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How social innovations emerge in a rigid regulatory context: the case of demand responsive transport in Switzerland

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ABSTRACT

Demand responsive transport (DRT) solutions may improve rural transport systems. These solutions often emerge as social innovations in rural areas. In Switzerland, their planning process is embedded in a rigid regulatory framework of the public transport system. The objective of this paper is to understand in which way the regulatory framework of the public transport system influences planning processes of a DRT solution in a rural setting. The methodological approach of social innovation biographies helps to examine the necessary planning steps to start mybuxi, a DRT in two Swiss rural municipalities. Our findings show that regulatory constraints dominate the final planning stage of the social innovation. Protections of current public transport regulations hinder federal offices from subsidizing the DRT, having direct implications on the financial sustainability of the system. The findings of this paper help actors to better address regulatory questions in the early stage of the respective innovation process.

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Social innovation; DRT; rural area; regulatory context; socio-technical transition; Switzerland

1. Introduction

The provision of public transport (PT) in rural areas faces numerous challenges due to dispersed settlement structures and low population densities. These rural characteristics make it difficult to provide adequate – in terms of efficiency and frequency – PT services. Demand Responsive Transport (DRT) represents an innovative solution and can replace private car trips (Mulley and Nelson 2009). DRT is ‘an intermediate form of PT, somewhere between a regular service route that uses small low floor buses and variably routed, highly personalized transport services offered by taxis’ (Brake, Nelson, and Wright 2004). Compared to traditional PT options, DRT has lower overall service provision costs because the vehicle size is reduced and novel technological solutions allow greater flexibility of the services, resulting in increased attractiveness (Teal and Becker 2011). In rural areas, DRT services often have been initiated as social innovations (SI) and tend to be

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operated by volunteer organizations building on strong local communities (Bock 2016; Gray, Shaw, and Farrington 2006; Neumeier 2017). Butzin, Rabadjieva, and van de Lindt (2015) identify a variety of practice fields of SIs in the transport sector such as citizen initiated PT, transport services for people with disabilities and/or elderly as well as mobility apps.

SIs are an important part of current socio-technical transitions toward more sustainable systems (Wittmayer et al. 2020) such as in the transport system (Meelen, Frenken, and Hobrink 2019; Sunio, Laperal, and Mateo-Babiano 2020). Embedded in a socio-technical transition process (Geels 2004), SIs can open spaces for experimentation in form of niches challenging existing regimes. These experiments are context specific and open new possibilities to test new intervention logics and governance approaches in real-world settings (Bulkeley and Castán Broto 2013; Wimbadi, Djalante, and Mori 2021; Wittmayer et al. 2020). By challenging dominant socio-technical regimes, SIs as transition experiments can play an important role in reconfiguring existing socio-technical systems (Hodson, Geels, and McMeekin 2017). Yet, we need to keep in mind that DRT services are embedded in a context-specific, complex network of governance, political and regulatory environments because service provision in PT normally needs to go through various stages of approval at different institutional levels. Yet, this latter aspect has received less attention in the literature even though some authors recognized that SIs in the transport sector in particular are subject to a set of governance and political framework conditions (Butzin and Rabadjieva 2017).

In this paper we focus on a case study of a DRT service that represents a SI, which was developed and by now implemented in two neighboring municipalities in a rural region in Switzerland. The SI we are interested in is called *mybuxi* and was successfully launched in 2019 as an on-demand ridepooling service that utilizes a smartphone application. *mybuxi* has the goal to provide attractive transport solutions for the local population. Even though PT in Switzerland is very well developed, especially between major destinations such as the larger metropolitan areas, services in rural areas have been subject to a reduction of lines as demand is decreasing and regular PT services are highly cost inefficient (FOT 2020; Office of Public Transport 2013; 2017). However, PT services in rural areas are seen as a necessity to ensure access to transport for mobility-disadvantaged groups justifying high subsidies (Buehler, Pucher, and Dümmler 2019; Mulley and Nelson 2009). For local authorities that have to subsidize PT routes in rural and dispersed settlement areas (Ubbels et al. 2017), new flexible forms of transport with a similar or better service quality may be an attractive solution to minimize public spending (de Jong et al. 2011). Regarding their characteristics, DRT services in rural areas show similar patterns as PT services and may increase cost efficiency as well as accessibility (Imhof and Blättler 2023; Thao, Imhof, and von Arx 2023). Despite anticipated positive consequences for the rural transport system, planning DRT services in Swiss rural areas is linked to several challenges and new business models are challenging historically evolved regulations and governance approaches.

The research gap that we are addressing is related to the question of how in a highly protective and regulatory environment (e.g. PT) a SI is implemented. So far, research on DRT services in rural areas examined their acceptance (Avermann and Schlüter 2019), the necessary degree of service flexibility (Sörensen et al. 2021) or influential factors on the behavior of a service usage (Wang et al. 2015). Yet, a focus on the regulatory

context is missing. The provision of DRT services such as *mybuxi* in Switzerland must be in line with current regulations for the provision of PT services to obtain public subsidies. As the following case study will show, the planning and the implementation of *mybuxi* was linked with regulatory constraints and challenges. Embedded in a path-dependent regulatory context, the actors of the *mybuxi* project had to find creative, case specific ways to enable the DRT service and allow it to operate within the given setting.

In this paper, we ask the following research question: How do complex regulations of the PT regime influence the planning process of a SI in the transport sector? The paper is structured as follows. Section 2 discusses the position of SIs in the superordinate theory on socio-technical transitions first, and then reflects the role of regulations in SIs and how the planning process of a SI can be theoretically structured. Section 3 describes the case study of *mybuxi* by introducing the regulatory and spatial setting, the characteristics of the *mybuxi* service and the chosen methodological approach of social innovation biographies. Section 4 introduces the results on the planning process of the SI *mybuxi* as well as how regulatory questions are influencing it. Section 5 concludes this paper, including an outlook on future research.

2. Theoretical and conceptual perspective on SIs and regulations

Social innovations represent community-based creative ways to respond to local problems such as those that arise in the context of PT provision in rural contexts (Grimm et al. 2013; Kirwan et al. 2013; Moore, Westley, and Nicholls 2012; Neumeier 2017). The withdrawal of the state from the supply of welfare services in addition to state or market failures are often considered as ‘unintentional’ drivers of SIs as they open the possibility for new actor constellations and forms of collaboration (Terstrieep et al. 2015). SIs can only evolve based on collective action when involved actors agree on aligned interests. The existence of social networks and social capital is therefore key for a SI (Neumeier 2012).

2.1. Emergence and implementation of SIs

In this work a focus is laid on the evolutionary planning process of a SI and the intersection of its various stages with regulatory aspects. Neumeier (2012; 2017) focused on the planning stages of a SI. Santos et al. (2013) embed the development of SIs in a broader context and proposed a life cycle model. Murray, Caulier-Grice, and Mulgan (2010) developed a six stages model, covering the process from the identification of a problem to the imposition of systemic change. A commonality of these models is that they all consider the development of SIs as non-linear processes. Feedback loops lead to adaptation of preceding stages. Some stages can be skipped. Unlike the models by Santos et al. (2013) and Murray, Caulier-Grice, and Mulgan (2010), Neumeier’s (2012; 2017) model focuses mainly on the creation and planning of SIs in rural contexts. We therefore apply Neumeier’s (2012; 2017) model to the rurally embedded SI *mybuxi* to obtain a detailed breakdown of the complex planning process into single steps.

According to Neumeier, the development of SIs starts with the stage of ‘Problematization’ (Neumeier 2012; 2017). The necessity for societal change is a starting point to form an initial group of actors. The identification and the existence of the impetus for initiating

a SI is critical for the constitution of this group. Noack and Federwisch (2019) show that the impetus for rural SIs often originates from external, urban factors and knowledge exchanges. Urban actors bring the necessary knowledge to rural areas to initiate a SI process.

In a second stage, the ‘Expression of interest’ (Neumeier 2012; 2017), the actors’ network changes. New actors join the core group due to their positive view on the planned initiative. In this stage, the SI is reliant on actors that are able to build a community through a diffusion of knowledge on the targeted social issue (Nordberg, Mariussen, and Virkkala 2020).

The third stage after Neumeier (2012; 2017) is the ‘Delineation and coordination’ stage. Actors must build common ground on the new form of collaborative action. The innovation here can take new paths as those envisioned in the beginning. Those actors interested in the innovation begin to negotiate the new form of action.

The subsequent stage of the implementation and testing of the SI (Neumeier 2012; 2017) is the tipping point, where success or failure – and with it the continuation or stopping of the innovation – is determined. Neumeier’s model ends at this point. SIs that prove to be successful are sustained and multiplied to have a societal impact for more society members. In the end, a successful SI is subject to a mainstreaming process (Murray, Caulier-Grice, and Mulgan 2010; Santos et al. 2013).

2.2. SIs as niches in the socio-technical transition theory

In the transport sector, SI initiatives are manifold and tackle challenges such as the ways in which transport can be inclusive for all members of society and how society can reduce negative ecological impacts of individual transport (e.g. CO₂ emission, noise level).

SIs may have an impact on the transformation of socio-technical systems (Wittmayer et al. 2020). To better understand the mechanisms how SIs and other niche innovations can challenge dominant systems (regimes), the multi-level perspective on socio-technical transitions was introduced (Geels 2004). Embedded in the socio-technical landscape of an exogenous environment (such as shared cultural beliefs and values), different dominant socio-technical regimes exist. Regimes are stable systems consisting of shared rules, cognitive routines, institutional arrangements, and regulations. Examples for dominant regimes are the automobility or the PT regimes, which evolved over long periods of time (Geels 2004; 2005; 2011). To challenge a regime innovations and novelties emerge in the form of niches trying to become part of or replace the regime. These niches often have a radical and disruptive character as they are less dominated by lock-in or path dependency mechanisms than existing regimes (Klitkou et al. 2015). With their disruptive character, niches, as in our SI case, can affect the regulatory environment.

2.3. SIs and the regulatory context

Transition processes are influenced by governance processes on different levels and with different interests: involved are institutions from the regional to the national and international level (Acuto 2015; Geels 2012). Knowing the possible tensions between radical change of niches and established actors and governance settings, Wittmayer et al. (2016) calls for creative ways to open spaces for experimentation such as SIs. By opening spaces,

roles and attitudes of actors and institutions may be reflected and challenged, supporting the evolution and establishment of new ways of governing a sustainable future.

Hodson, Geels, and McMeekin (2017) provides an analytical framework on the possible ways how niches and existing regimes interrelate and reconfigure urban transition processes. Multiple parallel innovations and existing regimes can either compete against each other, co-exist together or even complement each other regarding the impact on the transition process (see also Schwanen 2015). Experiments can either provoke struggles between new and old socio-technical arrangements (competing); the systems can exist in parallel (co-existing); or they can merge and lead to a new socio-technical arrangement (complement). These experiments can lead to new forms of governance. Those new forms of governance can be in a competing situation with existing governance to the point of contradiction. The forms of governance can be autonomous or loosely coupled (co-existing) or they can complement each other in a reinforcing new governance form. Actors' and institutions' differential understanding of sustainability can lead to competing goals; non-conflictual understandings can occur in parallel (co-existing) or the understandings can be complementary and reinforce each other in favor on sustainability goals (Hodson, Geels, and McMeekin 2017).

Spaces for experimentation always call for space specific regulatory frameworks (Hodson and Marvin 2012; Wimbadi, Djalante, and Mori 2021). Innovations – not only technological but also social – are often influenced by the regulatory environment. Specific regulations in terms of authoritative rules, norms, standards, laws, etc. are particularly important for developing and implementing innovative ideas in heavily regulated sectors such as transport. Regulations here are defined as 'a set of authoritative rules, some often accompanied by some administrative agency, for monitoring and enforcing compliance' (Jordana and Levi-Faur 2004, 3). Regulations in transport systems address economic, safety and environmental concerns. Economic regulations concern the allocation of capital and pricing. Safety regulations focus on the operation of transport systems. Environmental regulations are related to externalities and the impact on the environment (Rodrigue 2020). Regulatory reforms are a possibility for improving the quality of PT (Ongkittikul and Geerlings 2006).

The implementation of SIs can have unwanted, unforeseen outcomes (Grimm et al. 2013). Terstriep et al. (2015, 2) point out that '[s]ocial innovations tend to challenge institutions and thus, require an understanding of institutional order and multilevel governance that direct institutions, which facilitate or impede their implementation'. SIs always have to adopt and deal with regulations in the sector where they try to evolve (Terstriep, Rehfeld, and Kleverbeck 2020). An incompatible regulatory culture can constrain SIs (Hubert 2011) and regulatory uncertainties are often considered as possible barriers for entrepreneurs to innovate (Grimm et al. 2013). In addition to regulatory uncertainties Jalonen (2011) also points to institutional uncertainties as another possible barrier to innovation. Uncertainties may result from a lack of understanding on the way regulations may affect a SI. Based on the example of community energy storage in Germany, Gährs and Knoefel (2020) show that an unclear legal definition of the regulatory framework can hold stakeholders back from implementing innovations. To deal with the regulatory uncertainties and constraints, external and non-local knowledge has to be involved in a SI (Nordberg, Mariussen, and Virkkala 2020).

Lo Schiavo et al. (2013) show that regulations can be subject of constant modifications in favor of new innovations that are being implemented. The regulator often only

supports demonstration projects due to uncertainties of the technological and organizational development of innovations. The lack of regulations for new emerging services shows that a missing or unclear regulatory framework can also have an enabling nature, leading to the possibility for an entrepreneur to develop own rules, until the moment when regulatory mechanisms begin to intervene (Lowe 1995).

Focusing on the possibility of autonomous vehicles (AVs) as PT system in rural areas, Imhof, Frölicher, and von Arx (2020) call for an adaptation of the Swiss regulatory framework toward a flexible PT system, where PT is currently highly subsidized. The case of Singapore and their sandboxing approach examined by Tan and Taeihagh (2021) shows that governing and regulating AV trials with an adaptive strategy that is preemptive and responsive at the same time, is a promising way to put the potential of AVs in value and to minimize their risks for society and the traffic system at the same time. Despite uncertainties of implementing AVs, the Singaporean government was able to ensure stability and adaptability for interested actors to evaluate and implement AVs in the transport system.

The Swiss PT regulatory framework stands in contrast to regulatory frameworks of countries, where PT services were deregulated in favor of DRT services in the past. In Great Britain, local authorities of rural and dispersed areas filled existing gaps in the PT network with innovative flexible transport modes by deregulating the PT system, which then led to independent projects that sometimes overlapped each other or to gaps in the provision of PT services, and ultimately to confusion for customers (Brake and Nelson 2007).

3. Case study and method

To better understand how a DRT service can successfully be implemented despite regulatory constraints and uncertainties, we analyzed a new DRT service in Switzerland. The service *mybuxi* was implemented in the two rural communities of Herzogenbuchsee and Niederözn in the northern part of the canton of Bern (see Figure 1). New mobility projects that provide flexible transport services with the help of smartphone applications and have the characteristics of SIs are scarce in Switzerland. Initially, fully flexible DRT services were mainly evaluated by PT operators, providing their service for a maximum extent of 1.5 years in mainly suburban areas of Switzerland. So far, there is not enough evidence on how SIs in the Swiss transport sector deal with regulatory constraints and in which way new spaces of experimentation challenge current regimes.

mybuxi's regulatory history is unique in comparison with other DRT services. DRT services are typically less flexible and easier to implement within set transport regulations. Unlike most Swiss DRT services up to its inception, *mybuxi* was initiated by a group of private actors and not by well-established transport companies. The latter typically have extensive knowledge and long-standing experience with passenger demand and operating transport services.

3.1. Regulatory setting

Establishing *mybuxi* took place in a unique regulatory context and two specific aspects are important to consider: the PT system in Switzerland and the local taxi industry

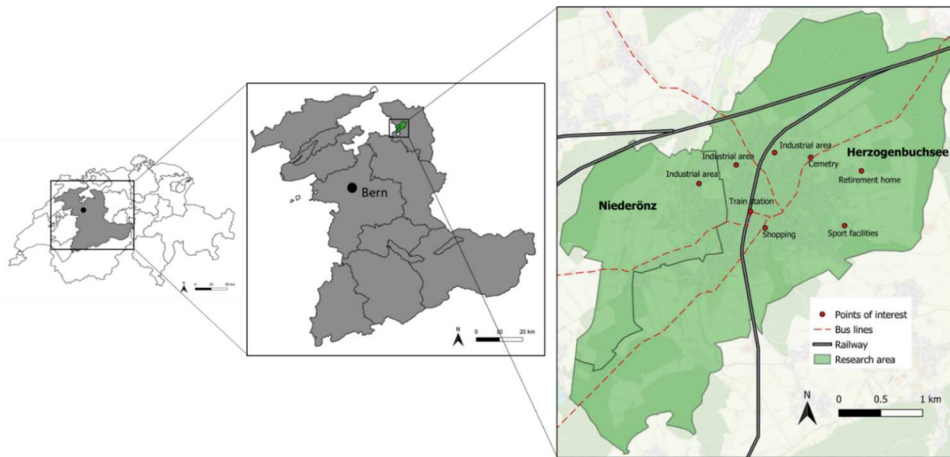


Figure 1. Geographical situation of mybuxi in Switzerland (left) and the canton of Bern (middle); local situation (right).

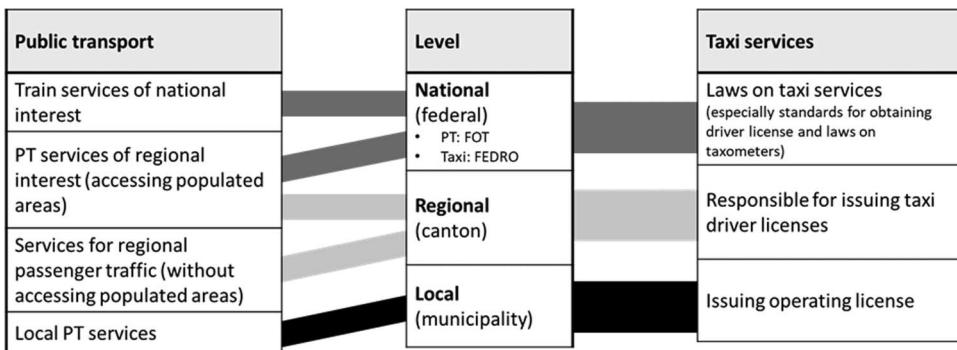


Figure 2. Responsibilities for PT and taxi services in Switzerland (simplified).

(see also [Figure 2](#) for a simplified overview of responsibilities). In Switzerland, the service design of fully flexible DRT services is situated in between PT services, which are characterized by line-bound services, and the taxi industry, which provides non-shared individual trips for passengers. On a national level, two different federal offices regulate these two services: the Federal Office of Transport (FOT) regulates PT services, and the Federal Roads Office (FEDRO) is responsible for the laws on taxi services. Besides regulations on the national level, each of the 26 Swiss cantons has additional local regulations on PT services and their subsidies. Also on the municipality level, local PT and taxi services can get licensed, be implemented, and get subsidized.

Switzerland has one of the highest rates of PT use in Western Europe (Petersen 2016) and PT services are offered in remote rural areas depending on the population density (above 100 people per locality) or when there is a touristic interest. On the national level, the Swiss PT system is defined in the *Federal Law from 20th March 2009 on the*

Passenger Transport (Passenger Transport Law, PBG) [Bundesgesetz vom 20. März 2009 über die Personenbeförderung (Personenbeförderungsgesetz, PBG)] (2009). The services are divided into four subcategories:

- (1) Services of national interest are train services between medium and large urban centers in Switzerland and in surrounding areas of neighboring countries. The concession to operate long distance traffic services is issued by the Swiss government. Cost-efficient services do not receive financial support from the state.
- (2) Services for regional passenger traffic accessing populated areas are regulated by the Swiss government as well as the respective canton. Populated areas with a population above 100 people need to be accessed by PT. Uncovered costs of the service provision are covered by subsidies provided by the federal government and the respective canton. Eligible are only services with trains, buses, trams, boats, and cable cars with a capacity above eight seats per vehicle. The FOT is responsible for issuing concessions for this kind of service.
- (3) Services for regional passenger traffic without accessing populated areas are mostly provided due to touristic reasons. Services, with which no populated area with more than one hundred inhabitants is accessed fall into this category. These services are not eligible for subsidies by the Swiss government. Canton and/or municipalities can subsidize these services.
- (4) Local services are services that provide access to areas inside a municipality and not outside the municipal boundaries. Those services are not eligible for financial support by the Swiss government. The canton and/or municipality can cover uncovered costs.

All service providers offering services in these four categories are obligated to provide their service in the agreement, signed by main Swiss PT actors, of the *Nationaler Direkter Verkehr* (translated *national direct transport*). The agreement stipulates each passenger trip in Switzerland must be under one single contract: one tariff will be defined despite several involved enterprises. PT enterprises are required to cooperate by law. The coordinating alliance ‘Alliance Swisspass’ defines and sets standards for the cooperation (Alliance SwissPass 2021) and tariffs (Alliance SwissPass 2020).

Current law acknowledges only line-bound traffic with defined stops. A linked requirement is the publication of a timetable at each stop. The *Federal Act on the Elimination of Discrimination against People with Disabilities* (Disability Discrimination Act) obligates all PT service providers to guarantee accessibility to their service, vehicles, and infrastructure for disabled people.

The *Law on the Public Transport of the canton of Bern* (2008) further foresees that the canton can support the planning of PT services by third parties within the scope of PT and traffic coordination (Art. 11, Sec. 1). In the law, the term ‘third party’ remains unclear.

Exceptional authorizations issued by the Swiss government are possible under the PBG, Article 5: ‘The Federal Council can allow exceptions from the passenger transport shelf (translated from German). Here, the law does not provide further details on when and how such exceptions can be issued.

The FOT allows research and innovation in its area of responsibility. From their perspective, innovation ‘means the development of new products, methods, processes and services in industry and society through research’ (FOT 2017, 1). Fundable are innovations in the PT system targeting the energy-efficiency of the system to reach the goals of the Swiss energy strategy (SFOE 2017). This said, SIs like *mybuxi* are not eligible for subsidies as the highly flexible DRT service is not acknowledged as PT service, yet.

Outside the innovation fund of the FOT, a consortium made up of six Swiss federal offices (energy, health, roads, environment, transport and spatial development) organize the ‘Office of Coordination for Sustainable Mobility’ (in German: Koordinationsstelle für Nachhaltige Mobilität, KOMO) and grant bi-annual funding support for innovative projects with market potential which are not necessarily related to PT (EnergieSchweiz, n.d.).

The Swiss taxi industry in Switzerland is also facing regulations. On the national level, the FEDRO is responsible for superordinate regulations on taxi driver licenses. Unlike PT services, taxi services are mainly determined by cantonal and municipal regulations. According to the *Decree on Holding and Operating of Taxis (Taxi Decree 2012)* of the canton of Bern, operating a taxi service is linked to a permission issued by a municipality. Taxi drivers need to be in possession of a driver’s license that allows for-profit transport of passengers. A municipality can determine tariffs for taxis and if necessary, could subsidize the service. A taxi trip is determined as a transport service for a single guest or a small group of guests that book a ride from A to B.

3.2. Spatial setting

The municipalities of Herzogenbuchsee and Niederönz are situated in the north of the canton of Bern, Niederönz bordering the canton of Solothurn. Both are classified as rural center-villages (FSO 2017). Herzogenbuchsee had a population of 7,255 inhabitants and Niederönz of 1,681 inhabitants in the year 2019 (FSO 2021).

The central train station, situated in Herzogenbuchsee, is the backbone of local transport. Direct trips to the capital of Bern take 34 min and to Zurich 53 min. Departing from the train station, several bus lines serve surrounding villages. The bus lines connect stops along the main traffic axis within Herzogenbuchsee and Niederönz but only operate each half or full hour. The bus lines do not access points of interest such as a retirement home in the west or public sport facilities (see Figure 1).

mybuxi started to provide services to both municipalities in 2019. After the first year, it had a high acceptance rate. The service is based on a smartphone application allowing the request of a ridesharing service at any time during operating hours. *mybuxi* ensures a service between the first and the last train from and to Herzogenbuchsee. On Fridays and Saturdays, the service is ensured until 01:40 am and on weekdays until 00:40 am at night. Trips are possible from and to all points reachable by car inside the municipalities’ boundaries. A single trip cost three Swiss Franc (CHF) during the first year of operation and four CHF thereafter. Two electric mini-van (Nissan E-Valia) are used for the transport of passengers. Volunteer drivers earn 10 CHF per hour and take over one shift every second week. The service is locally managed by a specially founded association called EBuxi. The start-up *mybuxi* supports the EBuxi association in daily business decisions and provides the technological infrastructure.

3.3. Methodological approach

SIs like *mybuxi* are embedded in a broader context and local conditions play a crucial role (Deserti and Rizzo 2020). The process of developing and implementing a SI is considered non-linear, calling for a method that can picture the entire innovation process (Kleverbeck and Terstriep 2017). To better understand the regulatory issues that arise during the innovation process and the planning steps from the ideation to operations, we utilized the method of social innovation biographies (SBI) (Butzin and Widmaier 2016; Kleverbeck and Terstriep 2017). Additionally, the method of SBIs provides a guideline for researchers to deal with the high complexity of SIs and the involved actors. The SBI methodological approach is a combination of ‘analytical’ (Figure 3: black boxes) and ‘process’ (Figure 3: gray boxes) steps. The methodological approach involves the following steps (for an overview, see Figure 3).

3.3.1. Desk research

To better understand the conditions under which the *mybuxi* innovation developed and its planning process, we first conducted an in-depth desk research to identify crucial interview questions.

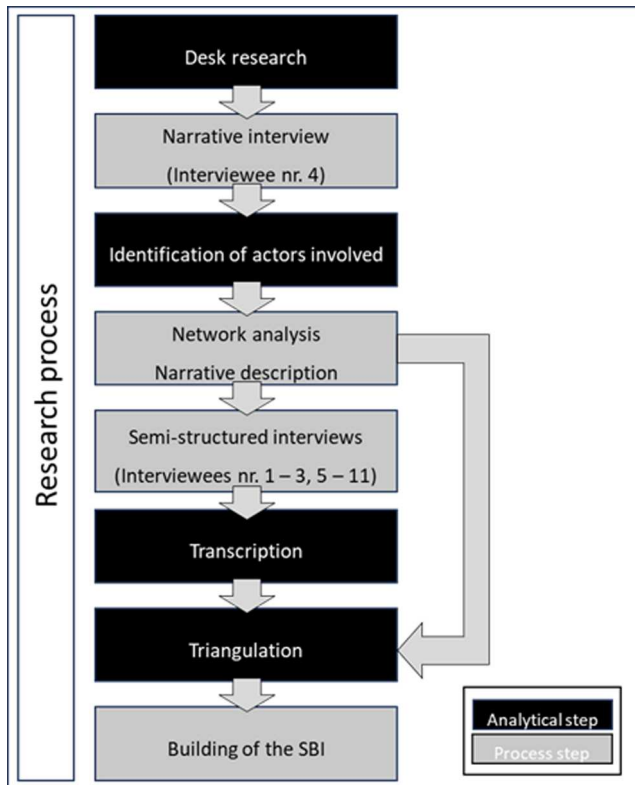


Figure 3. Diagram of the research process.

3.3.2. Narrative interviews

One narrative interview was conducted in March 2020 with the founder of *mybuxi* (see Table 1). The interview helped to identify key factors in the history of the innovation process, the background of the idea, the involved actors and the milestones in the innovation process. Furthermore, initial ideas about regulatory constraints and uncertainties could be identified, which instructed further interviews (e.g. interviews with authorities at different government levels).

3.3.3. Network analysis and narrative description

Actors identified in the desk research and narrative interviews and their connections and role were examined in an egocentric network analysis and documented in a narrative description. Key actors could be identified.

3.3.4. Semi-structured interviews

A total of ten semi-structured interviews with identified key actors involved in the innovation process were conducted. To cover all types of actors, we interviewed members of the EBuxi association, the project manager of *mybuxi*, local, cantonal, and state authorities, a representative of the software provider, a planner of a local transport enterprise as well as a representative of one of the main sponsors of *mybuxi*. The interviews took between ½ and 1½ h and were conducted by telephone due to COVID-19 restrictions. All interviews were conducted between April and May 2020 and were transcribed with the F5 software.

3.3.5. Triangulation

Based on the egocentric network analysis and the semi-structured interviews, we applied the framework of Neumeier (2012; 2017) on the planning process of our SI. This framework helped to identify necessary planning steps in each stage of the SI. On the basis of these stages, we can illustrate the process of *mybuxi* up to its implementation. In this step, we enriched the data with documents of the federal and cantonal law.

Table 1. Interview description.

Interviewee Nr.	Function	Business/office	Level	Duration (in min)
1	Member of steering committee	EBuxi	Local	83
2	Member of steering committee	EBuxi		82
3	Mayor	Municipality of Herzogenbuchsee		60
4*	Founder	mybuxi	Regional	87
5	Offer planner	Regional bus and train operator		44
6a	Scientific researcher Responsible for offers and infrastructure	Office of public transport; Canton of Bern		76
6b	Responsible for traffic coordination			
7	Project manager	mybuxi		33
8	Deputy leader	Volunteer development fund	National	71
9	Co-department chef with scientific researcher	Federal office of transport		68
10	Project leader; president working group mobility 4.0	Federal roads office		63
11	Account manager	Software provider	International	72

*Narrative interview.

3.3.6. Building the SBI

The last step consisted of writing and analyzing the entire innovation process and creating a complete SBI. The narrative was structured in different sections such as the planning steps that were necessary in the creation of *mybuxi*, questions related to the regulatory framework, descriptions of details according to the three innovation stages after Neumeier (2012; 2017).

4. Results: the process of planning the SI of mybuxi

The following sections highlight the involved actors, the important planning steps and the regulatory questions relating to each planning stage. All results are summarized in Table 2.

Table 2. Summary of planning the SI of mybuxi.

	Problematization	Expression of interest	Delineation and coordination
Actors and planning steps	Local key actors plan DRT service to improve local PT system Urban meetup actors develop research project for rural DRT services Foundation of mybuxi start-up	Merging pathways of local actors and mybuxi start-up thanks to high ranking federal official Local municipalities ensure public subsidies Founding EBuxi association Mybuxi start-up ensures strategical and where necessary operational support Canton of Bern issues a permission to operate	Operational tasks of the local actors (and mybuxi start-up in certain steps): - Sponsoring - Finding volunteer drivers - Introduction to the DRT software An external lawyer helps to deal with regulatory challenges
Regulatory questions	Identification of two possible regulatory frameworks: PT and taxi regime Mybuxi start-up identifies the PT regulations as favorable. Taxi regime seems not suitable.	Municipalities withdraw from the planning process, ensuring political support Permission by the canton of Bern is related to a high interest in the project's findings; but the mybuxi service is not acknowledged as PT service	Ambivalent, contradicting positions inside FOT Unsuccessful concession process Success in obtaining exceptional permission Ambitions of mybuxi start-up to be acknowledged as PT service Bilateral meetings with FOT and mybuxi start-up.
Conclusions	Developing DRT service to improve local PT system (Pol and Ville 2009) Idea of rural DRT service may contribute to positive regional development (Tschumi et al. 2020) Identification of a new governance arrangement regarding PT (-similar) services	Merging pathways of local and start-up actors show that urban impulses are crucial for Sis in rural areas (Noack and Federwisch 2019) Crucial role of the local public sector for SI (Butzin, Rabadjieva, and Emmert 2017) Governance arrangement contradicts on the local level of governing a PT service; on the cantonal level, a rather co-existent situation (Hodson, Geels, and McMeekin 2017)	Incompatible regulatory framework hinders mybuxi service to ensure long-lasting service (Grimm et al. 2013; Hubert 2011) External knowledge to deal with regulatory uncertainties (Nordberg, Mariussen, and Virkkala 2020) Missing sandboxing approach considered as hindrance (Lo Schiavo et al. 2013; Tan and Taeihagh 2021) FOT: conflicting understandings on governing mybuxi service (Hodson, Geels, and McMeekin 2017)

4.1. Problematization

Planning the *mybuxi* service started in early 2018 with two parallel ideation processes that involved local actors in Herzogenbuchsee, and actors engaged in a meetup in the Swiss capital city of Bern. All ideas developed in this stage were based on the ambition to challenge the rather high car dependency and to compensate the lack of attractive PT services in rural areas (for an overview of the problematization phase, see [Figure 4](#)).

At the local level, a handful of key members of the community (authorities and civil society) were engaged in the ideation process. Here, one of the founders of EBuxi made the following statement during his interview:

For the train station, there was a development project, where I was member of a task force to coordinate the project. With some of the members, which were representatives of the municipality, we often met informally and discussed random political problems.

(Interviewee 1, personal communication, translated from German, March 2020)

The cited ‘informal discussions’ between some of the members from the municipality were at the root of identifying the need for a local transport service accessing all populated areas in the local community, highlighting the potential role of unstructured discussions between actors as idea accelerators. While the local PT service only provided stops along selected axes and being perceived as limiting, the actors had the idea to provide a flexible and sustainable transport service through a DRT solution. Additionally, they also identified the lack of taxi services in their municipality. Based on their knowledge of technological solutions, the local actors began to look for suitable partners to implement a DRT service.

While the idea for a local DRT was established at the local level, other efforts with similar ambitions took place nearby. A Bern based innovation meetup called ‘innolab

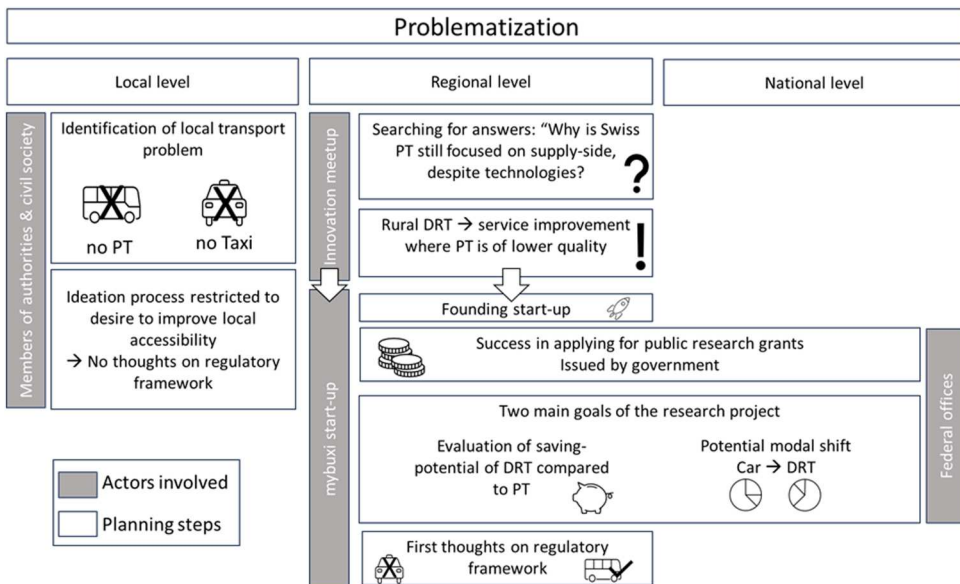


Figure 4. Summary of the problematization phase.

smart mobility' attracted actors of PT enterprises, IT development, start-ups, and consulting enterprises. The participants of the meetup discussed why Swiss PT still mainly focuses on the supply-side when technologies for DRT transport have been available and were already in use in other countries. The meet-up actors noticed that DRT traffic could improve transport services in rural areas, emphasizing that DRT would trigger a service improvement where PT does not provide access to all inhabitants in a satisfying quality. Upon several meetings, one member of the meetup founded the start-up *mybuxi* in 2018. The start-up was successful in applying for public research grants from KOMO, a national research fund on sustainable mobility administered by six federal offices. First contacts to these six federal offices took place to discuss the proposed research project, helping to define the main goals of the project. Two main goals were set to evaluate how local DRT services challenge current socio-technical regimes:

- Evaluation of saving potentials if cost-inefficient PT services are replaced by DRT services
- Estimation of the potential modal shift from private transport modes to a DRT service

No further actors were engaged in the problematization stage. The ideation processes of the local actors and the newly founded start-up *mybuxi* have not merged so far.

At this early stage, it remained vague how SI could be governed and whether the idea of *mybuxi* would fit in existing (local and national) regulatory frameworks or not. Two possible regimes and their corresponding regulatory framework were identified to be theoretically suitable for a local DRT service: the local PT and the taxi regime. As the ideation process of the local actors was so far restricted to a desire of improving local accessibility, there were no debates about the regulatory framework.

For the *mybuxi* start-up, however, the regulatory questions were important. In their view, the existing taxi law was unsuitable for a DRT service in rural areas. The reason lies in the simplistic understanding of a taxi ride as a trip from A to B. This would not have been in the sense of DRT service that tries to pool as many trip demands with similar trip targets as possible. The higher the pooling rate, the better the ecological impact of the service and as a result revenues per vehicle kilometer increase. Based on this view, the taxi regime was not further considered as suitable regime and regulatory framework. Based on the assumption that *mybuxi* would be more suitable as PT service than a taxi service, the following questions concentrated on the regulations of the PT regime. But at this stage of the SI, no clear decisions on how to regulate a local DRT service based on the regulatory framework of the PT regime were made.

In this stage of the SI, the initial set up of the SI was driven by the ambitions of the local actors to solve the local PT problems. With the goal to provide a local DRT service, the local actors tackled the challenge to improve the local PT quality in favor of those people without direct access to an own car. This supports Pol and Ville's (2009) view that SIs are primarily developed with the goal to have a positive impact on local quality of life. Tschumi et al. (2020) argue that SIs are increasingly seen as a possible driver of development in rural areas and this was also confirmed through our interviews as the founder of *mybuxi* highlighted that the DRT service should also provide a reliable, safe service with a positive image for these rural areas.

All involved actors aimed for a transition toward a more sustainable local transport service in a rural setting. The discussions during this first stage were dominated by the idea of a DRT service that would co-exist with the current PT regime as the involved actors did not want to limit already scarce PT services.

While new PT services in Switzerland are developed based on data-based indicators like population density and size and are governed on national, cantonal, or local levels, a completely new arrangement of actors started to emerge in the case of mybuxi. Especially the founding of a start-up for the purpose of providing a DRT service is considered a novelty in Switzerland. From the beginning, the start-up mybuxi represented a competing governance approach to traditional PT services as it started to challenge the monopoly of mainstream transport service providers in rural areas.

4.2. Expression of interest

In the second stage of the SI (Expression of Interest Stage), the ambitions of the local actors and those of the actors involved with the start-up mybuxi merged thanks to a spontaneous meeting with a high-ranking official of the FOT. To secure a successful operational business, the so far strongly involved actors of the public administration of the municipality officially left the project. The ambitions of the remaining actors to challenge and reconfigure the rural sustainable transport system became clearer in this stage (for an overview of the expression of interest phase, see Figure 5).

First, the project gained strong momentum after a contact between the local actors and a high-ranking federal official of the Federal Office of Spatial Development at a national

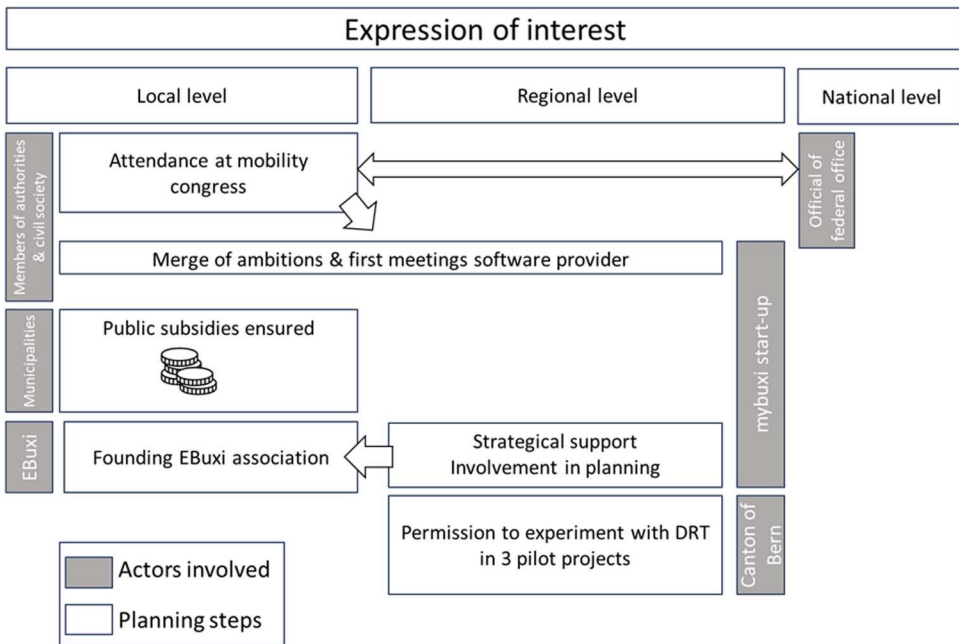


Figure 5. Summary of the expression of interest phase.

mobility congress in the middle of 2018. The federal official knew that the *mybuxi* start-up was searching for suitable pilot regions within the scope of the KOMO research project. Up to now the so-far separate objectives and ambitions of the local actors and the *mybuxi* start-up merged. The founder of *mybuxi* explains this critical point in the project as follows:

For the proposal of the KOMO project we needed a letter of intent of an interested region. One of the managers of the Federal Office for Spatial Development, whom I knew from another job, asked if *mybuxi* knew from the need in Herzogenbuchsee to plan an innovative local bus solution. After that, *mybuxi* contacted the local actors. [...] Together with a software provider that contacted us before, we sat with the local actors together and it was rather rapidly decided, that we would give a DRT system a try. After that it went rather fast.

(Interviewee 2, personal communication, translated from German, March 2020)

Both involved municipalities ensured public subsidies for the experimentation phase of the project. To attract new partners and to plan the operational business, a local association called EBuxi was founded in November 2018. The *mybuxi* start-up ensured strategic support and was involved in certain operational planning steps, including the provision of suitable software for the DRT service.

In this second stage, regulatory questions remained in the background and did not dominate because no decisions were made so far about which exact regulations the service had to follow, leaving all actors in an unclear situation. The involved representatives of ensured political support and a regulatory framework as far as their political authority reached. Additionally, the *mybuxi* start-up successfully got a permission by the Office for PT of the canton of Bern to experiment with DRT services in form of three pilot projects. This is seen by the interview partners as a generous interpretation of the cantonal law, as the canton's interest in the findings regarding the financial, traffic-related, and social impact of the project is high. The granted money from the canton of Bern was bound to the planning of the project and not to the operational business. Current developments of the technological environment are further key factors why the project gets supported by the canton, as the representative of the canton of Berne mentioned in the interview:

There already existed DRT services in the canton of Berne, but these projects in the past were not app-based [rather dial-a-ride services] and all were discontinued to this day.

(Interviewee 6a, personal communication, translated from German, May 2020)

The actors of the canton were especially interested in gaining more knowledge about how to deal with these new possibilities and how they contribute to a more sustainable transport system.

The overarching goals of the SI in this stage rested on the ambitions to provide an attractive, sustainable local transport service.

The merging pathways of the local actors and the newly founded *mybuxi* start-up go along with the findings of Noack and Federwisch (2019) that SIs in rural areas often rely on urban impulses. In our case, the involvement of the *mybuxi* start-up was especially crucial for designing the final services. The knowledge and network of the *mybuxi* founder complemented the existing local knowledge and network.

With the withdrawal of the municipality, there have been adaptations of the governance arrangement of the project itself. Even though the municipality was no longer

involved, the local public sector retained an important supportive role (Butzin, Rabadjieva, and Emmert 2017). Several interview partners highlighted the enabling role of the municipality for the entire *mybuxi* project. Yet, compared to governing a classical PT regime in a municipality, the governance arrangement at this stage remained fragmented in the sense that the SI challenged established PT laws and regulations. The governance approach of the cantonal authorities suggests a co-existence of the SI with other PT services as the issued permit for the pilot projects of *mybuxi* was based on the existing laws.

4.3. Delineation and coordination

In the final planning stage, determining the regulatory framework under which the services *mybuxi* would have been able to operate was the dominant and most crucial topic. The inclusion of external knowledge in form of a specialized lawyer was critical for the successful implementation of the SI (for an overview of the problematization phase, see Figure 6).

There were several operational tasks to solve in this third step of planning the SI. At the local level, the previously newly founded EBuxi association had to find sponsors to finance the operation. This is related to the fact that so far, there was no clear regulatory framework identified in the two preceding stages of planning that would have guaranteed public subsidies. With the help of an innovation fund of the local energy provider, a vehicle was financed. Additionally, the association had to engage several volunteer drivers for the daily business. In addition, the *mybuxi* start-up collaborated with a Spanish software enterprise that provides the suitable software for DRT services in rural areas. All drivers and the EBuxi steering committee got introduced to the software. The operational planning process so far has been ready for the final implementation of the *mybuxi* service.

Answering crucial questions regarding the regulatory framework was quite challenging in this stage. The actors involved in the *mybuxi* start-up set themselves rather ambitious goals to become part of the mainstream PT system. Being part of the PT system

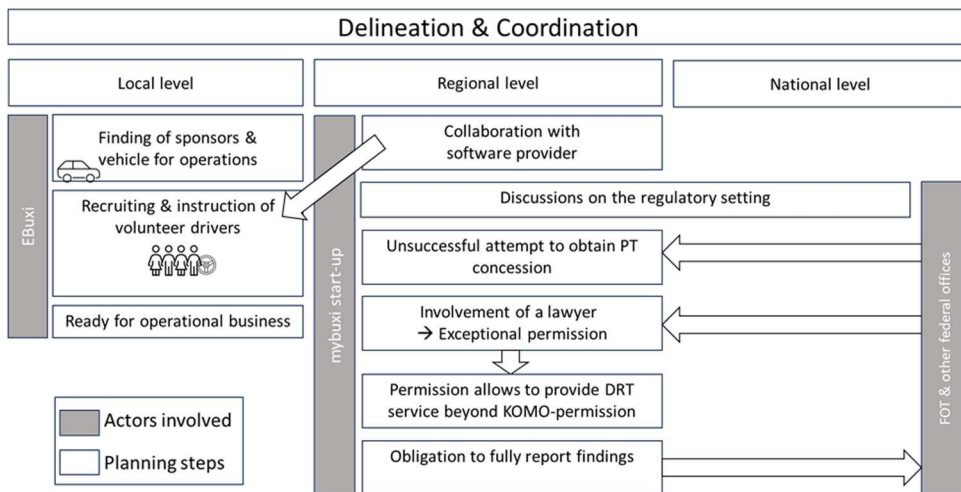


Figure 6. Summary of the delineation and coordination phase.

would have meant that *mybuxi* could continue its services over the duration of the granted pilot project of *mybuxi* (see problematization stage) and would have allowed the service for subsidies by the FOT and the canton of Bern. In this and the previous stages, the *mybuxi* start-up was responsible for dealing with all questions related to the regulatory context; the local actors of the EBuxi association did not have to deal with this type of questions.

In a first attempt, the *mybuxi* start-up tried to solve the open regulatory questions with the Federal Office of Transport (FOT). Ambivalent, contradicting positions inside the FOT became obvious. The efforts of *mybuxi* to improve the rural mobility system was positively perceived by persons in charge of the political and strategical development of the Swiss mobility system. From their perspective, *mybuxi* was the opportunity to evaluate new DRT services in rural areas in Switzerland. Another point of view was then indicated by persons of the FOT responsible for the concession of PT services. They proposed proceeding in similar ways as other PT services with a concession form. Filling out this form highlighted the differences between *mybuxi*'s DRT service as a niche offering and the classical PT services. Compared to traditional PT services, a hindrance for on-demand services is the definition of prices related to trip distances. This in turn is based on a sector-wide agreement to offer one PT ticket per trip, despite different PT providers. As pooled rides get longer, this tariff definition is not suitable for *mybuxi*. Further, operating with virtual stations is a challenge for barrier-free access to the vehicles. Fulfilling all regulations of the Disability Discrimination Act would have had huge implications for the interior design of the vehicles and the economic efficiency of the service. Based on these and several other regulatory constraints, the concession was not assigned to *mybuxi*.

At this point, *mybuxi* involved an external specialized lawyer on PT regulations. With his help, the possibilities to position *mybuxi* inside the current regulatory framework were evaluated. A possibility was elaborated that the provision of the service would take place with an exceptional authorization under the PBG, the law on Swiss PT. In agreement with a lawyer of the FOT, an exceptional, rarely used authorization was issued. The *mybuxi* service was allowed to provide its services beyond the permission related to the KOMO project. This authorization is rarely used as the *mybuxi* start-up founder mentioned in the interview. It allowed to experiment with the possibilities of a rural DRT service.

In return, we [mybuxi] are obliged to deliver the FOT as well as the FEDRO data on the operational business and we have to provide them on a regular base reportings which are then discussed together.

(Interviewee 2, personal communication, translated from German, March 2020)

One of the main reasons why *mybuxi* obtained the authorization, was the high interest of the federal and cantonal government to gain more knowledge about on-demand solutions in areas where current PT is cost-inefficient. At the time of our research, *mybuxi* remains ineligible for federal subsidies despite the exceptional permission. One of the success factors relates to the degree of trust of the actors in each other (particularly local and federal actors) given that a start-up obtains the opportunity to experiment with a novel approach despite regulatory uncertainties. On the other hand, the actors involved in the start-up *mybuxi* trusted public officials that all provided information would have been managed in a confidential manner.

The third planning stage of delineation and coordination seemed to have been crucial in terms of the SI fitting into the traditional regulatory framework. The exceptional operating permission that was issued for a longer period than expected, ensured the actors with a certain degree of planning security. But at the same time, the goal to be acknowledged as PT service was missed and this has – in the views of the interviewees – economic consequences for the service. As a result, the costs of the *mybuxi* service that remain uncovered will need to be financed by private sponsors in the future. Interviewees acknowledged that knowing that providing the *mybuxi* service is linked to remaining regulatory uncertainties makes the search for sponsors rather difficult. This supports the findings of Hubert (2011) and Grimm et al. (2013) who identified the negative influence of an incompatible regulatory environment on SIs.

Our data for this stage also shows that there is a certain need of external knowledge in the planning of a SI when dealing with regulatory uncertainties. The involvement of an external lawyer was crucial for obtaining an exceptional permission outside the PT regulations. Nordberg, Mariussen, and Virkkala (2020) show that external knowledge is necessary to deal with regulatory uncertainties and constraints. Our case illustrates this point nicely.

Regarding the future of SIs and their ability to transform service provision in rural areas, the founder of *mybuxi* noted that Switzerland does not provide a good environment for experimenting SIs. This may impact how new forms of mobility are regulated in the future. Currently only experimental cases like *mybuxi*, that were able to persuade the regulatory agencies in their favor, can operate outside an existing regulatory framework (Lo Schiavo et al. 2013). Regulations are then based on the expertise generated in the pilot projects. From the perspective of the *mybuxi* start-up the Swiss approach contrasts, for example, with Asian countries where recent technologies are tested based on a loose regulatory framework. There, regulations are an answer to the social and systemic development of a technology (Tan and Taihagh 2021). Nevertheless, the missing experimental approach is counteracted by the openness of the responsible Swiss federal office to discuss regulatory constraints and that agreements can be arranged bilaterally without unreachable hurdles for new enterprises like *mybuxi*.

The conflicting understandings inside the FOT shows conflicting understandings on the governance of *mybuxi* (Hodson, Geels, and McMeekin 2017). By trying to prevent the PT system from changing, lawyers inside the FOT try to protect the regulatory framework from radical changes. The rigid regulatory framework of the PT regime is – from the perspective of the FOT – a way to protect the PT system and to secure quality in services (Rodrigue 2020). We also see that the responsible persons for strategic and political decisions inside the FOT are open to finding suitable ways to create room for experiments. This supports the view of Ongkittikul and Geerlings' (2006) that regulatory reforms are a suitable way to improve the PT quality.

5. Conclusion

The aim of this paper is to show how the SI *mybuxi* evolved in a regulatory setting that constrains DRT services. To answer the research question, we used the methodological approach of SBIs (Butzin and Widmaier 2016; Kleverbeck and Terstriep 2017) and conducted 11 interviews in total with key actors of the SI. The SBI approach helped to

thoroughly examine the complex planning process *mybuxi* faced due to regulatory challenges.

Combining the SBI approach with the planning stages of a SI introduced by Neumeier (2012; 2017), we are able to better understand how innovative planning processes may help SIs to evolve and to become successful despite regulatory constraints. The local actors' goal to improve the local transport system in the involved municipalities were achieved by introducing an attractive DRT service. This was only possible through solving regulatory questions in the final planning stage. The successful planning of the *mybuxi* service may contribute to a transition toward a more sustainable rural transport environment, as the SI ensures an increase in the accessibility of all settlement areas in the municipalities. Unlike in urban areas, experiments in rural areas like the *mybuxi* SI are isolated niches challenging dominant regimes (Geels 2005). From a user perspective, the improvement in PT access especially means for the targeted user group of people without access to a car an improvement in their access to sustainable transport modes. We consider the planning process of the *mybuxi* service as one feasible way to successfully implement a SI in rural areas. More SIs in the transport sector need to be examined and comparatively analyzed to gain valuable insight into their evolvement as well as to understand the impact the respective regulatory frameworks have on their planning and implementation.

This paper contributes to a better understanding on how complex regulations in the PT regime influence the planning process of a SI in this sector. In the first two stages, hardly any question emerged regarding the regulation of the service. Yet, in the final planning stage when coordination and delineation of the SI were critical and the SI was already defined, the regulatory questions became crucial. Similarly to Grimm et al. (2013), the federal actors responsible for regulating the service tried to shield the current regulatory framework from disruptive change. Involving external knowledge (Nordberg, Mariussen, and Virkkala 2020) was helpful as the obtained exceptional permission allowed a continuation of the service (Grimm et al. 2013; Hubert 2011). This paper contributes to the so-far scarce literature on how SIs such as rural DRT services are hindered from developing attractive, user-oriented services that may improve rural living conditions by historically evolved regulations.

This research is limited to one specific SI in a rural area, and we specifically focused on the planning stages. There is a need to better understand how DRT services in rural areas can further emerge in favor of a sustainable rural transport environment and how they can sustain overall. A special focus must remain on the regulatory framework: changes here can have significant implications on the service design of DRT service in rural areas. A better understanding of the relations between DRT services, SIs and the regulatory framework will help to better prepare all involved actors for the emergence of new mobility forms such as, for example autonomous vehicles in rural areas.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

- Acuto, M. 2015. "Retrofitting Global Environmental Politics?" In *Retrofitting Cities: Priorities, Governance and Experimentation*, edited by M. Hodson and S. Marvin, 107–118. Oxon: Routledge.
- Alliance SwissPass. 2020. Allgemeiner Personentarif.
- Alliance SwissPass. 2021. Übereinkommen der Alliance SwissPass (Nationale Organisation zur Zusammenarbeit der am Direkten Personenverkehr Teilnehmenden). Kurzform: Ue500 (Issue 1).
- Avermann, N., and J. Schlüter. 2019. "Determinants of Customer Satisfaction with a True Door-to-Door DRT Service in Rural Germany." *Research in Transportation Business & Management* 32: 100420. <https://doi.org/10.1016/j.rtbm.2019.100420>.
- Bock, B. B. 2016. "Rural Marginalisation and the Role of Social Innovation; a Turn towards Nexogenous Development and Rural Reconnection." *Sociologia Ruralis* 56 (4): 552–573. <https://doi.org/10.1111/soru.12119>.
- Brake, J., and J. D. Nelson. 2007. "A Case Study of Flexible Solutions to Transport Demand in a Deregulated Environment." *Journal of Transport Geography* 15 (4): 262–273. <https://doi.org/10.1016/j.jtrangeo.2006.08.006>.
- Brake, J., J. D. Nelson, and S. Wright. 2004. "Demand Responsive Transport: Towards the Emergence of a New Market Segment." *Journal of Transport Geography* 12 (4): 323–337. <https://doi.org/10.1016/j.jtrangeo.2004.08.011>.
- Buehler, R., J. Pucher, and O. Dümmler. 2019. "Verkehrsverbund: The Evolution and Spread of Fully Integrated Regional Public Transport in Germany, Austria, and Switzerland." *International Journal of Sustainable Transportation* 13 (1): 36–50. <https://doi.org/10.1080/15568318.2018.1431821>.
- Bulkeley, H., and V. Castán Broto. 2013. "Government by Experiment? Global Cities and the Governing of Climate Change." *Transactions of the Institute of British Geographers* 38 (3): 361–375. <https://doi.org/10.1111/j.1475-5661.2012.00535.x>.
- Butzin, A., and M. Rabadjieva. 2017. *Social Innovation in Mobility and Transport*. European Policy Brief.
- Butzin, A., M. Rabadjieva, and S. Emmert. 2017. "Final Report: Social Innovation in Mobility and Transport." https://www.si-drive.eu/wp-content/uploads/2018/03/SI-DRIVE-D8_4-Final-Policy-Field-Report-Mobility-and-Transport.pdf.
- Butzin, A., M. Rabadjieva, and M. van de Lindt. 2015. *Social Innovation in Transport and Mobility: State of the Art Summary (Report of the SI-DRIVE Project: Social Innovation: Driving Force of Social Change)*. Brussels: European Union.
- Butzin, A., and B. Widmaier. 2016. "Exploring Territorial Knowledge Dynamics through Innovation Biographies." *Regional Studies* 50 (2): 220–232. <https://doi.org/10.1080/00343404.2014.1001353>.
- Decree on Holding and Operating of Taxis (Taxi decree) [Verordnung über das Halten und Führen von Taxis (Taxiverordnung, TaxiV)]. 2012. "Testimony of Canton of Berne [Kanton Bern]." <https://www.belex.sites.be.ch/frontend/versions/949>.
- de Jong, W., J. Vogels, K. van Wijk, and O. Cazemier. 2011. "The Key Factors for Providing Successful Public Transport in Low-Density Areas in The Netherlands." *Research in Transportation Business & Management* 2: 65–73. <https://doi.org/10.1016/j.rtbm.2011.07.002>.
- Deserti, A., and F. Rizzo. 2020. "Context Dependency of Social Innovation: In Search of New Sustainability Models." *European Planning Studies* 28 (5): 864–880. <https://doi.org/10.1080/09654313.2019.1634005>.
- EnergieSchweiz. n.d. "Koordinationsstelle für nachhaltige Mobilität (KOMO) – EnergieSchweiz." Accessed March 15, 2021. <https://www.energieschweiz.ch/page/de-ch/koordinationsstelle-fuer-nachhaltige-mobilitaet-komo>.
- Federal Law from 20th March 2009 on the Passenger Transport (Passenger Transport Law, PBG) [Bundesgesetz vom 20. März 2009 über die Personenbeförderung (Personenbeförderungsgesetz, PBG)]. 2009. <https://www.fedlex.admin.ch/eli/cc/2009/680/de>.
- FOT (Federal Office of Transport). 2017. Fact Sheet on Research and Innovation. FOT.

- FOT (Federal Office of Transport). 2020. “Kostendeckungsgrad RPV (=Cost Efficiency Rate RTT).” Federal Office of Transport. <https://www.bav.admin.ch/bav/de/home/das-bav/aufgaben-des-amtes/finanzierung/finanzierung-verkehr/personenverkehr/rpv-mit-erschliessungsfunktion/bestellverfahren.html>.
- FSO (Federal Statistical Office). 2017. Gemeindetypologie und Stadt/Land-Typologie: Raumgliederungen der Schweiz [Typology of Municipalities and Urban/Rural-Typology: Territorial Classification of Switzerland].
- FSO (Federal Statistical Office). 2021. “Regional Portraits 2021: Key Data of All Communes.” <https://www.bfs.admin.ch/bfs/en/home/statistics/regional-statistics/regional-portraits-key-figures/communes/data-explanations.assetdetail.15864443.html>.
- Gähns, S., and J. Knoefel. 2020. “Stakeholder Demands and Regulatory Framework for Community Energy Storage with a Focus on Germany.” *Energy Policy* 144: 111678. <https://doi.org/10.1016/j.enpol.2020.111678>.
- Geels, F. W. 2004. “From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory.” *Research Policy* 33 (6–7): 897–920. <https://doi.org/10.1016/j.respol.2004.01.015>.
- Geels, F. W. 2005. “The Dynamics of Transitions in Socio-Technical Systems: A Multi-Level Analysis of the Transition Pathway from Horse-Drawn Carriages to Automobiles (1860–1930).” *Technology Analysis & Strategic Management* 17 (4): 445–476. <https://doi.org/10.1080/09537320500357319>.
- Geels, F. W. 2011. “The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms.” *Environmental Innovation and Societal Transitions* 1 (1): 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>.
- Geels, F. W. 2012. “A Socio-Technical Analysis of Low-Carbon Transitions: Introducing the Multi-Level Perspective into Transport Studies.” *Journal of Transport Geography* 24: 471–482. <https://doi.org/10.1016/j.jtrangeo.2012.01.021>.
- Gray, D., J. Shaw, and J. Farrington. 2006. “Community Transport, Social Capital and Social Exclusion in Rural Areas.” *Area* 38 (1): 89–98. <https://doi.org/10.1111/j.1475-4762.2006.00662.x>.
- Grimm, R., C. Fox, S. Baines, and K. Albertson. 2013. “Social Innovation, an Answer to Contemporary Societal Challenges? Locating the Concept in Theory and Practice.” *Innovation: The European Journal of Social Science Research* 26 (4): 436–455. <https://doi.org/10.1080/13511610.2013.848163>.
- Hodson, M., F. Geels, and A. McMeekin. 2017. “Reconfiguring Urban Sustainability Transitions, Analysing Multiplicity.” *Sustainability* 9 (2): 299. <https://doi.org/10.3390/su9020299>.
- Hodson, M., and S. Marvin. 2012. “Mediating Low-Carbon Urban Transitions? Forms of Organization, Knowledge and Action.” *European Planning Studies* 20 (3): 421–439. <https://doi.org/10.1080/09654313.2012.651804>.
- Hubert, A. 2011. “Empowering People, Driving Change: Social Innovation in the European Union.” <https://doi.org/10.2796/13155>.
- Imhof, S., and K. Blättler. 2023. “Assessing Spatial Characteristics to Predict DRT Demand in Rural Switzerland.” *Research in Transportation Economics* 99: 101301. <https://doi.org/10.1016/j.retrec.2023.101301>.
- Imhof, S., J. Frölicher, and W. von Arx. 2020. “Shared Autonomous Vehicles in Rural Public Transportation Systems.” *Research in Transportation Economics* 83: 100925. <https://doi.org/10.1016/j.retrec.2020.100925>.
- Jalonen, H. 2011. “The Uncertainty of Innovation: A Systematic Review of the Literature.” *Journal of Management Research* 4 (1), <https://doi.org/10.5296/jmr.v4i1.1039>.
- Jordana, J., and D. Levi-Faur. 2004. *The Politics of Regulation: Institutions and Regulatory Reforms for the Age of Governance*. Cheltenham: Edward Elgar Publishing.
- Kirwan, J., B. Ilbery, D. Maye, and J. Carey. 2013. “Grassroots Social Innovations and Food Localisation: An Investigation of the Local Food Programme in England.” *Global Environmental Change* 23 (5): 830–837. <https://doi.org/10.1016/j.gloenvcha.2012.12.004>.
- Kleverbeck, M., and J. Terstriep. 2017. “Analysing the Social Innovation Process – The Methodology of Social Innovation Biographies.” *European Public & Social Innovation Review* 2 (2): 15–29. <https://doi.org/10.31637/epsir.17-2.2>.

- Klitkou, A., S. Bolwig, T. Hansen, and N. Wessberg. 2015. "The Role of Lock-in Mechanisms in Transition Processes: The Case of Energy for Road Transport." *Environmental Innovation and Societal Transitions* 16: 22–37. <https://doi.org/10.1016/j.eist.2015.07.005>.
- Law on the Public Transport [Gesetz über den öffentlichen Verkehr]. 2008. "Testimony of Canton of Berne [Kanton Bern]." <https://www.belex.sites.be.ch/frontend/versions/373>.
- Lo Schiavo, L., M. Delfanti, E. Fumagalli, and V. Olivieri. 2013. "Changing the Regulation for Regulating the Change: Innovation-Driven Regulatory Developments for Smart Grids, Smart Metering and e-Mobility in Italy." *Energy Policy* 57: 506–517. <https://doi.org/10.1016/j.enpol.2013.02.022>.
- Lowe, A. 1995. "The Basic Social Processes of Entrepreneurial Innovation." *International Journal of Entrepreneurial Behavior & Research* 1 (2): 54–76. <https://doi.org/10.1108/13552559510090622>.
- Meelen, T., K. Frenken, and S. Hobrinsk. 2019. "Weak Spots for Car-Sharing in The Netherlands? The Geography of Socio-Technical Regimes and the Adoption of Niche Innovations." *Energy Research & Social Science* 52: 132–143. <https://doi.org/10.1016/j.erss.2019.01.023>.
- Moore, M.-L., F. R. Westley, and A. Nicholls. 2012. "The Social Finance and Social Innovation Nexus." *Journal of Social Entrepreneurship* 3 (2): 115–132. <https://doi.org/10.1080/19420676.2012.725824>.
- Mulley, C., and J. D. Nelson. 2009. "Flexible Transport Services: A New Market Opportunity for Public Transport." *Research in Transportation Economics* 25 (1): 39–45. <https://doi.org/10.1016/j.retrec.2009.08.008>.
- Murray, R., J. Caulier-Grice, and G. Mulgan. 2010. *The Open Book of Social Innovation*. London: The Young Foundation & NESTA.
- Neumeier, S. 2012. "Why Do Social Innovations in Rural Development Matter and Should They Be Considered More Seriously in Rural Development Research? – Proposal for a Stronger Focus on Social Innovations in Rural Development Research." *Sociologia Ruralis* 52 (1): 48–69. <https://doi.org/10.1111/j.1467-9523.2011.00553.x>.
- Neumeier, S. 2017. "Social Innovation in Rural Development: Identifying the Key Factors of Success." *The Geographical Journal* 183 (1): 34–46. <https://doi.org/10.1111/geoj.12180>.
- Noack, A., and T. Federwisch. 2019. "Social Innovation in Rural Regions: Urban Impulses and Cross-Border Constellations of Actors." *Sociologia Ruralis* 59 (1): 92–112. <https://doi.org/10.1111/soru.12216>.
- Nordberg, K., Å. Mariussen, and S. Virkkala. 2020. "Community-Driven Social Innovation and Quadruple Helix Coordination in Rural Development. Case Study on LEADER Group Aktion Österbotten." *Journal of Rural Studies* 79: 157–168. <https://doi.org/10.1016/j.jrurstud.2020.08.001>.
- Office of Public Transport. 2013. Beschluss über das Angebot im öffentlichen Verkehr für die Fahrplanperioden 2014–2017 (= Decision on the Public Transport Offer for the Timeplan 2014–2017).
- Office of Public Transport. 2017. Angebotskonzept des Kantons Bern für den öffentlichen Orts- und Regionalverkehr 2018–2021 (= Service Concept of the Canton of Bern for the Public Local and Regional Traffic 2018–2021).
- Ongkittikul, S., and H. Geerlings. 2006. "Opportunities for Innovation in Public Transport: Effects of Regulatory Reforms on Innovative Capabilities." *Transport Policy* 13 (4): 283–293. <https://doi.org/10.1016/j.tranpol.2005.12.003>.
- Petersen, T. 2016. "Watching the Swiss: A Network Approach to Rural and Exurban Public Transport." *Transport Policy* 52: 175–185. <https://doi.org/10.1016/j.tranpol.2016.07.012>.
- Pol, E., and S. Ville. 2009. "Social Innovation: Buzz Word or Enduring Term?" *The Journal of Socio-Economics* 38 (6): 878–885. <https://doi.org/10.1016/j.socsec.2009.02.011>.
- Rodrigue, J.-P. 2020. *The Geography of Transport Systems*. Oxon: Routledge.
- Santos, F., J. C. Salvado, I. L. de Carvalho, and U. G. Schulte. 2013. "The Life Cycle of Social Innovations." In *Social Innovation*, edited by T. Osburg and R. Schmidpeter, 183–195. Berlin/Heidelberg: Springer.
- Schwanen, T. 2015. "The Bumpy Road toward Low-Energy Urban Mobility: Case Studies from Two UK Cities." *Sustainability* 7 (6): 7086–7111. <https://doi.org/10.3390/su7067086>.

- SFOE (Swiss Federal Office of Energy). 2017. Wichtigste Neuerungen im Energierecht ab 2018 (= Most Important Alterations in the Energy Law as of 2018).
- Sörensen, L., A. Bossert, J. P. Jokinen, and J. Schlüter. 2021. “How Much Flexibility Does Rural Public Transport Need? – Implications from a Fully Flexible DRT System.” *Transport Policy* 100: 5–20. <https://doi.org/10.1016/j.tranpol.2020.09.005>.
- Sunio, V., M. Laperal, and I. Mateo-Babiano. 2020. “Social Enterprise as Catalyst of Transformation in the Micro-Mobility Sector.” *Transportation Research Part A: Policy and Practice* 138: 145–157. <https://doi.org/10.1016/j.tra.2020.05.027>.
- Tan, S. Y., and A. Taeihagh. 2021. “Adaptive Governance of Autonomous Vehicles: Accelerating the Adoption of Disruptive Technologies in Singapore.” *Government Information Quarterly* 38 (2): 101546. <https://doi.org/10.1016/j.giq.2020.101546>.
- Teal, R. F., and A. J. Becker. 2011. “Business Strategies and Technology for Access by Transit in Lower Density Environments.” *Research in Transportation Business & Management* 2: 57–64. <https://doi.org/10.1016/j.rtbm.2011.08.003>.
- Terstriep, J., M. Kleverbeck, A. Deserti, and F. Rizzo. 2015. Comparative Report on SI across Europe. Deliverable D3.2 of the Project «Boosting the Impact of SI in Europe through Economic Underpinnings» (SIMPACT), European Commission – 7th Framework Programme.
- Terstriep, J., D. Rehfeld, and M. Kleverbeck. 2020. “Favourable Social Innovation Ecosystem(s)? – An Explorative Approach.” *European Planning Studies* 28 (5): 881–905. <https://doi.org/10.1080/09654313.2019.1708868>.
- Thao, V. T., S. Imhof, and W. von Arx. 2023. “Demand Responsive Transport: New Insights from Peri-Urban Experiences.” *Travel Behaviour and Society* 31: 141–150. <https://doi.org/10.1016/j.tbs.2022.11.012>.
- Tschumi, P., A. Winiger, S. Wirth, H. Mayer, and I. Seidl. 2020. “Wachstumsunabhängigkeit durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet.” In *Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien*, edited by B. Lange, M. Hülz, B. Schmid, and C. Schulz, 117–137. Bielefeld: Transcript Verlag.
- Ubbels, B., P. Nijkamp, E. Verhoef, S. Potter, and M. Enoch. 2017. “Alternative Ways of Funding Public Transport: A Case Study Assessment.” *European Journal of Transport and Infrastructure Research* 1 (1): 73–89. <https://doi.org/10.18757/EJTIR.2001.1.1.2629>.
- Wang, C., M. Quddus, M. Enoch, T. Ryley, and L. Davison. 2015. “Exploring the Propensity to Travel by Demand Responsive Transport in the Rural Area of Lincolnshire in England.” *Case Studies on Transport Policy* 3 (2): 129–136. <https://doi.org/10.1016/j.cstp.2014.12.006>.
- Wimbadi, R. W., R. Djalante, and A. Mori. 2021. “Urban Experiments with Public Transport for Low Carbon Mobility Transitions in Cities: A Systematic Literature Review (1990–2020).” *Sustainable Cities and Society* 72: 103023. <https://doi.org/10.1016/j.scs.2021.103023>.
- Wittmayer, J. M., T. de Geus, B. Pel, F. Avelino, S. Hielscher, T. Hoppe, S. Mühlemeier, ... A. Härtwig. 2020. “Beyond Instrumentalism: Broadening the Understanding of Social Innovation in Socio-Technical Energy Systems.” *Energy Research & Social Science* 70: 101689. <https://doi.org/10.1016/j.erss.2020.101689>.
- Wittmayer, J. M., F. van Steenberg, A. Rok, and C. Roorda. 2016. “Governing Sustainability: A Dialogue between Local Agenda 21 and Transition Management.” *Local Environment* 21 (8): 939–955. <https://doi.org/10.1080/13549839.2015.1050658>.