empirischen Daten zu verstehen, dass aufgrund der digitalen Konnektivität physische Distanzen kaum noch unüberbrückbare Hürden darstellen. Gerade für abgelegenere Berggebiete scheint dies (auch zukünftig) relevant zu sein. Dadurch entstehen neue Vorteile für die Berggebiete, wie ein Gemeindepräsident im Interview erklärt:

> *Das ist eben unser Vorteil, dass die Distanz kurz wird. Diese ist zuvor unüberwindbar gewesen und das sind die Chancen, die wir heute haben. Wo wir mit den Zentren kommunizieren können, wo man aus dem Zentrum kommen kann und bei uns arbeiten und gleichzeitig hat man im Zentrum die Arbeit hier oder umgekehrt. Wir können mit den Zentren kommunizieren, wir können miteinander Lösungen finden oder suchen und Probleme lösen, wo man das Know-How nicht vor Ort hat. Man kann sehr kurze und effiziente Arbeit generieren.*

Das Internet bringt Zentrum und Peripherie näher zueinander, da es ermöglicht, auf digitale Informationen von überall und augenblicklich zuzugreifen. Dies scheint auch für die medizinische Versorgung von Mensch und Tier im Berggebiet höchst relevant zu sein. Das Internet vereinfacht den Austausch zwischen Patient_innen und Ärzt_innen. Zudem können Letztere durch den Einsatz von IKTs schneller Expert_innenmeinungen auch von ausserhalb einholen. Dies ist insbesondere in Notfallsituationen wichtig, in denen schnelle Entscheidungen getroffen werden müssen. Die Nutzung der IKTs eröffnet neue Möglichkeiten der adäquaten medizinischen Versorgung im Berggebiet, so die interviewte Tierärztin:

> *Die Digitalisierung vereinfacht die Kommunikation mit Spezialisten und verringert damit die Distanz zu ihnen. Die Distanz wird irrelevant. Ich könnte auch mit Spezialisten aus dem Ausland, egal woher, das gleiche machen. Aber wir arbeiten eigentlich schon landesbezogen, wir bleiben in der Schweiz. Man kennt sich auch in der Schweiz, man weiss, wen man fragen soll und zu wem man Vertrauen hat. So gesehen ist die Digitalisierung schon wichtig für uns, sie holt uns aus der Peripherie näher zu den Spezialisten an den grossen Kliniken.*

Die Digitalisierung und insbesondere die aufkommende Telemedizin eröffnen neue Chancen für die Gesundheitsversorgung im Berggebiet und allgemein in peripheren Regionen. Ein Vorstandsmitglied des Gesundheitszentrum Unterengadin dazu:

> *Wir haben erkannt, dass dank der Digitalisierung die peripheren Regionen näher ans Zentrum rücken und damit auch eine Versorgungsbrücke gebaut werden kann, welche das Angebotsspektrum erweitert.*

Die Vorteile kürzerer Distanzen über das Internet zeigen sich auch in der Wissensbeschaffung, da neustes medizinisches Wissen (auch in Textform) zu jeder Zeit über das Internet und nicht nur vor Ort in Bibliotheken abrufbar ist. Dies ist enorm wichtig, so eine interviewte Hausärztin, da sich medizinisches Wissen in kurzen Abständen stets erweitert.

Die Gemeindeverwaltung und die Gesundheitsversorgung sind nicht die einzigen Akteur_innen, die von kürzeren Distanzen bzw. Wegen im digitalen Raum profitieren. Auch für Schulen im Berggebiet ergeben sich neue Möglichkeiten, wie zum Beispiel des Fernunterrichts. Nicht nur innerhalb der Fallstudienregion selbst, sondern auch international. Weil die Schulen allgemein weniger Schüler_innenzahlen als in städtischen Gebieten aufweisen, ist auch das Lehrangebot dementsprechend begrenzt. Die Digitalisierung scheint hier Abhilfe schaffen zu können, wie die Direktorin einer gymnasialen Einrichtung im Interview erklärt:

> *Wir erhalten Schülerinnen und Schuler aus aller Welt. Wir möchten hier angebunden sein. Wir haben die Idee, dass wir mittelfristig Kooperationen mit internationalen Schulen eingehen. Wir könnten uns zum Beispiel mit einer chinesischen Uni zusammenschliessen und den Sprachunterricht, für unsere chinesischen Schülerinnen und Schüler in Mandarin so anbieten, sodass unsere chinesischen Schülerinnen und Schüler mit China im Unterricht sein könnten. Denn als relativ kleine Schule können wir von unserer Seite her nicht das volle Bildungsangebot anbieten mit Lehrern, nach dem klassischen Modell. [...] Zwei Drittel unserer Schülerinnen und Schüler unserer Schule werden mittelfristig international sein und ein Drittel regional; teilweise aus der ganzen Schweiz. Da werden sicher zusätzliche Ansprüche an das Bildungsangebot auf uns zukommen. Ich habe jetzt das Beispiel Mandarinunterricht gebracht. Wenn nur wenige Chinesen unsere Schule besuchen, können wir nicht auch noch einen Mandarinlehrer hier hochbringen, dafür liegen wir zu dezentral. Aber Mandarin als Unterrichtsfach anzubieten ist für uns ein wichtiges Verkaufsargument im chinesischen Markt. Auf der einen Seite ist es eine Schweizer Schule. Unsere Schülerinnen und Schüler können hier einen internationalen Abschluss machen und lernen die europäische Kultur kennen. Und auf der anderen Seite können wir dennoch etwas aus diesen Kulturkreisen, wo sie herkommen, in die Schule mit hineinnehmen.*

In diesem Sinne eröffnet die Digitalisierung die Möglichkeit, neue nationale wie auch internationale Kooperation eingehen zu können. Dies spart einerseits Kosten und andererseits wird es dadurch möglich, das schulische Angebot weiter auszubauen, was wiederum die Attraktivität der Schulen im Berggebiet steigern kann. Auch die Initiative miaEngiadina leistet hier einen Beitrag mit der Anbindung der Schulen ans Glasfasernetz sowie deren Vernetzung über eine regionale online Schulplattform für Lehrer_innen und Schüler_innen.

Die Interviewauszüge zeigen, dass digitale Technologien in der Tat physische Distanzen überbrücken können. Nicht nur innerhalb des Berggebiets, sondern auch im geographischen Spagat zwischen Zentren und Peripherien. Während jedoch die physische, räumliche Distanz zwischen der Fallstudienregion und den städtischen Zentren unverändert bleibt, bringen das Internet und die damit verbundene Nutzung der IKTs städtische wie auch nichtstädtische Akteur_innen näher zueinander (vgl. Anderson 2000; McIntyre 2009; van Leeuwen 2015). In der Folge entstehen neue Stadt-Land-Verbindungen im digitalen Raum. Dies hat wiederum einen zeitsparenden Effekt. Denn die Digitalisierung macht es möglich, vormals lange Wege durch den Zugang zu Information und Wissen im Internet zu kompensieren.

4.3. Widersprüche der Digitalisierung in der Peripherie

Der digitale Wandel scheint sich in vielerlei Hinsicht gewinnbringend auf die Berggebiete auszuwirken. Zahlreiche Akteur_innen können von den neuen Möglichkeiten der digitalen Konnektivität auf unterschiedliche Art und Weise profitieren. Nichtsdestotrotz verdeutlichen die Interviews, dass die Digitalisierung in den Berggebieten auch Widersprüche hervorzurufen scheint. Zahlreiche Interviewpartner_innen wiesen auf negative bzw.

kontraproduktive Entwicklungen des digitalen Wandels hin. Während beispielsweise der Onlinehandel für die einen ein neues, vielversprechendes Geschäftsmodell ist, können für andere neue Unsicherheiten aufgrund der grösseren Konkurrenz im Internet entstehen. Solch ein Widerspruch kristallisierte sich aber nicht nur im Detailhandel heraus.

Auch die Hotelindustrie scheint von den Kehrseiten der Digitalisierung betroffen zu sein. Während in den Interviews der Besitzer der grösseren Hotels auf die Vorzüge der Digitalisierung hinwies, wie zum Beispiel für Werbung oder Effizienz in der Hotelverwaltung, so scheint sich in kleineren Betrieben in derselben Branche ein anderes Bild abzuzeichnen. In Zeiten der Onlinebuchungsplattformen verändert sich auch die Betreuung und Kommunikation zwischen einem Hotel und den Kund_innen. Während sich das Buchungsprozedere in Sachen Zeitaufwand und Effizienz für beide Seiten deutlich veränderte, nimmt der persönliche Kontakt zwischen Hotelangestellten und den Kund_innen immer wie mehr ab, wie die Eigentümer eines mittelgrossen Hotelbetriebs im Interview festhalten. Aber gerade dieser Kontakt scheint ein wichtiges Element für den Erfolg eines solchen Hotels in den Berggebieten zu sein:

> *Das ist ja auch ein wichtiger Bestandteil von den Gasthäusern in diesen kleinen Orten. Wenn man in dieses Unpersönliche reinfällt, dann hat man keine Chancen, um zu überleben. [...] Ja, in einer Grossstadt oder in einer Stadt hat es ja jetzt sehr viele neue Hotels, grosse Hotels, die aufgehen. Sehr modern. Und ich nehme an, da ist alles vernetzt. Und dort kommt laufend hinten Nachschub. Einfach durch die Grösse. Und hier kommt dieser Nachschub nicht. Das heisst der, der mal hier ist, den muss man wie behalten können und sagen, dass er von uns erzählt und er wieder zurückkommt. Der Nachschub kommt nicht automatisch wie jetzt in Luzern, wo einfach ständig neue Betriebe aufgehen.*

Die Eigentümer halten somit fest, dass wiederkehrende Gäste für mittlere und kleinere Hotelbetriebe in der Fallstudienregion enorm wichtig sind. Aber gemäss den Interviewpartner_innen scheinen unpersönliche Onlinegeschichten dafür nicht unbedingt förderlich zu sein. Hinzu kommt noch die angenehme Flexibilität im Buchungs- und Stornierungsverfahren für die Gäste, insbesondere falls das Wetter nicht mit dem geplanten Wochenendausflug mitspielen würde. Die kurzfristigen Stornierungen bringen jedoch für die Hoteleigentümer vermehrt Unsicherheiten mit sich, die vor der Digitalisierung nicht in diesem Umfang vorhanden waren.

Die Kritik an der Unpersönlichkeit im Internet erwähnten auch diverse andere Akteur_innen in den Interviews. Beispielsweise wies eine interviewte Hausärztin darauf hin, dass nicht alles digitalisiert werden könne und Grenzen betreffend Digitalisierung bestehen. Eine ärztliche Untersuchung geht immer noch am besten in Person. Und auch in der Schule scheint nicht alles einfach digital machbar zu sein. Die Direktorin der gymnasialen Einrichtung wies auf die Schule als wichtigen pädagogischen Ort hin, bei dem ein Zusammenkommen im physischen Raum nicht einfach digital ersetzbar ist. Ganz allgemein wiesen zahlreiche Interviewpartner_innen darauf hin, dass Konversationen und die Aufrechterhaltung von Kontakten und Netzwerken nicht ausschliesslich online stattfinden können. Der Austausch würde sich stark unterscheiden, wenn er digital oder analog geführt wird. Obwohl die Technik vieles vereinfachen kann, besteht bei den interviewten Akteur_innen eine hohe Übereinstimmung darüber, dass physische Treffen nach wie vor beispielsweise einem Skype-Anruf vorzuziehen sind. Während die Überwindung physischer Distanzen mit der Nutzung von IKTs durchaus ihre Vorteile hat, beinhaltet dies aber auch Gefahren, so die interviewte Architektin:

> *Das hat vielleicht nicht nur mit Architektur zu tun, aber ich glaube, die Gefahr ist, dass der Kontakt zwischen Menschen weniger wird. Man kann alles aus der Distanz machen, ich muss nicht mehr mit der Bauherrschaft physisch vor Ort sein, denn ich kann alles digital verschicken, wir können das zusammen per Face-Time anschauen,*

Video-Call oder was auch immer und vielleicht ist die Gefahr, dass es unpersönlicher wird. Das wäre schade. Face to Face ist immer noch das allerwichtigste.

Die Architektin teilte im Interview auch ihre Skepsis gegenüber der Möglichkeit von Online-Meetings per Videokonferenz. Der persönliche Kontakt scheint in den Berggebieten umso wichtiger zu sein. Eine Meinung, die zum Beispiel auch die Direktorin des kleineren Spitals teilt:

Wir hatten auch studiert, ob wir das in Zukunft per Video-System oder so etwas machen wollen. Aber ich muss sagen, dass wir da abhängen als periphere Region. Also da sind mir die persönlichen Kontakte zu 90% schon wichtiger.

Der Community-Ansatz konnte diverse Widersprüche ans Licht bringen. Und das auch bei handwerklichen Berufen. Ein Schreiner erklärte im Gespräch, dass dank dem Internet eine grössere Transparenz vorhanden ist, was den Austausch mit Klient_innen enorm zeitsparender macht. Im selben Interview erklärte er aber auch, dass durch diese Transparenz der gesamte Küchenmarkt in der Region zusammengebrochen ist. Insbesondere Preisvergleiche mit Produkten im Ausland machen es enorm schwierig für ihn in diesem Bereich wettbewerbsfähig zu bleiben. Das Beispiel zeigt, dass einerseits der Arbeitsprozess effizienter gestaltet werden kann, aber diese auf der anderen Seite durch erhöhte Preistransparenz wieder obsolet wird, wenn ein Markt dadurch zusammenbricht. Ein anderer Schreiner machte im Interview zudem auf die zusätzliche Arbeitslast aufmerksam, die durch die Kommunikation im Internet in den letzten Jahren noch zusätzlich dazukam.

Wie in diesem Abschnitt mit wenigen Beispielen angedeutet, scheint die Digitalisierung gerade in den Berggebieten ein zweischneidiges Schwert zu sein. Während in diesem Bereich noch weitere Untersuchungen nötig sind, zeigen die Beispiele aber schon ziemlich deutlich, dass es den Hype der Digitalisierung auch kritisch zu hinterfragen gilt (vgl. Grimes 2003: 189). Ganz allgemein sind auch negative Konsequenzen der Digitalisierung wie zunehmende Arbeitsbelastung, Geschwindigkeit und damit verbunden auch Stress sowie unpersönlichere Kommunikation wahrzunehmen. Somit ist es wichtig, unterschiedliche Sichtweisen auf das Phänomen des digitalen Wandels zuzulassen, insbesondere in den Berggebieten. Dies scheint gerade darum relevant zu sein, um die Feinheiten divergierender Erfahrungen unterschiedlicher Akteur_innen nicht lediglich zu erkennen, sondern auch anzuerkennen, um daraus angepasste Digitalisierungsstrategien zu entwickeln. Allgemein scheinen die Herausforderungen gerade für kleinere Unternehmen, Organisationen und Institutionen grösser zu sein. Und damit einhergehend die Gefahr, noch stärker marginalisiert zu werden (vgl. Grimes 2003: 189).

4.4. Unterschiede digitaler Erfahrungen im Berggebiet

Der digitale Wandel birgt Chancen, aber auch Hindernisse. Insbesondere auch für ländliche Gesellschaften (vgl. Philip & Williams 2019: 307). Diese Hindernisse können ganz verschiedener Natur sein und wirken sich somit auch in unterschiedlicher Art und Weise auf die Akteur_innengruppen aus. Die Gruppe der Unternehmen und Entrepreneur_innen im tertiären Sektor scheint grundlegend vom digitalen Wandel betroffen zu sein. Die Interviewdaten heben beispielsweise hervor, dass Konnektivität und IKTs ihren Preis haben. Während grössere Betriebe die digitalen Neuerungen willkommen heissen, hallt es Kritik aus dem Lager der kleineren Unternehmen. Variierende Finanzkapitalausstattungen können bei Letzteren zu Stresssituationen führen. Dies wird beispielsweise im Gesundheitssektor ersichtlich.

Bei der Einführung von E-Health kommen auch finanzielle Herausforderungen für die Gesundheitsversorgung hinzu, insbesondere für das kleinere Spital in der Fallstudienregion. Denn E-Health bedingt nicht nur die Anbindung der Gesundheitseinrichtung an ein Glasfasernetz, sondern auch die Kosten für die dazugehörige technische Ausrüstung und die spezifische Ausbildung für die Angestellten. Die Direktorin des kleineren Spitals kritisierte diese hohen Kosten im Interview:

> *Also sicher ist das etwas, das uns fast übermässig belasten kann, kostenmässig. Das muss man ganz ehrlich sagen. Also diese Kosten wachsen doch. Die waren letztes Jahr für einen kleinen Betrieb, der Gesamtumsatz von 8 Millionen knapp hat, waren diese letztes Jahr schon bei 160'000 Franken. Diese werden weiter wachsen. Das darf man schon sagen: es ist ein ziemlicher Betrag. Und ich denke mit E-Health sind wir sicher mal um 100'000 Franken höher irgendwann einmal, wenn das alles umgesetzt ist. Und da muss man sich schon fragen, wo es Grenzen hat und was man kann und kann man da auch Synergien nutzen.*

Im selben Interview wies sie zudem darauf hin, dass der Kanton für dieses finanzielle Risiko zu wenig finanzielle Unterstützung anbietet. Der Kanton macht das Gesetz, aber lässt das Spital bei der Umsetzung alleine.

Digitalisierung hat ihren Preis. Dies kristallisierte sich in zahlreichen Interviews heraus. Während beispielsweise der Schweizerische Nationalpark im Engadin mit Glasfaseranschluss und neuster Technologie ausgestattet ist, so scheinen kleinere Institutionen betreffend Digitalisierung vor grösseren finanziellen Herausforderungen zu stehen. So muss Beispielsweise ein Kulturzentrum der Region ganz bedacht und sorgfältig mit den eigenen personellen Ressourcen für digitale Projekte und Arbeiten umgehen, da das Team ohnehin schon eher klein ist. Dazu kommt noch die IT-Infrastruktur, die nicht nur in der Anschaffung, sondern auch in deren Aufrechterhaltung durch eine externe IT-Firma ihren Preis hat. Zudem führt dies zu neuen Abhängigkeiten von IT-Spezialist_innen, was im Interview kritisiert wurde.

Die genannten Beispiele verdeutlichen, dass es mit dem Breitbandanschluss und der Anschaffung der IT-Infrastruktur noch lange nicht getan ist, um von der Digitalisierung zu profitieren. Es braucht auch die nötigen personellen Ressourcen für die Bespielung der digitalen Kanäle, die dazugehörende Ausbildung sowie immer wiederkehrende Investitionen in die Aufrechterhaltung und Erneuerung der IT-Infrastruktur. Dies gibt zu verstehen, dass digitaler Wandel ein gewisses finanzielles Polster voraussetzt.

Der Abschnitt soll verdeutlichen, dass die Erfahrungen des digitalen Wandels in der Fallstudienregion ganz unterschiedlich sein können. Der Community-Ansatz auf der Akteur_innenebene (vgl. Salemink et al. 2017) bietet sich geradezu an, um unterschiedliche Bedürfnisse und Ansprüche an die Digitalisierung ans Licht zu bringen, was eine einseitige Fokussierung auf eine Akteur_innengruppe nicht könnte. Des Weiteren stach aus den Interviews hervor, dass es wohl kein allgemeingültiges Erfolgsrezept der Digitalisierung für die Berggebiete gibt. Das heterogene Abbild der Erfahrungen und Bedürfnisse der Akteur_innengruppen gibt zu verstehen, dass der Digitalisierungsprozess nicht für alle gleich abläuft und folglich individuell angepasste Umsetzungsprozesse benötigt.

5. Schlussfolgerungen und Ausblick

Die Digitalisierung scheint nicht unbemerkt an den Berggebieten vorbeizugehen. Ziel der vorliegenden Fallstudie war es zu untersuchen, wie die Akteur_innen in den Berggemeinden der Region Unterengadin/Münstertal den digitalen Wandel wahrnehmen und welche Erfahrungen daraus resultieren. Die Resultate erhellen, dass der digitale Wandel Chancen und zeitgleich Gefahren mit sich bringt, wenn er zu allgemein vonstatten geht.

Nicht alle Akteur_innen können auf dieselbe Art und Weise am digitalen Wandel teilhaben. In dieser Hinsicht scheint es relevant zu sein, auch den differierenden Bedürfnissen und Anforderungen der unterschiedlichen Akteur_innen in den Berggebieten mehr Beachtung zu schenken und nicht zu ignorieren. Finanziell besser gestellte Akteur_innen profitieren mehr als die finanziell schwächeren. Der Community-Ansatz machte ersichtlich, dass Digitalisierung kein uniformer Prozess ist und es kein allgemeines Erfolgsrezept für die Implementierung von Digitalisierung in den Berggebieten gibt. Denn alleine mit der Glasfasererschliessung ist der digitale Wandel noch lange nicht getan. Vor diesem Hintergrund scheint es uns als unumgänglich, eine differenziertere Debatte über die lokalen Merkmale, Bedürfnisse und Anforderungen der Akteur_innen in Bezug auf den digitalen Wandel in den Berggebieten zu führen. Will die Digitalisierung Erfolg haben, so sollte sie entlang der lokalen Bedürfnisse und Anforderungen erfolgen, so unterschiedlich diese auch sein mögen. Dabei geht es darum, deren Unterschiede und Feinheiten nicht nur zu erkennen, sondern auch anzuerkennen und sie ernst zu nehmen. Denn die Unterschiede entstehen nur bedingt aufgrund von variierenden Datenraten (vgl. Stocker & Whalley 2018; Philip & Williams 2019). Sie zeigen sich vielmehr in der ungenügenden Finanzkapitalausstattung oder im nicht vorhandenen Know-How, das wiederum mit finanziellen Ausgaben verbunden ist. Somit ist deutlich zu erkennen, dass die Vielfalt der lokalen Bedürfnisse und Erfahrungen auch individueller und flexibler gestaltete politische Massnahmen und Leitbilder für die digitale Transformation in den Berggebieten benötigen.

Der Community-Ansatz (vgl. Salemink et al. 2017) erwies sich als nützliche Vorgehensweise, um eine differenzierte Sichtweise auf den digitalen Wandel und dessen Transformationen in den Berggebieten zu generieren. Dies scheint unerlässlich zu sein. So zeigen die individuellen Erfahrungen der unterschiedlichen Akteur_innen einen heterogenen Fussabdruck der Digitalisierung. Nicht alle profitieren von den digitalen Veränderungen, was ungleiche Entwicklungsdynamiken ländlicher Ökonomien nach sich zieht. So scheinen ganz allgemein die zunehmende Arbeitsbelastung, erhöhte Geschwindigkeit, Stress sowie die unpersönliche Kommunikation über das Internet erst recht durch die Digitalisierung gefördert zu werden.

Nichtsdestotrotz gehen die Ergebnisse der Fallstudie teilweise auch mit den Überlegungen des Wandels von ländlichen Ökonomien und des technologischen Wandels als treibende Kraft neuer Geschäftsmöglichkeiten einher (vgl. Woods 2019). In der Dynamik des ländlichen ökonomischen Wandels kommt es zu einer Neubewertung bzw. Inwertsetzung traditionell zugeschriebener Charakteristiken und Werte der Berggebiete wie Landschaft, Natur und Tourismus. Wie in der Studie zu erkennen, geschieht dies beispielsweise dadurch, dass auch städtische Aktivitäten wie Co-Working seit kürzerer Zeit auch in den ländlichen Regionen und in den Berggebieten vermehrt anzutreffen sind (vgl. De Souza 2017). Es scheint somit wichtig zu sein, die romantisierende Sichtweise auf die Berggebiete infrage zu stellen und deren Annehmlichkeiten sowie die marginale Randlage kritisch und sozio-ökonomisch zu hinterfragen. In dieser Hinsicht stellt sich jedoch auch die Frage, wie weit der ländliche Raum noch kommerzialisiert sowie in Wert gesetzt werden kann und wo dann auch deren Grenzen sind.

Auch die Fallstudie hat ihre Grenzen. So kann das empirische Datenmaterial nur beschränkt erklären, ob die Digitalisierung in den Berggebieten eine Erfolgsgeschichte ist oder nicht. Die Studie kann auch nicht darüber Aufschluss geben, ob schnelleres Internet wirklich die Abwanderung stoppen und zu einem höheren Rückwanderungssaldo führen kann (vgl. Medaglia & Petitta 2014: 19-20). Um klare Schlüsse darüber zu ziehen, braucht es weitere Studien, die sich explizit diesem Phänomen in den Schweizer Berggebieten widmen.

Nichtsdestotrotz können die Resultate der vorliegenden Studie auch auf andere, ähnliche Berggebiete übertragen werden. Somit kann die Studie als Ausgangspunkt für weitere empirische Forschungen im Bereich wandelnder ländlicher Ökonomien vor dem Hintergrund der Digitalisierung dienen. Es braucht dringend weitere Studien, die sich mit verwandten Themen befassen wie der Analyse von Stadt-Land-Verbindungen, die Verlegung kreativer und wissensintensiver Arbeitsweisen von Zentren ins Berggebiet (z.B. Mountain Co-Working), Dynamiken der Vorbereitungen auf digitale Konnektivität, Auswirkungen der Digitalisierung auf Innovationen in den Berggebieten oder multilokale, digitale Arbeitsweisen zwischen Stadt und Berg (siehe dafür unser aktuelles Forschungsprojekt: Link). Zudem scheint es unumgänglich zu sein, die gegenwärtigen Glasfasererschliessungen in den Berggebieten und das technologische Konzept des digitalen Grabens auch vor dem Hintergrund der aufkommenden 5G-Technologie (kritisch) zu diskutieren.

Die digitale Transformation in den Berggebieten kann auch geographisch auf unterschiedlichen Massstabsebenen diskutiert werden. So stellen die Resultate der Fallstudie die traditionelle, dualistische Sichtweise auf Stadt und Land infrage. Denn Digitalisierung führt zu einer Flexibilisierung von Raum aufgrund dynamischer Verbindungen (Linkages) im digitalen Raum. Im digitalen Zeitalter scheint ein scharfer Dualismus zwischen Stadt und Land aufgrund von Stadt-Land-Verbindungen im digitalen Raum an Relevanz zu verlieren, wenn nicht sogar gänzlich obsolet zu werden (vgl. Lichter & Brown 2011). Das Internet und die Nutzung von IKTs lassen Zentren und Peripherien sozial wie auch ökonomisch näher aneinanderrücken. Vor diesem Hintergrund kommt der flächendeckenden Breitbanderschliessung und der Nutzung von IKTs in den Berggebieten dennoch eine zentrale Rolle zu. Und trotzdem gilt es auch hier eine dialektische Perspektive zu bewahren. Denn während digitale Stadt-Land-Verbindungen den digitalen Graben für die einen aufheben und neue Möglichkeiten in ökonomischer Hinsicht eröffnen, so scheint sich dieser für andere kaum zu verändern oder im schlechtesten Fall unangenehm zu wachsen.

Die vorliegende Fallstudie gewährt neue Einblicke und ein differenziertes Verständnis über den digitalen Wandel in den Berggebieten. Digitale Anbindung ist kein uniformer Prozess, sondern geschieht auf individueller Ebene. Somit scheint eine differenzierte Sichtweise der Digitalisierung auf Ebene der Akteur_innen in den Berggebieten unabdingbar zu sein für deren wissenschaftlichen Erforschung sowie auch für die Praxis.

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Center for Regional Economic Development (CRED)

Universität Bern

Schanzeneckstrasse 1

Postfach

CH-3001 Bern

Telefon: +41 31 631 37 11

E-Mail: info@cred.unibe.ch

Website: http://www.cred.unibe.ch

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Kontaktdaten der Autor_innen:

Reto Bürgin

Universität Bern

Geographisches Institut

Hallerstrasse 12

CH-3012 Bern

Tel. +41 31 631 85 56

Email: reto.buergin@giub.unibe.ch

Heike Mayer

Universität Bern

Geographisches Institut

Hallerstrasse 12

CH-3012 Bern

Tel. +41 31 631 88 86

Email: heike.mayer@giub.unibe.ch

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Annex article 2: Heute hier, morgen dort – digital und ortsunabhängig arbeiten

Author: Reto Bürgin

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B4
Heute hier, morgen dort – digital und ortsunabhängig arbeiten

Reto Bürgin

Wirkt es sich auf Produktivität und Effizienz aus, ob der Arbeit in der Stadt oder in der Abgeschiedenheit der Berge nachgegangen wird? Welche Tätigkeiten erfordern gerade die spezifischen Vorteile des einen oder anderen Standorts? Ein Team der Unit Wirtschaftsgeographie und des Science IT Supports (ScITS) der Universität Bern ist der digitalen Multilokalität auf der Spur.

Die Erschliessung der Berggebiete mit Breitbandinfrastruktur, insbesondere mit Glasfasertechnologie, ist in vollem Gang. Lokale Initiativen wie miaEngiadina im Engadin oder NüGlarus im Glarnerland verkleinern den digitalen Graben zwischen Stadt und Land und tragen zum Wandel ländlicher Ökonomien bei[1]. Auch in der Neuen Regionalpolitik (NRP), die sich der Entwicklung ländlicher Regionen und Berggebiete widmet, ist die Digitalisierung ein Kernthema. Mit solchen Veränderungen gehen auch ortsunabhängige Arbeitsweisen von Wissensarbeitenden einher. So ersetzen Laptop, Smartphone und Internet die physische Präsenz am Arbeitsplatz. In dieser Hinsicht gewinnt die strategische Nutzung von Marginalität[2] an Bedeutung.

In einem vom Schweizerischen Nationalfonds geförderten Forschungsprojekt zur digitalen Multilokalität untersuchen Forschende der Universität Bern, inwiefern sich die Nutzung digitaler Technologien zwischen dem Arbeitsplatz in der Stadt und dem in den

Bergen unterscheidet. Weiter interessiert, wie sich die Nutzung der Marginalität auf die Arbeit auswirkt. Dabei werden die Arbeitspraktiken von Personen untersucht, die hauptsächlich in einem städtischen Umfeld tätig sind, jedoch zeitweise bewusst die Schweizer Berggebiete aufsuchen, um ihrer Arbeit nachzugehen.[3]

Was denken Sie?

1 Zu welchem Grad nutzen Sie digitale Technologien?

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Strategisch Distanz schaffen

Die ersten Resultate der Studie legen nahe, dass digitale Technologien unverzichtbar für eine multilokale Arbeitsweise sind. Dennoch arbeiten die Studienteilnehmenden im Berggebiet weniger an ihrem Laptop und mit ihrem Smartphone. Sie nutzen die Marginalität, um Abstand von den digitalen Technologien zu nehmen und um Gedankengänge auch einmal – ganz analog – auf ein Blatt Papier zu skizzieren.
Die Entfernung zu Vorgesetzten und Mitarbeitenden am städtischen Arbeitsplatz ermöglicht eine ruhige und geschützte Arbeitsatmosphäre. Durch geringere Ablenkung steigen Konzentration und Fokussierung auf die eigentliche Arbeit. Weniger Unterbrüche fördern zum einen intensive Phasen der Denkarbeit und zum anderen bieten sie Raum, um angehäufte oder pendente Aufgaben effizient abzuarbeiten. Darüber hinaus macht sich der Tapetenwechsel vom städtischen Umfeld in die Naturlandschaft der Berge durch eine positive Wirkung auf Arbeitsmoral und -motivation bemerkbar.
Doch scheint diese digitale multilokale Arbeitsweise auch Einschränkungen der Arbeit mit sich zu bringen. Die Abgeschiedenheit in den Bergen kann zur Isolierung führen. Dies zeigt sich unter anderem im erschwerten Austausch mit Mitarbeitenden und Vorgesetzten. Multilokale Wissensarbeitende kommen nicht darum herum, den Kontakt aktiv über die digitalen Kommunikationswege zu suchen und zu planen. Die Distanz erschwert zudem spontanes, persönliches Agieren und kann zur Reduktion des Einflusses auf Teamarbeiten und damit verbundene Entscheidungsfindungen führen. Eine mögliche Folge davon ist die Verlangsamung von Arbeitsprozessen.

Durch geringere Ablenkung steigen Konzentration und Fokussierung auf die eigentliche Arbeit.

Machen Berge kreativer?

Die fehlende physische Interaktion mit Teammitgliedern scheint sich auch auf kreative Tätigkeiten auszuwirken. Zwar nutzen die multilokalen Wissensarbeitenden die Marginalität für intensiv ainstormings, jedoch scheinen die kreativen Arbeitsphasen an splatz gebunden zu sein. Dies lässt sich damit erklären, dass Kre l in Teamarbeit stattfinden. Offenbar ist es gerade der intensive, d ır die nötige Kreativität in den Arbeitsprozessen verantwortlich i tionsmittel mögen hier zwar Abhilfe schaffen, können jedoch ur selten kompensieren.

Digitale Multilokalität – was können wir davon mitnehmen?

Für eine digitale multilokale Arbeitsweise zwischen Stadt und Berg scheint die Nutzung digitaler Technologien unverzichtbar zu sein. Dies wirft ein kritisches Licht auf den digitalen Graben in geographischer Hinsicht: Einerseits bieten die Berggebiete aufgrund ihrer Distanz zu den städtischen Zentren eine geschützte und produktive Umgebung für wissensintensive Tätigkeiten. Andererseits scheinen die Berggebiete gar nicht mehr so abgelegen zu sein wie angenommen. Denn insbesondere die immanente digitale Verbindung zwischen den Arbeitsplätzen in der Stadt und auf dem Berg lässt physische Distanzen kognitiv schrumpfen.

Darüber hinaus lässt sich feststellen, dass Kreativität als kollektiver Prozess zu verstehen ist und vorwiegend am städtischen Arbeitsplatz im Austausch mit Mitarbeitenden stattfindet. Das Aufsuchen und Nutzen von Marginalität ist somit ein strategisches Mittel zur Erledigung spezifischer Aufgaben. An seine Grenzen stösst das Arbeiten in der Abgeschiedenheit eher dann, wenn Teamarbeit gefragt ist. Eine zyklische Arbeitsweise zwischen Stadt und Berg scheint die Effizienz und Produktivität zu fördern, indem die Vorteile der jeweiligen Arbeitsorte genutzt werden.

An seine Grenzen stösst das Arbeiten in der Abgeschiedenheit eher dann, wenn Teamarbeit gefragt ist.

Die Studie verge tzung der Marginalität für digitale multilokale Wissensarbeiten eiz hat; insbesondere aufgrund der guten Vereinbarkeit von Fr ie, die durch das flexiblere Zeitmanagement möglich wird. Un digitale Multilokalität ein Privileg zu sein. Der Besitz einer Zweitwohnung in den Bergen oder die Verfügbarkeit eines freien Betts sind Voraussetzungen, um einer solch flexiblen Arbeitsweise nachgehen zu können.

Die digitale Multilokalität weist auf einen grundlegenden Wandel in der Form der räumlichen Arbeitsverrichtung hin – zumindest für diejenigen, die einer solchen Arbeitsweise nachgehen können. So rücken auch die Qualitäten der Berggebiete vermehrt ins Zentrum des Interesses und machen deutlich, dass die Entwicklungen der unterschiedlichen Raumtypen der Schweiz zusammen zu betrachten sind.

Reto Bürgin

Geograph/Soziologe und Doktorand in der Unit Wirtschaftsgeographie am Geographischen Institut der Universität Bern. Seine Forschungsschwerpunkte sind Digitalisierung in den Berggebieten, Urban Rural Linkages, Stadtgeographie/-soziologie sowie die Schriften von Lucius Burckhardt.

E-Mail