CHERRIES
RESPONSIBLE HEALTHCARE ECOSYSTEMS

Drivers and barriers for innovation pilots in healthcare

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Authors: Stefan Philipp, Philipp Brugner, Wolfgang Haider, Selina Pichler, (all ZSI), Anestis Amanatitis, Ingeborg Meijer (both UL)

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Author(s) Email	philipp@zsi.at
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Executive summary	Innovation is expected to ease the pressures that aging populations put on healthcare systems. However, healthcare innovations often fail. To understand why innovations fail, the opportunities and constraints of actors aiming to transform healthcare practices need to be understood. The paper compares the health and care development paths of Murcia (ES) and Örebro (SE) with a micro-perspective on agency, combining evolutionary and institutional approaches. It illustrates the dynamics of the agency-practice-structure relation and how actors aim to modify structural barriers for future practice. Finally, it discusses the implications of this relation for regional development and healthcare policy.

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1. Introduction

Under this task we studies innovations in the healthcare system deploying an innovation biographies approach that allow the study of time–space dynamics of knowledge and ways of knowledge combination in innovation processes from a micro-level perspective. In CHERRIES, we used this approach in order to gain in-depth, longitudinal knowledge about innovation pilots in healthcare. In total, we studied 12 cases in the three regions of Murcia (ES), the Republic of Cyprus (CY), and Örebro (SE).

In this document, we provide an overview of the process and present the manuscript that has been developed based on the conducted research. The process illustrates the serendipitous research that started with an idea that has been drafted during the proposal process, without knowledge of potential case studies and ended in a manuscript ready for submission in an open access format. It contains the information on the regional innovation projects that were collected, analysed, as well as the manuscript.

In total 34 cases have been collected with the support of the regional partners. Of these, 12 cases have been analysed in depth deploying an innovation biography methodology. These cases have revealed regional structure that enable or constrain regional actors in developing and adopting innovative solutions for healthcare. Based on these findings the manuscript has been drafted comparing the cases of Murcia and Örebro.

This selection has been made as both regions developed structures, the SMS Innovation Unit and the Partnership for Social Innovation, that enable experimentation in their health and care systems that, however, focus on different innovation aspects. While Murcia focuses on digital healthcare solutions to modernise their services, the Örebro actors developed an approach based on social innovations to combat the fragmentation of the system. Due to these similarities, a comparison between those two regions seemed fruitful. This, however, does not imply a depreciation of the cases observed in Cyprus and the efforts of the actors there. In reality, many of the processes described in depth in the manuscript can also be found in Cyprus. However, on the one hand the process is in an earlier stage in comparison to the other two regions and on the other hand, the development trajectory in Cyprus shows similarities to Murcia. Thus, given the limited amount of space available in an academic journal, the decision has been made to focus on two regions only.

In this deliverable, we provide an overview of the process and the results obtained. We decided to provide a context of the Cyprus case in this deliverable as it has not been included in the manuscript. The document is structures as follows. First, the process incl. the conceptual turns we made after the analysis of our cases is illustrated. The collected material is presented and the Cyprus case is outlined before we present the manuscript.

2. Process

The process section of this deliverable contains information from the original concept note, the methodology, and the mapped and analysed cases. This data is presented in order to provide an overview of the approach and how we navigated the complex system of healthcare innovation.

2.1. Objective and consideration

In the context of CHERRIES, qualitative innovation case studies from the regions were used to gain in-depth, longitudinal knowledge about innovation (pilots) in healthcare. In accordance with the definition of healthcare innovations by the WHO[1] the case studies were mapped to capture differences between preventive, promotive, therapeutic and rehabilitative/assistive care innovation. Through that, the case studies supplement the regional mappings, which capture the regional ecosystems as such, by providing a more-fine grained perspective on the four different healthcare innovation subsystems:

- **Prevention**: Disease prevention is understood as specific, population-based and individual-based interventions for primary (e.g. vaccination) and secondary (e.g. early detection through screening) prevention, aiming to minimize the burden of diseases and associated risk factors.
- **Health promotion** is the process of empowering people to increase control over their health and its determinants through health literacy efforts and multisectoral action to increase healthy behaviours (e.g. lifestyle advise).
- **Therapeutic care** is relating to the treatment of disease or disorders by remedial agents or methods for cure having a beneficial effect on the body or mind (e.g. treatments, products, technologies or services).
- **Rehabilitation or assistive care** enables and promotes inclusion and participation, especially of persons with disability, aging populations, and people with non-communicable diseases, e.g. through hearing aids, wheelchairs, prostheses and devices.

The data was collected through case studies based on the methodology of innovation biographies (Butzin & Widmaier, 2016)[2]. Innovation biographies capture social relations and contextual settings of knowledge developed and applied in innovation processes. Thereby, they allow the study of time-space dynamics of knowledge in innovation processes from a micro-level perspective and go beyond the regional boundaries that limit the mapping exercise.

[1] "Health innovation identifies new or improved health policies, systems, products and technologies, and services and delivery methods that improve people's health and wellbeing. Health innovation responds to unmet public health needs by creating new ways of thinking and working with a focus on the needs of vulnerable populations. It aims to add value in the form of improved efficiency, effectiveness, quality, sustainability, safety and/or affordability. Health innovation can be preventive, promotive, curative and rehabilitative and/or assistive care." WHO online, https://www.who.int/topics/innovation/en/ retrieved 24.06.2020

[2] Butzin, A., & Widmaier, B. (2016). Exploring Territorial Knowledge Dynamics through Innovation Biographies. *Regional Studies, 50(2).* https://doi.org/10.1080/00343404.2014.1001353

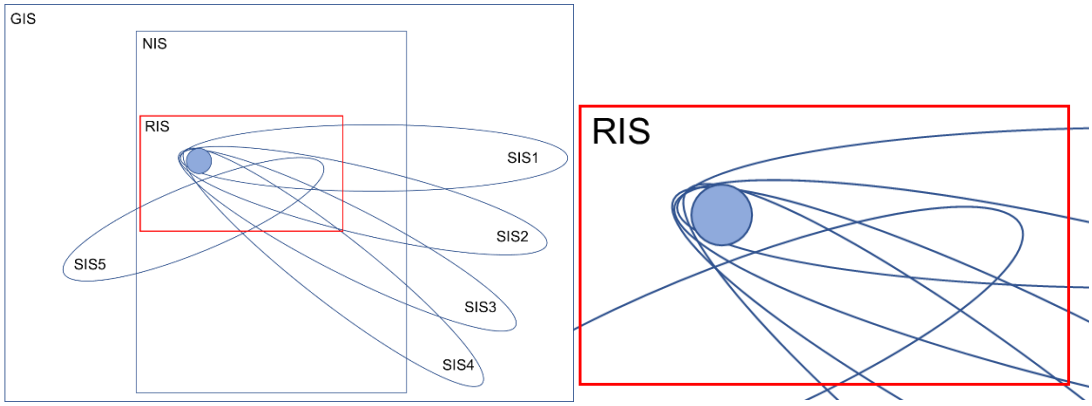

Figure 1: (left) Schematic illustration of the subsystems going beyond regional boundaries (with SIS5 as place-holder for innovation systems with high influence on health like e.g. ICT), (right) the complexity of the regional ecosystems covered by the mapping

Figure 1. illustrates the original nested concept of innovation systems. It builds on an understanding that the healthcare innovation system might consist of various Sectoral Innovation Systems (SIS), the are present within but also go beyond the Regional Innovation Systems (RIS), and that therefore, also National (NIS) and Global Innovation Systems (GIS) are relevant to understand observed trajectories. It built upon the idea that a sectoral (e.g. the preventive care system) innovation subsystems includes varying actors, networks and institutions and that innovation within these subsystems might built on different knowledge bases, learning modes or valuation methods. The right part of Fig. 1, shows that these systems most likely overlap and share a focal point in the actual care provision system (blue circle). Therefore, the hypothesis for this study was that both, the regional ecosystems as well as the subsystems and their innovation behaviour must be understood well in order to provide appropriate policy advice.

2.2. Methodology

The following describes the original methodology and theoretical positioning of the research. The case studies were analysed by the innovation biography approach. The key methodological principle of innovation biographies is to follow an innovation idea over time by analysing the interactions of innovation actors and by applying an open, inductive approach to data analysis (cf. Butzin and Widmaier, 2016). Understanding the causalities and contexts of innovation processes gives insight into how knowledge from various sources (geographical, sectoral) is combined during the innovation process and how territorial knowledge dynamics unfold.

The analysis of the case studies consisted of three main elements. 1) a document analysis provided an understanding of content, main actors, as well as an understanding of sector specifics and context. We aimed at establishing a preliminary timeline of the innovation case based on the documents. 2) with this basic understanding of the innovation, a narrative interview with the main innovator(s) or entrepreneur(s) was conducted. The aim was to let them tell the story of the innovation from their perspective. Which problem did they want(ed) to solve, where did the idea come from, who were the most important collaborators, challenges, and drivers of the process etc.? These aspects were sequenced according to the phases of idea generation, implementation, impact, and institutional embedding and covered aspects of resource formation, characteristics of knowledge and learning processes with spatial and institutional dimensions as well as the role of markets and the ability to standardise innovation results. This allowed the constructing of ego-network of the innovation (innovation as central actor). 3) Departing from this ego-network, we recruited additional interview partners, in order to validate the data obtained so far and to enrich the biography with outside perspectives.

The primary points of interest were the development of the following aspects:

- Source of idea or innovation need
- Resource mobilisation
- Innovation mode
- Valuation model

We further aimed at identifying the knowledge and learning mode the innovation was predominantly based on and, second, the innovations valuation model.

In accordance to the model developed by Binz and Truffer (2017), we aimed at analysing the knowledge bases and learning modes of each innovation on the knowledge dichotomy developed by Jensen et al. (2007)[3]. The aim was to distinguish if an innovation was dominated by a science and technology driven (STI) innovation mode or rely more strongly on learning by doing, using and interacting (DUI). Innovation in STI-based industries depends on knowledge that develops from the application of scientific principles and which can get codified in models, patents and reports. In industries where the DUI-based innovation mode is more dominant (e.g. luxury watchmaking, specialized machine tools, wind power), in contrast, learning depends more strongly on novel recombination of experience-based knowledge and competencies. The hypothesis was, that different subsystems of the healthcare innovation system will depend on very different forms of knowledge and learning modes (e.g. development of new drug-based therapies vs. new approaches in assistive care).

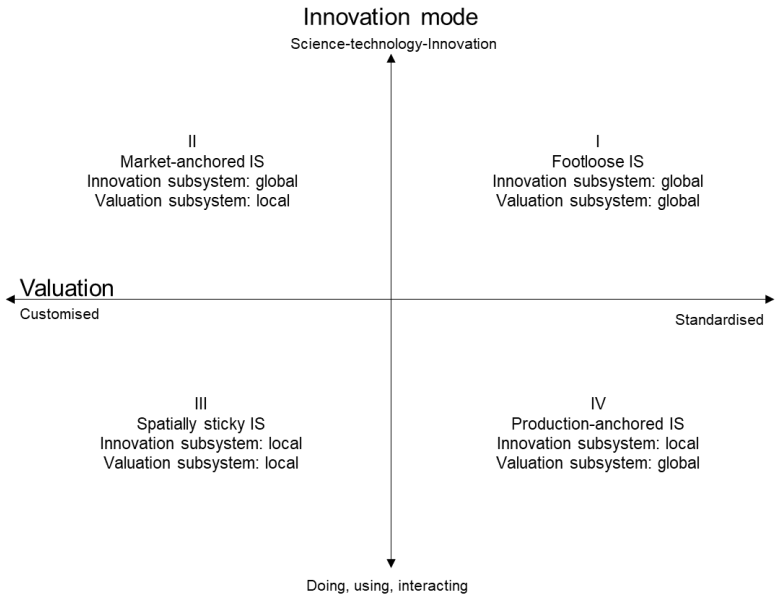

Figure 2: Innovation-valuation framework and types of innovation systems (Binz and Truffer, 2017)

The second aspect relates to the innovation's market and its potential for up-scaling. In the case of standardised valuation, consumption and legitimacy are stabilised around clearly identified goods, services and brands. End-users have relatively undifferentiated preferences that are uniform in various parts of the world and base their acquisition choices mainly on price signals. In contrast, in industries that depend on customised valuation, products need to be tailored to the needs of specialised user groups or depend on

[3] Jensen, M. B., Johnson, B., Lorenz, E., & Lundvall, B. Å. (2007). Forms of knowledge and modes of innovation. *Research Policy, 36(5),* 680–693. https://doi.org/10.1016/J.RESPOL.2007.01.006

symbolic embedding in historically grown territorial contexts (Binz & Truffer, 2017)[4]. Analog to the knowledge bases, the hypothesis is that the valuation modes might differ in the different subsystems. Further, we assumed that the highly skewed market (heavily regulated, market power of payors etc.) for most healthcare innovations might play a decisive but varying role in an innovation's potential to enter (new) markets.

2.3. Mapping approach

The mapping was open in order to create a pool of potentially interesting cases for selection. The pool should include as many health innovation cases from the three regions as possible, as the "case owners" might be interesting stakeholders for various engagement formats (e.g. call for solutions). We aimed at selecting 4 interesting cases per region but were aware that we might not be able to find comparable cases for all subsystem in each region and therefore, we also mapped interesting cases beyond the three regions (via FP projects). Therefore, ZSI asked all partners to collect to collect as many health innovations as possible via a predefined tool. The initial case selection grid is depicted in Table 1. However, the aim to select one case per region and subsystem leading to four cases per region and 3 per subsystem, did not not work as anticipated.

	Cyprus	Murcia	Örebro
Preventive care	One case per cell		
Therapeutic care			
Assistive care		…	
Promotive care			…

Table 1: Ideal case selection gird

The collection of cases has been done via an Excel tool that has been prepared by ZSI and distributed to all partners in spring 2020. Partners were asked provide the following information:

- Case name
- A short description of the innovation incl. why it is an interesting case
- Link to further information
- Contact details central actors (e.g. the firm website, the innovator etc.)
- The region (e.g. Örebro) should be indicated
- The **health dimension** determines the nature of the case study as regards its relation to the health innovation system. The case study has to be pertaining on one of the four dimensions of preventive, promotive, therapeutic and assistive care.
- The **development phase** of the innovation (The development phase of the case study helps to determine its maturity and potential impacts. The case study has to have proven at least punctual impact (e.g. prototype exits))
- The **innovation type** criteria helps to determine the nature of the case study in relation to its innovative character.
- The **geographical scope** allows to determine on which level the case study was implemented and how it should be classified according to geographical localisation.

[4] Binz, C., & Truffer, B. (2017). Global Innovation Systems—A conceptual framework for innovation dynamics in transnational contexts. *Research Policy, 46(7),* 1284–1298. https://doi.org/10.1016/j.respol.2017.05.012

2.4. Mapped and selected cases

Case Name	Short Description	Link	Region	Health Dim-ension	Develop-ment phase	Inno-vation type	Geo-graphical scope
Bialoom	bialoom is a deep tech start-up established in Nicosia, Cyprus with a vision to grow into a global diagnostics game changer. bialoom finds itself at the cross road of silicon photonics, plasmonics and in-vitro diagnostics to solve global diagnostic challenges.	http://bialoom.com	Cyprus	Preventive	Pre-development phase	product	Regional
Embrace Watch	Embrace is a smart locator for the elderly. Receiving immediate information of the exact location of your loved ones. It includes wandering prevention alert, fall detection alert and personal location safety technology.	https://cellock.com/	Cyprus	Assistive	Take-off phase	product	Regional
Theramir	Developing novel microRNA based therapeutics and companion diagnostics for patients and healthcare providers	https://www.theramir.com/about	Cyprus	Therapeutic	Take-off phase	product	Regional
Medtl Technolgies	Enabling accurate, affordable healthcare screening for early disease detection, providing an exceptional user experience enhancing quality of life.	https://mymedtl.com/	Cyprus	Preventive	Development phase	product	Regional
Heatshield	Heatshield focuses on providing adaptation strategies to ever-increasing temperatures for the five major industries of the EU and its workers: manufacturing, construction, transportation, tourism, and agriculture.	https://www.heat-shield.eu	Cyprus	Preventive	Development phase	process	International
SERUMS	Securing Medical Data in Smart Patient-Centric Healthcare Systems	https://www.serums-h2020.org	Cyprus	Ambiguous	Development phase	process	International

interopEHRate	The project enables patients to be in full control of the usage and the routes of their health data. The central instrument, being laid in "patients' hands" is the Smart EHR	https://www.interopehrate.eu	Cyprus	Assistive	Development phase	process	International
E-Hcert	Blockchain health data management developed in Areteiou Hospital for secure sharing of clincial data		Cyprus		Development phase	product	International
NIPD Genetics	NIPD Genetics is a European biotechnology company that designs, develops, and provides advanced genetic tests. NIPD Genetics provides the VERACITY NIPT for aneuploidies and microdeletions; VERAgene comprehensive NIPT for aneuploidies, microdeletions and 100 monogenic diseases; PreSENTIA hereditary cancer panels and ForeSENTIA tumor profile panels	https://www.nipd.com/	Cyprus	Preventive	Take-off phase	product	Regional
Gravidity	Digital card for monitoring pregnancy and puerperium of the Murcia Health Service (SMS). The main objective of the system is to improve with a digital solution the accessibility and monitoring of pregnancy and puerperium up to 6 months for the pregnant woman, empowering her in the self-management of her process, as well as for the professionals involved in her care. The comprehensive monitoring of the pregnant woman as well as her inclusion and empowerment are difficult to guarantee without a digital and mobile solution. PIAM (The Comprehensive Programme of Care for Women) clearly establishes workflows and there are countless printed training documents whose digital consultation would make it easier for the pregnant woman to receive the right information at the right time and in the right place. A successfully validated solution in this pilot would be replicable throughout the Region of Murcia (10,000 pregnancies/year) and also in a very similar way to the rest of the autonomous communities of Spain, personalizing some changes in the workflow of the professionals involved. Gravidity has been successfully tested (validated) with 53 women, belonging to 3 health	https://www.indemandhealth.eu/wp-content/uploads/2019/01/2-Challenge-2ndcall-Murcia-EN.pdf	Murcia	Ambiguous	Pre-development phase	social	International

	centers in Murcia, and with all the health professionals involved in their monitoring.						
Deep Diver	Assistant to search for diagnoses with suspicion of Occupational Diseases. Work-related illnesses are the leading cause of preventable deaths in developed countries. Within them, Professional Diseases (PD) are a group of different pathologies whose causal relationship with the job is proven, and which implies a legal responsibility in their prevention, care and benefits. However, most PD go unnoticed as a Common Disease, with the public system assuming the cost of their benefits. Deep Diver extend the alerts to detect suspicions of PD by taking advantage of all the information in the clinical history of PC and hospital, as well as the free text of the clinical records, developing an algorithm with a success rate that allows them to be automated. Thanks to the knowledge of the different professionals involved in the co-creation, the final solution created was able to predict more than 4,000 occupational diseases related to asbestos with an accuracy close to perfection, to only 17 thousandths (AUC ROC = 0.983).	https://www.indemandhealth.eu/wp-content/uploads/2019/01/1-Challenge-2ndcall-Murcia-EN.pdf	Murcia	Preventive	Pre-development phase	product	Regional
Epico	Solution that leverages existing corporate IT systems to facilitate the empowerment of patients with epilepsy, and their convenient communication with doctors. The main objective is to improve the quality of life perceived by epileptic patients by facilitating a more convenient communication with his doctor and empowering him to better manage his disease. As a secondary objective, the Challenger also wants to learn how to easily integrate 3rd party patient facing mobile solutions through its corporate IT systems. With EPICO we have responded to a growing demand from patients for better accessibility to the Epilepsy consultation. 68% of the patients discharged from EPICO during 2019 had ever had the need to consult with their Neurologist outside of their scheduled appointment	https://www.indemandhealth.eu/wp-content/uploads/2018/02/1-Challenge-3_EPITIC.pdf	Murcia	Therapeutic	Development phase	product	Regional

	and found great difficulties in being able to contact them (69% rate the accessibility to the consultation as unsatisfactory or very unsatisfactory). Given the possibility of having a tool that would allow them not to have to travel to the hospital for a routine consultation, 82% were very satisfied. This application and system of care for people with epilepsy has been shown to be efficient and possibly replicable to other chronic pathologies that affect patients of working age or with caregivers of that profile.						
Neuorathome	kinect sensor-based software for the rehabilitation of patients with gait and balance disorders tested in FICHE European project (FIWARE eHealt acellarator). NeuroAtHome is a virtual care platform that enables healthcare professionals to deliver quantified physical and cognitive rehabilitation across care settings. NeuroAtHome uses gamification, session personalization and real-time motion analysis to deliver care to individuals suffering from chronic health conditions and for active ageing. The solution can be used on-premises (in hospitals and outpatient centers) or to prescribe to remote sites (homes or other health centers). As a result, NeuroAtHome can improve rehabilitation outcomes, track patient evolution objectively and increase clinician productivity and patient access to rehabilitation services.	https://rteinsas.wixsite.com/mundortein/single-post/2016/12/27/NEUROATHOME-EN-EL-PROGRAMA-DE-INVESTIGACI%C3%93N-EUROPEO-FICHE-JUNTO-AL-SERVICIO-MURCIANO-DE-SALUD	Murcia	Assistive	Acceleration phase	product	National
ProEmpower	ProEmpower looks to procure an integrated ICT solution for diabetes self-management which should be offered to the procurers as a managed service. The solution must address the following building blocks of diabetes management:	https://proempower-pcp.eu/	Murcia	Promotive	Pre-development phase	business	International

	Early detection, Personal decision support, Comprehensive diabetes training offer, Glucose control loop, Healthy lifestyle, Self-help and peer support, and Quality & outcome reporting.						
PHArA-ON	Pharaon's overall objective is to make a reality smart and active living for Europe's ageing population by creating a set of integrated and highly customizable interoperable open platforms with advanced services, devices, and tools including IoT, artificial intelligence, robotics, cloud computing, smart wearables, big data, and intelligent analytics.	https://www.pharaon.eu	Murcia	Assistive	Pre-development phase	social	International
eCare	Our goal is to encourage independent living, wellbeing and to relieve health and care services budget pressure. For do so through the implementation of a Pre-Commercial Procurement scheme.	https://ecare-pcp.eu	Murcia	Preventive	Pre-development phase	social	International
Voptica	Voptica has developed the Visual Adaptive Optics (VAO) simulator, a disruptive innovation in eye testing, allowing patients to experience the effect of intraocular lenses or laser surgery on their vision before the actual operation	https://voptica.com	Murcia	Therapeutic	Take-off phase	product	Regional
Successful agening	We live longer and are heathier and the challange is to stay healthy as long as possible. This work content lifelong learning, digital knowledge among elderly, a blogg, food and nutrition. There av doctoral students dong research in siccessful aeging and in a program called Newbreed (Horizon 2020). The effort is to gaing new knowlledge of ageing and then to design services that promptes a healthy life.	https://www.oru.se/strategiska-satsningar/successful-agein/	Örebro	Preventive	Development phase		Regional
Social investment, samverkan för teckenspråkiga SÖT	Cooperation between Activa and the municipality of Örebro to helt people with hearing disabilitys and psyciatric problems to get work, get un education. The project hade the aim to create support the people with hearing disabilities to find a job or get education. They also hade an aim to crete a social company that could hire pepole from the targetgroup. during the project time they hade frutibasket	the same as abouwe	Örebro	Assistive	Acceleration phase	social	Regional

	delivery to companies in cooperation with a norweigian social company " Go Frukt", they hade a small catering and a cafe. Unfortunately this did not work out so well. But the aim to fins new ways for income and self support was good and gave good knowlidge for the future and who to develop supported self employment.						
Rehabiliterande arbetssätt	More and more people are in need of care and assistent from the society and the health care sector. The resorces are not big inuff and the cost increases faster than the tax incoms. Fewer people must privide service for more. At the same time more people feel alone and allignated. Elderly people aspecially. That increses illnes and sickness and create more nedds for care and assistent. The challange is how to provide care and support that benefits the health and make people involved in how and what they may nedd to feel well and cope with there lives. Make people more activa rather than provide everthing without asking. This is the core issue for the rehabilttion workway. We need to work thogether, the municipality, the health care sactor, the civil society and the people in need och care and assistent. We use service design as a tool to create a bottom up prespective.	https://www.orebro.se/fordjupning/fordjupning/leverantor-utforare/rehabiliterande-arbetssatt.html	Örebro	Preventive	Development phase	social	Regional
RAPP	App that is developed in cooperation with Örebro Universitet and the Region. Patients that has gone thorugh surgery can leave hospital and by usin the app make self montoring and put data in to the app so the caregiver can follow the patient. Better and quicker rehabilitation and fewer visits to the hospital is the goal. The patient is in charge of his/hes rehab.	https://www.oru.se/samverkan/innovation-och-ideutveckling/rapp/case-rapp/	Örebro	Therapeutic	Take-off phase	product	Regional
Tillsammans för alla barns bästa (TABB),	The project are inspired of the work done in Scotland called getting it right for every child (GIRFEC). But aiming to develop a method that works in the Swedish context. Today it’s often common for a child	https://www.regionorebrolan.se/sv	Örebro	Preventive	Pre-development phase		Regional

	with some sort of need (for example mental illness or/and problem in the school) to have different contacts with the healthcare sector, the social services, and the school and each of those organizations are working independent of each other. It means that none of them has any clue what the other organization does and therefore can't see the whole picture of what the child really needs. The parents also get the role for administrate different meetings with different organizations it can be a tiring job. The project are manage by the county and consist of three pathfinder projects in three different municipalities. The aim is to get a functional cooperation between the social service, the school and the healthcare sector and in that way take a common responsibility for the child in need, to set the child and its needs in the middle.	/Regional-utveckling/Utbildning--arbetsmarknad/Projekt/Tillsammans-for-alla-barns-basta-/					
IPS -en väg till liv och hälsa	On going ESF project run by Activa fondation. Working with people with phsyciatric diagnosis with the evidens based method, IPS. A cooperation with the Regional helthcare and other authoroties. The core issue is to help and assist people in need of psychiatric care to find a way out to the labor market or to go back to school. This is done in close cooperation with the psychiatric helt care/hospital, doctor, nurses and a IPS coach that participate in the care team.		Örebro	Assistive	Acceleration phase	social	regional
Förstudie - IPS och sociala utfallskontrakt	A pilot study concerning cooperation between authoroties and the civil society concerning the use of the IPS method and how to co-found the work. The main focus of this study was to examine the costs for the society for people with psyciatric dissabilityes by just give care and by not coooerate among athorityes insted of give evideced based suppot (IPS). And what cost decrese that is possible to make by a changing of work methods and organisation changes within the healt care but also in how the work together and with the persons needs in the center.	By e-mail from Activa	Örebro	Assistive	Pre-development phase	organisational	National

Social investments, NP resurs och samverkan	Help students, 15-25 with NPF diagnosis to get education and form a plan for the future. The base of the work is to give individual support och together with the student define personal challanges and benefits so that a plan for work or school can be formated. Give support and build self confidence and working together with the school, unemployment office, adult education and social wellfare office.	www.orebro.se/fordjupning/fordjupning/sa-arbetar-vi-med/sociala-investeringar.html	Örebro	Assistive	Acceleration phase	social	Regional
Social investment,Brobyggare i Vivalla och Baronbackarna	Helt parents to help there children to cope get trough school by giving education from people with the same ethnic background. This projekt has hired people with the same ethnic bakground as the people that are the target grups for the work in order the make i bridge between the families and the school in order to build confidence between them. Then the scool togheter with social service and the civil society give selt help tools in a program called "connect". The people that were hired to work with this project also was given training by the University of Sköndal in Stockholm.	the same as abowe	Örebro	Assistive	Take-off phase	social	Regional
Social investment, Bryggan	Help stundents with normbreaking behavior to go back to school by working with the students in a small gruop, involving parents and other network. A cooperation between school and social services. In the project there are employes with differt backgrounds, social workers, teatchers, family educators. They work togheter with the families to educate the parents in how to give there child support in coping with school, helt parents to cooperate with the childs school and help the school to adjust the inviorment in the school and inthe classrooom to make it possible fot the child to feel that he/she can participate and go back to school. They aslo work with the child to change the behavior and to cope with challnges and difficulties.	the same as abowe	Örebro	Assistive	Take-off phase	social	Regional

Kvinna i fokus/Woman in focus	Kvinna i Fokus is a TIA (Early Intervention for Asylum Seekers) project aimed at asylum-seeking women aged 18 and up. As an asylum seeker, being able to engage in meaningful employment and become part of a community provides opportunities for a slightly easier everyday life. Being able to train the body can strengthen both the physical and the mental mind, which is Kvinna i Fokus' goal. The women are offered a place in a group that meets twice a week to try out different types of physical activities and have fellowship through healthy cooking, which also includes education in healthy habits.	https://www.rfsisu.se/orebrolan/Viarbetarmed/Aktuellaprojekt/KvinnaiFokus	Örebro	Promotive	Development phase	social	Regional
Rörelsesatsning i skolan/Movement investment in school	A project aiming to increase the physical litteracy and physical activity levels among children and young people in school, in order to improve educational results as well as helth and wellbeing. The project is a collaboration between schools and sports federation, funded by the government through the Swedish sports conederation.	https://www.rfsisu.se/orebrolan/Viarbetarmed/Aktuellaprojekt/rorelsesatsningiskolan/	Örebro	Promotive	Pre-development phase	social	Regional
Redo-projektet	Cooperationproject with long time women on sick leave where they tested differnt methods in the project to find out what was the best method for going back to work and feel better. For example they tested yoga, weight blankets, and a method called redo. After they have evaluated the methods they implemented the best workin metod that was redo. There is a report on this but it is not on line. Please request it from us if you mwant to have it.		Örebro	Therapeutic	Take-off phase		Regional
Språka i samverkan	A new project started in may 2020. Workin with imigrants with complex problems, that has difficulties to find job and learn swedish . Mostley men. In cooperation with civil society the project try to find mentors and create speaking groups. It is a coaching process and the aim is to learn swedish and to get a job in the future.		Örebro	Assistive	Development phase	social	Regional

IT-guide	Young imigrants working with learning elderly people to use Internet. It is a way to impove there language for the young peolpe and getin contact with swedisch people and an a way for elderly people to learn Internet so they can use social media, pay bills with internetbank and so on. It has been a summerwork for many yong pepole that still goes to school and during the semesters they can work part time on there spare time.	https://www.it-guide.se/orebro/	Örebro	Promotive	Development phase	social	National
Social Impact Lab – innovation to overcome societal challenges	Social Impact Lab exists so that research and expertise at Örebro University may overcome societal challenges. Social Impact Lab (SoIL) is an innovation environment and a programme that focuses on innovations for social sustainability. The programme provides support and expertise for innovative idea development over twelve months, with regular meeting one day a week. At SoIL, researchers and teaching staff from Örebro University participate, as well as staff from other organisations, in creating the right conditions for collaboration and innovation. From the ideas received by Social Impact Lab, solutions are fashioned in harmony with practitioners and users with the sight set on new and innovative methods for further use. The expectation is to contribute to improving society's ability deal with the shortcomings experienced by individual citizens, groups or other stakeholders. Within this framework there are both promotive, preventive, Therapeutic and assistive projects, some of the listed below.	https://www.oru.se/english/collaboration/innovation-and-idea-development/social-impact-lab--innovation-to-overcome-societal-challenges/	Örebro	Promotive	Acceleration phase	organisational	Regional
Dans för Hälsa (Dance for health)	The project has developed a way to work with teenage girls with mental illness. The method work with unpretentious dance training and in that way also to create a supporting social group for girls with different forms of mental illness. The results shows that the girls increased their self-reported health, decreased pain, fatigue and stress, and that the use of analgesic medicine also decreased in the	https://www.dansforhalsa.se/	Örebro	Therapeutic	Acceleration phase		International

	group. The project has moved on and the founder Anna Duberg are now working to spread the model to both other parts of the country and in Europe. The method is for example in use in Hungary and are on its way to be implemended in Finland						
Livsstilsrådgivning för hälsosammt åldrande (Lifestyle counselling for a healthy ageing)	The amount of elderly people are increasing in the coming decades. At the same time aging are connected to a stepwise disability and decreased health. That means that the need for healthcare services are going to increase in the future. By developing a new form of life style counselling that include both biological health markers and information about the individual lifestyle you can get a weighted picture of the individual state of health. The next step is to offer individualized tools for health promotion and behaviour change. The aim is to decrease the need for healthcare, and in that way relive the health care sector, and to keep a good health and life quality throughout the whole life.	https://www.oru.se/samverkan/innovation-och-ideutveckling/social-impact-lab/deltagare-2020/andreas-nilsson/	Örebro	Promotive	Pre-development phase		Regional
Caresses	Culture Aware Robots and Environmental Sensor Systems for Elderly Support	http://caressesrobot.org/en/	Örebro	Ambiguous	Take-off phase	product	International

Figure 3: Mapped cases in the three regions

The cases collected represent the different entry points we had into the regional systems as well as the cultural approach towards innovation. In Cyprus, most innovations are concepts and early products coming from the start-up ecosystem. In Murcia, the cases are innovations SMS has been developing in the course of European projects. While the innovations in Örebro are mostly social innovations that emerged in the context of public sector entities and CSOs. Thus, the idea in selecting a coherent set of innovations for all healthcare categories did not seem appropriate anymore.

Based on desk research and the information from the mapping a selection has been made that aiming at balancing technological innovations with social innovations. Whereby the cases that are too nascent, obviously ended without impact, or were redundant were eliminated. With this approach we narrowed the cases down to the following selected 12 cases:

Republic of Cyprus

- Bialoom
- Embrace Watch
- E-Hcert

Murcia

- Deep Diver
- Epico
- Neuorathome
- ProEmpower

Örebro

- Social Investment Fund (that implemented several cases but was not mapped previously)
- Social investment, samverkan för teckenspråkiga
- Rehabiliterande arbetssätt
- RAPP
- Tillsammans för alla barns bästa

For these cases interviews (guidelines see Annex), desk research and literature review has been conducted in accordance to the innovation biographies methodology described above. The research was conducted in winter 2020 and spring 2021.

2.5. Change in research concept

As a result of the identified cases within the CHERRIES regions and due to the change in the selection logic, the preliminary results made clear that the initial research concept was void. Within these cases we could not identify and compare the different subsystems of healthcare innovations. Further, results indicated that classifying a single innovation according to the WHO categories might often not be possible as they combine different logics within a single approach. Another problem arose from the valuation mode of the GIS concept. Many of these pilots did not yet establish themselves on the market or are only being tested and advanced in a series of innovation funding in local contexts. Thus, the link to the GIS concept did not work as expected either.

Based on those issues, we needed to identify a new methodological approach for the paper, that is the defined outcome of this task. The sense-making process, based on the empirical material, included a review of healthcare innovation literature, which often is specific on single diseases or technologies (e.g., Barlow,

2017)[5], implementation science (e.g., May et al., 2016)[6], and finally practice theory (Smets et al., 2017)[7]. The observed struggle of actors to establish novel practices in the context of healthcare in combination with the starting policy work in CHERRIES, provided the idea for connecting practice theory with regional development literature (e.g., Grilitisch and Sotaurata, 2020)[8] to understand the regional trajectories. This literature review and the development of a second research concept has been finalised in early 2022. In order to be able to include the empirical material of WP5 and WP6 into the paper development, the writing of the paper needed to wait for the second series of interview that were conducted in the context of the WP6 onsite visits (September and October 2022). Due to these difficulties in the research process, the paper accumulated a significant delay.

The upside of this process is that the paper could include the CHERRIES pilots and their opening effects on the regional ecosystems into the analyses. Thus, instead of four, each region could be described by five case increasing the soundness of the approach. The new research concept is described in detail in section 3.

We have been invited to submit the paper to a forthcoming Special Issue in a high-quality Journal. The publication is subject to a positive peer review process.

2.6. The case of the Republic of Cyprus

As mentioned above, the comparison of the cases and the limited space an academic publication provides, led us to the decision to focus on two cases for the paper. The cases of Murcia and Örebro were selected as they provided an interesting contrast, in the way they focus on digital healthcare innovation vs. social innovation, but, at the same time, they there were showing similar processes histories. The case of Cyprus, while distinct, shows parallels with Murcia but at the same time is seams less advanced in this process as Murcia has been working with these methods for a decade now. In the following, we want to capture the developments in Cyprus in a similar way we did in the context of the paper.

The Republic of Cyprus is an island state with about 1,2 Mio. inhabitants, which makes it the third most populous island in the Mediterranean. Generally, Cyprus is regarded as a moderate innovator in the European landscape, as indicated by the European innovation index (Mena Jara et al., 2020). However, the ambition of the country is to proliferate as regional innovation centre. Accordingly, the Innovate Cyprus R&I strategy presents the vision: "*Cyprus to become a dynamic and competitive economy, driven by research, scientific excellence, innovation, technological development and entrepreneurship, and a regional hub in these fundamental areas*". This vision is substantiated by public R&I instruments to attracted and support innovators in Cyprus. The CHERRIES regional partners witnessed and experienced this development, too, accounting for: *"…a lot of funding schemes since the recession in 2013 to promote local knowledge development and entrepreneurship*".[9]

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[5] Barlow, J. (2016). *Managing Innovation In Healthcare.* World Scientific Publishing Europe.

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[7] Smets, M., Aristidou, A., & Whittington, R. (2017). *Towards a Practice-Driven Institutionalism.* In Greenwood, R., Oliver, C., Lawrence, T.B., and Meyer, R. (Eds.), The SAGE Handbook of Organizational Institutionalism (2nd ed., pp. 365–390). SAGE Publications ltd.

[8] Grillitsch, M., & Sotarauta, M. (2020). Trinity of change agency, regional development paths and opportunity spaces: *Https://Doi.Org/10.1177/0309132519853870, 44(4),* 704–723. https://doi.org/10.1177/0309132519853870

[9] *Evaluative conversation during April 2022 with Cypriot CHERRIES partners*

At the same time, Cyprus was undergoing a transition towards a general healthcare scheme (GHS)[10]. Especially after Cyprus became EU member in 2003, there was a national move to become "*more European*" and in adopting European standards and directions in both healthcare and innovation. Up until recently, health services in the Republic of Cyprus were delivered through a publicly funded health system, which entitled three-quarters of the population to access free of charge care at the point of use and a private health sector that was unregulated and contributed to high out-of-pocket payments (Mena Jara et al., 2020). This is ought to change with full implementation of the GHS, that claims that "*to implement the GHS, a people-centred system reflective of modern thinking and practices, which is based on the principles of social solidarity, justice and universality, both in regards to contributions and coverage*".

In this context, our entry point for understanding the regional eco-system were the Aretaeio Hospital (AIK) and the R&D centre CyRIC. AIK is a private hospital located in north-west Nicosia and CyRIC a regional R&I centre and accelerator that is one of the central actors in the emerging start-up system of Cyprus. CyRIC, via its incubator, invests in and supports technology-focused start-ups and businesses, providing the equipment and spaces for entrepreneurs to settle and develop their ideas. CyRIC itself is active in European projects and aims to create opportunities for the regional system it is embedded in. Bialoom is an example of CyRIC supporting the developed of new technologies and brining these actors into (European) projects to support their R&D. The Embrace Watch, developed during the "Social Challenges Innovation Platform" project, was an entry point for demand-oriented activities, reaching out to local municipalities for collaborations to develop solutions to existing municipal problems.

Project	Description
Bialoom	Bialoom is a start-up that develops sensors for diagnostics. Silicon plasmo-photonic sensors are used in disposable cartridges to quantify biomarker signatures from the patient blood. The technology is currently developed in projects but not yet available on the market.
Embrace Watch	The embrace watch is a wearable device that has been developed during an EU challenge-oriented project. It had the ambition to detect emotions of its wearers and had been tested in an elderly care home. The original product was not marketed but further developed in funded project.
E-Hcert	E-Hcert, developed and adopted in the context of AIK, is an archival solution based on the VeChain Thor blockchain for the Laboratory Results and Vaccination Certificates. Patients can share and control their medical data in a secure environment.
CHERRIRES Doctors Hello	The CHERRIES pilot implemented a telemedicine solution in the healthcare services of AIK. The focus of the experimentation was the integration of this novel practice, in the interaction between remote communities and their healthcare professionals as well as in the organisational and institutional context of AIK.

The E-Hcert solution has been developed and marketed in cooperation with AIK senior personnel. It promoted AIK's reputation as an innovative hospital that provides services in accordance with the latest standards. In CHERRIES, the experience of CyRIC in implementing demand-oriented processes and AIK in developing and testing healthcare technology and technology-supported processes were combined in the

[10] *See GesY.*

provision of telemedicine services. The Doctors Hello solution has been tested and adjusted to the contexts of the region. The Solution provided visibility to the project partners and won the responsible business award in Cyprus. As a result of this process, the former head of IT in AIK was promoted to the newly created role of Chief Innovation Officer.

Subsequently, AIK has been purchased by the Hellenic Healthcare Group under the American CVC group, which simultaneously acquired the medical department of the University of Nicosia with the idea to merge these entities into a research hospital. The recent profile of AIK as an innovator did at least not obstruct such a deal. The idea is that this deal is a starting point for advancing the innovation work of the hospital and to establish them as a key player on the interface between research, technology development, and the provision of medical services. Thus, similarly to the SMS innovation unit in Murcia, AIK could become a driver of innovation that is embedded in the healthcare system and thus, has access to the epistemic communities and their problems.

3. Research paper

How actors transform healthcare: combining evolutionary and institutional perspectives on practice

Abstract
Innovation is expected to ease the pressures that aging populations put on healthcare systems. However, healthcare innovations often fail. To understand why innovations fail, the opportunities and constraints of actors aiming to transform healthcare practices need to be understood. The paper compares the health and care development paths of Murcia (ES) and Örebro (SE) with a micro-perspective on agency, combining evolutionary and institutional approaches. It illustrates the dynamics of the agency-practice-structure relation and how actors aim to modify structural barriers for future practice. Finally, it discusses the implications of this relation for regional development and healthcare policy.

Keywords:
Agency, Practice, Structure, Healthcare, Institutions, Evolutionary Economic Geography

Introduction: The issue of change in healthcare practice

The healthcare sector is undergoing tremendous changes throughout Europe as the systems are facing increasing demand due to aging societies, chronic, degenerative, and other noncommunicable diseases (Nolte, 2018; Schiavone & Ferretti, 2021; WHO, 2021). In this context, decision-makers increasingly recognise innovation as a means to respond to these challenges and to support high quality, safe, and effective care (Barlow, 2016; Broerse & Grin, 2017; Greenhalgh & Papoutsi, 2019). However, healthcare innovations rarely achieve widespread uptake despite robust evidence of their benefits (Greenhalgh & Papoutsi, 2019; Haring et al., 2022; Saidi et al., 2020). This implementation failure in healthcare arises from conflicts between contradictory system elements, working cultures, convictions, and the organisational and regulatory context (Greenhalgh & Papoutsi, 2019; Haring et al., 2022).

Healthcare is part of the foundational economy, as it is a service that is consumed by all citizens and is essential for human well-being (Coenen & Morgan, 2020; Hansen, 2022). To fathom the barriers for the transformation of healthcare practice, the actors that consume, deliver and structure its provision need to be understood. In order to trace how actors perceive, create and act upon opportunities (Baekkelund, 2021; Grillitsch & Sotarauta, 2020; Miörner, 2022) for changing practice in its spatio-temporal context, this study combines the evolutionary perspectives of transformative change (Schot & Steinmueller, 2018) and path development (Hassink et al., 2019) with institutional perspectives that provide explanations for the organisational (Smets et al., 2017) and institutional (Thornton & Ocasio, 2008) structures that shape practice. Hence, the study contributes to the theoretical gap on the interface of evolutionary and institutional perspectives in the foundational economy (Coenen & Morgan, 2020; Grillitsch & Sotarauta, 2020; Miörner, 2020) by introducing a practice perspective (Nicolini, 2012; Smets et al., 2017).

This combination of perspectives allows us to investigate how actors are attempting to modify the structures and opportunities that enable or constrain them to transform healthcare practice. This question is discussed in two regional cases – in Murcia (ES) and in Örebro (SE). In both regions actors aim to transform the health and care systems through innovative practices. We illustrate how different trajectories are shaped by path-dependent structures and actor constellations, which results in a focus on innovation as development of new technologies in Murcia and on innovation as reconfiguring social relations in Örebro.

The remainder of the paper is structured as follows. It begins with a discussion of the concept of change in the context of evolutionary and institutional theories, covering the study's conceptual elements of transformative change, path dependency, practice, and agency. Based on these elements our research

concept, a dynamic interpretation of the agency-practice-structure relationship (van Raak & de Haan, 2017) that includes spatio-temporal dimensions, is introduced. We look at the two cases of Murcia and Örebro to empirically trace the role agency in the transformation of healthcare practices. To conclude, we discuss the implications of these findings for future research and regional development and healthcare policy making.

Literature Review: Combining evolutionary and institutional perspectives to capture change in practice

Transformative change and path-dependence in the foundational economy

The transformative perspective on regional healthcare systems entails a focus on the evolutionary dynamics of a sector of the foundational economy, which refers to the mundane services that are consumed by all citizens and which are essential for human well-being and that are often directly or indirectly provided by the state (Coenen & Morgan, 2020; Hansen, 2022). These sectors affect the quality of life, are characterised by low wages, and employ a high share of the population and, thus, have a significant importance for regional and social development (Hansen, 2022; Hassink, 2020).

While the research focus on transformative change and foundational economics is a rather new field in regional development (Coenen & Morgan, 2020; Hansen, 2022; Hassink, 2020), evolutionary economic geography provides insights on path dependent processes, which, however, are mostly focused on favourable conditions for innovation and growth (Coenen et al., 2015; Isaksen et al., 2022). In path dependent systems, mechanisms for creating novelty can be found in institutions and policy (Martin & Martin, 2017; Steen, 2016) as well as in capacities (Martin & Martin, 2017), or as upgrading through the integration of innovative technologies, organizational innovations, or business models (Isaksen et al., 2018).

However, in the face of "*wicked problems*" (Rittel & Webber, 1973), the traditional technology-neutral innovation frameworks have been criticised for falling short in addressing these complex and unstructured problems due to their lack of directionality (Mazzucato, 2016; Weber & Rohracher, 2012). By addressing this critique, Schot and Steinmueller (2018) suggested "*transformative change*" as a new frame for system innovation, integrating insights from sustainability transition studies (e.g., Geels & Schot, 2007; Grin et al., 2010) into innovation systems thinking.

In this understanding of innovation, transformation refers to the purposeful adaptations of the development trajectories that are embedded within socio-technical systems (Hölscher et al., 2018).This is widening the perspective of innovation studies as it acknowledges that transformative approaches require multi-scalar changes (Grin et al., 2010; Schot & Steinmueller, 2018), within socio-systems that are characterised by the co-evolution of material and social elements into well aligned socio-technical configurations that provide stability, meaning, and legitimacy (Grin et al., 2010). Thus, a systemic conceptualisation of transformative innovation must build on changes on different levels and dimensions (Fünfschilling, 2014).

From a perspective of transformative change, experiments gain importance as a means for producing knowledge and initiating change (Schot & Steinmueller, 2018). In context of practice-driven change, experiments can be understood as co-production and testing processes of new approaches or novel institutional arrangements for societal problems in "real" social environments (Fastenrath & Coenen, 2021; Wanner et al., 2018). Thus, numerous projects and interventions use experiments with the aim to facilitate participatory and collaborative co-production processes, integrating different ways of knowing and jointly develop knowledge that is actionable and contributes to effective and legitimate solutions for the transformation of society (Mach et al., 2020; Turnhout et al., 2020). Simultaneously, while an experiment's key outcome is learning, their contribution to transformation is less clear (Turnhout et al., 2020). Turnhout and colleagues stress that co-production processes can end up reproducing, rather than contributing to

societal transformation, if they stay within confined project boundaries without engaging the wider political context.

A Practice-Driven Institutionalism perspective on change

In order to understand how actors can initiate transformation processes that aim at changing the practice of healthcare, this study further builds on neo-institutional theory (DiMaggio & Powell, 1983; Tolbert & Zucker, 1999) and practice-driven institutionalism (PDI) (Schatzki, 2001; Smets et al., 2017), which are both building on the seminal works of Bourdieu's theory of practice (1977) and Giddens' structuration theory (1984). Both theories aim to explain the social dynamics of the recursive relationship between actors and structures, where individual actors, practices and structures exist in a continuously emerging state of reciprocity and interconnectedness by which they generate, maintain and change social systems (Smets et al., 2017).

In this context, Schatzki (2001) defines practices as "*embodied, materially mediated arrays of human activity centrally organized around shared practical understanding*". Whereby, any practice is comprised by multiple interrelated and interdependent activities that are specific to their spatio- temporal context (Feldman & Orlikowski, 2011), and thus are collectively meaningful and a source of stability and legitimacy (Schatzki, 2001; van Raak & de Haan, 2017). While any activity is enacted by individuals, practices, or bundles of practices are usually implemented by organisations, hence, for practice theory the basic unit of analysis is "*the practice*". In this context, organisation can be conceptualised as interrelated bundles of practices (Smets et al., 2017). Further, as extension of this understanding, structures can be interpreted as the organisations that constitute an area of practice (DiMaggio & Powell, 1983; Fraser et al., 2019) and the institutions like regulations, values, norms, or logics by which individuals and organisations produce and structure their social reality (Thornton & Ocasio, 2008).

In this understanding, the origin of change is located in practice (Smets et al., 2017), which entails that change arises from everyday work in which actors develop the need and direction for change (Bridwell-Mitchell, 2016). Due to the duality of structure and agency, change in practice can trigger further organisational and institutional changes (Battilana et al., 2009; Smets et al., 2017). This is the case when novel practice unfolds effects beyond the organisation and moves to the field, whereby practice do not accumulate entirely accidentally but are implicitly coordinated by communities of practice (Bridwell-Mitchell, 2016). Whereby, practitioners progress through a stage of practices evaluation from which they develop the preferred solution. For instance, decision-makers faced with a proposed new practice do not adopt it directly but first aim "*to learn more about the practice itself, about others' reactions to it, and about potential ways to reduce complexity by adapting the practice to balance constituents' interests*" (Raaijmakers et al., 2015, p.40).

Opportunities for change

To reconcile the evolutionary and institutional perspectives introduced above, recent contributions in economic geography provide a perspective to understand constrains and opportunities that actors face when they try to initiate change. This conceptual link between structure and agency has been introduced by Grillitsch and Sotarauta (2020) as the notion of opportunity. The authors describe an opportunity space as a time-specific set of circumstances that enables change. Opportunity spaces are formed, perceived and used by individual actors or groups of actors and serve as a conceptual bridge between structure and agency (Grillitsch & Sotarauta, 2020; Kurikka et al., 2022; Miörner, 2022). Thus, the perception of opportunities and the capabilities to realize them vary between actors and regions. Imaginaries (Miörner, 2022) or social filters (Kurikka et al., 2022) represent cultural–cognitive institutions that shape actor's perceptions and, thus, restrain or empower actors in taking advantage of opportunities.

In this context, opportunities are addressed by human agency through intentional, purposive and meaningful actions, and the intended and unintended consequences of such actions (Grillitsch & Sotarauta, 2020).

Action here builds on the reflexive use of knowledge, resources and relations (Suitner et al., 2022), aims to change or reproduce practice (Baekkelund, 2021) and, by extension, the structural contexts it is embedded in (Battilana et al., 2009). The directionality of this agency depends on experiences and perceptions of future opportunities (Steen, 2016), the preferences and competences (Raaijmakers et al., 2015; Windrum & García-Goñi, 2008) as well as the mix of complementary and conflicting interests of the involved actors (Greenhalgh et al., 2018). Which highlights the importance of power in actor constellations (Avelino, 2021). As such, agency becomes important for articulating critique on current practice, developing actionable solutions within experiments, and mobilising others around a future practice to ensure its adoption (Battilana & Casciaro, 2021).

Based on these reflections on the role of agency, practice, and structures, we introduce our conceptualisation of transformation and change in practices in the following section.

Research Concept: A multidimensional framework for capturing transformation through practice in healthcare

To empirically capture actors' attempts to transform practice in regional healthcare systems, a micro-perspective on agency must be combined with a meso-perspective on the embedding of practice in organisational and institutional structures. The micro-perspective is important, as the transformation of practice and thus the embedded directions of a system (Fünfschilling, 2014; Schot & Steinmueller, 2018) requires purposeful human action (Suitner et al., 2022) and the capability to reconfigure the regional environment in which they are situated (Miörner, 2022). However, since the ability to act is shaped by structural conditions that pre-exist actors (Giddens, 1984; Leca & Naccache, 2016) we embed our analysis of agency in a multidimensional framework that takes the reciprocity and interconnectedness of actors, practice and structures as well as the spatio-temporal context into account (Grillitsch & Sotarauta, 2020; Smets et al., 2017).

The conceptual core of our study is a dynamic interpretation of the agency-practice-structure relationship (van Raak & de Haan, 2017) that includes spatio-temporal dimensions as well as a notion of transformative change. It combines practice-driven institutionalism (Schatzki, 2001; Smets et al., 2017) with a focus on the path-depended structural opportunities and constrains of the regional healthcare sectors (Barlow, 2016; Miörner, 2020), that shape the way actors make reflexive use of their resources and relations (Suitner et al., 2022). Whereby, we understand structures as the socio-technical configuration of the organisations and institutions of the healthcare system (DiMaggio & Powell, 1983; Thornton & Ocasio, 2008).

The transformative change perspective further entails that actors search within this opportunity space for future practices through experimentation, societal learning, deliberation and negotiation as a means to create practice-based experience about the (dis)advantages of particular innovation pathways (Schot & Steinmueller, 2018; Smets et al., 2017; Turnhout et al., 2020). Whereby the interconnectedness of practice and structure puts the system's selectivities (Miörner, 2020) and co-evolution between structure, agency and future practices at the forefront (van Raak & de Haan, 2017). Due to the non-linear nature of innovations, these transformation pathways consist of gradual reorientation of the existing structures and actors in the context of exogenous pressure and societal debates (Geels et al., 2016).

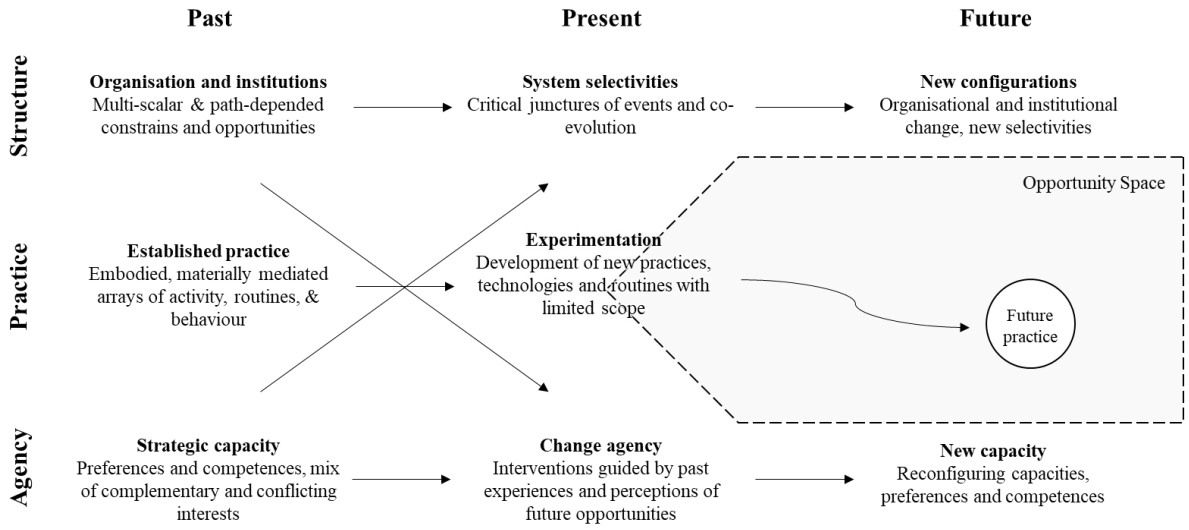

Figure 4: Dynamic model of practice transformation within the structure-practice-agency triplet

We conceptualise agency as purposive human action that builds on reflexive use of knowledge, resources and networks with the aim to change or reproduce practice (Baekkelund, 2021; Grillitsch & Sotarauta, 2020; Suitner et al., 2022). The directionality of this agency depends on factors like experiences, future-oriented perceptions, preferences and competences, or the strategic interests of the actors involved (Greenhalgh et al., 2018; Steen, 2016; Windrum & García-Goñi, 2008). Change agency is enacted in experimental or project contexts that diverge from current ways of doing.

Thus, we further conceptualise experiments as practice-oriented form of governance interventions that interact with place-based challenges by taking action and implementing potential solutions in real-life situations as a means of learning about potential future practices (Fastenrath & Coenen, 2021; Wanner et al., 2018). Thus, experiments are testing the opportunities for future practices in their structural contexts. The set of circumstances that make a change possible can subsequently be understood as the opportunity space for future practice in relation to structure (Grillitsch & Sotarauta, 2020). Whereby, we understand the opportunity space as a regional phenomenon that is constructed and transformed by actors over time (Miörner, 2022).

This concept, combining an evolutionary with an institutional perspective on agency, equips us with the analytical lens to understand how actors are constrained, attempt to modify structures, and construct opportunities for the development and adoption of innovative practices in regional healthcare systems. In the next section, we describe how this concept has been operationalised empirically.

Aiming to transform practice: Two case studies

Methodology

We have developed our methodology through a combination of path-tracing (Sotarauta & Grillitsch, 2022) and Nicolini's toolkit to study practice (2012). Both approaches, while stemming from different traditions, focus on the social and material contexts of actions that we conceptualise as outlined above. Capturing the micro-perspective of agency in combination with the meso-perspective on the transforming healthcare paths requires a context-sensitive mixed-method approach. Sotarauta and Grillitsch (2022) propose path tracing as a combination of process tracing and structured narrative analysis as a way of linking micro-processes of agency to regional development. Nicolini (2012) proposes an eclectic approach that alternates between zooming in on practice and zooming out to understand effects and association between practices. This zooming requires

moving between practice in the making and the texture of the practice, that connects one instance to many others.

Following Suitner and colleagues (2022), we use innovation projects and experiments, as micro-process events of change agency, as a starting point of our study. We zoom in on new practices in experiments to understand the material and discursive dimensions of it and subsequently zoom out to capture the arrangement of practice in its organisational and institutional context (Nicolini, 2012). The focus on innovation projects, experiments, or pilots thereby is important as they provide actors the space for negotiating and legitimising future practice. The zooming out provides the context for understanding the transformative requirements during the implementation of novel practices in a sense of translation and reconfiguration, understanding how new innovations reconfigure existing, dominant practices (Latour, 2005). By studying a sequence of innovation projects in each context, we trace how key actors in respective regional healthcare innovation settings created and changed their approaches and narratives for innovation. By connecting these events, actors, and narratives to institutional and organisational changes we create a link between change agency and the spatio-temporal development paths (Sotarauta & Grillitsch, 2022), that allows us to scrutinise how actors attempt to modify the structures and opportunities that enable or constrain them in transforming regional healthcare systems through innovative practices.

The laid-out approach demands a holistic understanding of the processes and relations that constitute the development of new healthcare practice at the two empirical contexts we focus on and demand a strategy of inquiry that accommodates such understanding. As mentioned before, we chose a case study approach (Starke, 2005). It is particularly well-suited as it allows for describing "*phenomena within real-life contexts from the perspective of those involved*" (Boblin et al., 2013, p. 1267) and thereby allows for describing the contextual dynamics that shape and maintain innovations with healthcare. The empirical work consists of various participatory engagements throughout a three-year project funded by the European Commission that focussed on increasing pressures on the healthcare systems that makes the current practices and sectoral structures unsustainable.

Throughout this project, we followed regional key-actors, which resulted in both planned and unplanned moments of data collection. Former includes (1) a network analysis of regional stakeholders and regional technoscientific competences (see Mena-Jara et al., 2021); (2) five qualitative case studies of innovation projects in each region (Suitner et al., 2022); and (3) interviews with actors about imaginaries and narratives (Miörner, 2022; Sotarauta & Grillitsch, 2022). The interview guidelines followed the approach of Suitner and colleagues (2022) and aimed at capturing agency in different steps of the innovation process. In total, 32 interviews were conducted online and in-person during February 2021 and October 2022. Each interview took about 60–120 minutes and was audio-recorded for later verbatim transcription. The innovation case interviews were transcribed and coded with MaxQDA software, using a deductive thematic coding approach. For matters of readability, references to the empirical material were coded. For detailed information on these materials, see Tables A1 (interview data) in the supplementary data.

Murcia case

The Spanish region of Murcia has around 1,5 Mio inhabitants of which half lives in the cities of Murcia and Cartagena. The economy is primarily specialized along agricultural value-chains and related services with policy foci on agri-food, water cycle, environment and, logistics (Mena-Jara et al., 2021). Murcia is regarded as a moderate innovator in the European landscape.

The regional public healthcare system consists of the Servicio Murciano de Salud (SMS) and has around 23,000 employees, in 11 hospitals and 85 healthcare centres, which makes SMS is the largest company in the region and, further, with approx. 2 billion EURO SMS consumes around half of the regions budget (MI1).

In general, the Spanish health sector is mainly public and private providers only exist on a marginal level. Since the early 2000s, the policy competences and budgets for healthcare have been transferred to the regional level, leaving the national ministry with a coordinating role (Mena-Jara et al., 2021). The regional actors see the Spanish and Murcian healthcare system as good, with a focus on a strong primary care (MI11) but a general trend that is putting "*pressure on the healthcare professionals*" (MI3) with increasing calls to focus the services on prevention (MI1, MI3, MI10). Whereby, regional healthcare professionals see the increasing demand on special services (e.g., access to specialist treatment and monitoring, rehabilitation) as a specific challenge that needs to be addressed to keep the healthcare system stable (MI10).

Within the Murcia region, a network of innovative Small and Medium Enterprises (SMEs) and start-ups aims to contribute solutions to these challenges by developing digital health and other data and technology-driven services for healthcare practice. Often described as a closely linked eco-system (MI2), it is fuelled by a strong collective regional identity built on commonly shared values that cast Murcia as a knowledge-producing economy. Central to this network is Ticbiomed (TBM), a cluster for digital health, supporting these actors since 2012. In 2022, TBM counted 64 members from Murcia and increasingly also the rest of Spain. SMS describes TBM as "*the most valuable ally, as evidenced by our collaborations in multiple projects*"[11]. The cooperation between TBM and SMS has had a significant impact on the way innovation activities are organised within the regional structures and on the opportunity spaces of the involved actors. From 2014 onwards, the collaboration between TBM and SMS resulted in the successful participation in FP projects. Through these projects, SMS profiled itself as an actor within the healthcare innovation system and subsequently adjusted its organisational structures by creating an innovation unit (SMS IU) to manage these projects operatively, showing how significant these projects were in relation to ongoing reflections about healthcare in the region.

Project	Description
FICHe	In the FICHe project, the Neuro-at-home pilot has been developed. The solution aims at supporting physical rehabilitation of patients in a clinical setting or at patients' homes. The platform supports personalised treatment and training plans for patients and gives clinicians the opportunity to follow a higher number of patients.
ProEmpower	The DM4ALL tool, developed during the H2020 project ProEmpower, is a digital healthcare solution that supports diabetes patients in collecting as a basis for self-management and supports healthcare professionals to follow and interact with their patients remotely, thus reducing the need for face-to-face meetings.
inDemand - Deep diver	The Deep Diver pilot uses Natural Language Processing algorithms on electronic health records to identify Asbestos-related occupational diseases. The algorithms flags healthcare records for review with the aim to support patients in receiving compensation and shifting the costs of treatment to employer financed insurances.
inDemand - EPICO	The EPICO pilot is an App for epileptic patients that aims at improving the patient-doctor communication and supports the self-management of patients. It seeks to improve the patient-doctor relationship through continuous engagement and monitoring, with the aim of preventing crisis and seizures.

[11] https://ticbiomed.org/en/testimonials/

CHERRIES – MS Progress	The MS Progress pilot aims at developing a wearable sensor that tracks the movements of multiple sclerosis (MS) patients, in order to deploy a kinetic algorithm that is able to detect the MS attacks early. This provides an opportunity to intervene early to stop the attack and, thus, slow the progression of the disease.

The first projects (FICHe & ProEmpower), had a focus on the development and scaling of digital health solutions, whereby SMS participated as testing site for solutions, clinical mentor, and offered support for integrating solutions into currently used Information Systems and tools (MI1). In both cases, solutions for the remote support of physical rehabilitation (FICHe) or diabetic patients (ProEmpower) have been developed and tested. The reasoning in both cases is to allow healthcare professionals to follow more patients and to provide services building on the empowerment and self-management of patients, thus decreasing the time a doctor needs to allocate to a patient. These approaches break with prevailing paternalistic (MI10) practices and aim to empower patients:

> "*…any innovation that goes towards that empowerment, I think it is very good and necessary, because in the future I sincerely believe that we are not going to be able to carry out all the health tasks that you think we should."* (MI10).

While the solutions were successfully evaluated by involved patients and doctors alike (FICHE, ProEmpower, MI10, MI11) the solutions were not adopted in the context of SMS. The solutions were contested as they challenged the institutional logics of healthcare professionals. Thus, this technology-push approach left the SMS IU unsatisfied (MI1).

This led to the development of the TBM coordinated inDemand project, that builds on bottom-up demand-orientation, Open Innovation, and co-creation led by healthcare professionals. This approach resulted in the development of eight innovation pilots in Murcia (Deep Diver, EPICO), that were developed in cooperation with adjacent SMEs, that received cascading project funding. The demand-orientation goes beyond projects by "*creating a culture inside our entity in which decisions are more demand driven*" (MI1) and thus this change affected the organisational culture, which is regarded as the central outcome of this project (MI1, MI2). It further, opened opportunity spaces for the regional entrepreneurial system, by providing access to funding, real use cases and organisational contexts (Deep Diver & Epico). The quality in which SMS implements these processes are valued by the entrepreneurial partners (MI7, MI9). Finally, the CHERRIES project (CHERRIES) opened the demand articulation process to patient organisations and involved local universities in the definition of suitable solutions. Further, the CHERRIES experiments included shared ownership between SMS and external innovators, which potentially would generate licencing fees for the public healthcare system.

Over this series of projects, the agency to shape future healthcare practices shifted from external companies and projects that saw the healthcare system mainly as testbed for solutions (FICHe, ProEmpower) to the SMS IU, the healthcare professionals and, lately, to patient organisations. SMS sees this broadening as a way towards developing more inclusive and fair healthcare practices (MI1). During these projects, the logic of the innovation processes as well as the nature of the future practices changed. The external technology-push of earlier projects has been substituted by a market-pull approach (Deep Diver, EPICO, CHERRIES), that builds on inclusive and co-creative negotiation processes between technology providers, healthcare, and patient users. While the acceptance of involved actors increased throughout this development, the issue of adoption is still challenging for SMS, as intra-organisational inconsistencies between the SMS IU and other departments in SMS prevail.

> *"Resistance to change is normal when you are undergoing deep transformations. It happens at individual and organizational levels. We are not talking about disruptive changes but of change that needs a maturation process." (MI13)*

Hence, the nature of the envisioned future practices is still contested and subject of an ongoing negotiation process between the different actor groups. The SMS IU, as main change agent, does not have a mandate to initiate changes in the structure and can destabilise existing practices only by creating alternative visions. To increase the vigour of these visions, the SMS IU strategically builds a network of allies from policy and industry (MI20 to circumvent the structural resistance that leads to the non-decision in terms of adopting new practices. However, while the future practices are not adopted in the context of SMS, the opportunity space created for entrepreneurial actors leads to innovative solutions that are adopted in different contexts (FICHe) or further developed by these actors (Deep Diver, ProEmpower, CHERRIES).

Örebro case

The Swedish Örebro County has around 300.000 inhabitants, of which half is living in the central city of Örebro. Most of the region is comprised by rural areas, organised, and governed in small municipalities and often shaped by a localised industrial specialisation. In part through this long industrial tradition and a strong manufacturing basis, Örebro County ranks among the leading European regions in R&D expenditures and as innovation leader (Mena-Jara et al., 2021).

In Sweden, responsibility for public healthcare is a shared responsibility between the national government, regions, and municipalities. Whereby, the Örebro County is the main public healthcare provider running several healthcare centres, and three hospitals with 8.000 employees (ÖI6), the County spends around 1 billion EURO on healthcare services, whereby the costs grow each year and political pressure to reduce spending is increasing (ÖI10; ÖI6). The municipalities provide social care services including home care and care homes. Small private health and care service actors, incl. Civil Society Organisations (CSO), offer services as well. Overall, the health and care systems perform well and provide good access to high quality care. However, the ageing population, chronicity and comorbidity is increasing the sectoral demand, especially in terms of long-term care (ÖI2, ÖI3, ÖI7, ÖI8), and the sector is increasingly confronted with a shortage of human resources, where healthcare centres cannot fill positions for all qualification levels (ÖI12).

These pressures lead to a situation where the welfare system is reaching its limits, which reflects the general trend of the retreating Swedish welfare state, whereby the old Swedish social contract of

> "*You work. You pay your taxes. The state takes care of you!*" (Participant in WS)

is losing validity. These pressures initiated a "*paradigm shift*" (ÖI10) towards patient-centred and integrated care under the umbrella term "*close care*" (ÖI7). This shift entails a move from "*best available care*" to care that is "*good enough*" (ÖI10) and financially sustainable. This emphasises the pressure on the healthcare system and the limits of the welfare system in general. Municipal healthcare is one of the sites where these pressures play out (ÖI1, ÖI2, ÖI3, SIF). In this context, municipal actors implement change projects, searching for new ways of organising social care services (SIF, TABB, REH), and actively seek the cooperation with CSOs (SÖT). Whereby, one of the biggest challenges is the coordination between "silos", the gaps between practices and structural inconsistencies that hinder collaboration between various actors (ÖI8, ÖI10).

Project	Description
RAPP	RAPP is an app-based application for follow-up on post operative recovery of day surgery patients. It opens a communication channel between patient and healthcare provider for monitoring and understanding of post-surgery symptoms.

TABB	The *Tillsammans för alla barns bästa* project, aims to explore the transferability of the Scottish GIRFEC (Getting It Right For Every Child) approach to Örebro. It aims to create an integrated case management on the interface of school, social, and healthcare services, as an early intervention that prevents public expenditure later in life.
SIF & SÖT	The Social Investment Fund (SIF) of the Örebro Municipality support the experimentation with new practices and transforms the way public services are provided. One of the investments was the *"Samverkan för teckenspråkiga"* (Collaboration for sign language practitioners) project, that supported the labour market integration of people with hearing and cognitive impairment in cooperation with the Activa Foundation, a local CSO.
REH	The Rehabiliterande Arbetssätt in a project that supports the transition towards close care, which is person-centred and integrated care model. The approach moves from compensating for an individual's lack of abilities to an empowering and rehabilitative approach, that supports a good and healthy life with as much independence as possible.
CHERRIES	The pilot "Seniors lead Seniors" aims at identifying involuntarily lonely elderly people and engage them in activities of the *Seniorkraft* programme, which consist of social and health related activities. The programme provides social context and meaning, physical activity, and encourage good eating habits, as a preventive approach.

This multi-level governance and the differences in epistemic institutions make it difficult to define shared problems, solutions, and the collective value they create (ÖI8, ÖI10, ÖI11). These structural features create barriers for collaboration between public bodies and CSOs as well as within large organisations, like e.g., the County administration, and often rely on project-based activities and good relations between actors (ÖI10). Subsequently, the search for future practices includes not only a variety of actors and bottom-up experimentation, but also questions of multi-level governance. This is creating a complex environment of constant change that is threatening to tire organisations and professionals (ÖI2). Aware of these collaboration failures and promising initiatives, and to coordinate and support these endeavours, the Regional Development Department of the County initiated the Partnership for Social Innovation (PSI) in 2015 (PSI, 2021, ÖI6, ÖI8). Nowadays, the PSI is a network of more than 40 regional organisations from the social economy, the local university, municipalities, and County that aims to "*strengthen the conditions for addressing societal challenges with socially innovative approaches*" (PSI, 2021). The PSI establishes a network, provides an arena for exchange of experience, and provides project support (PSI, ÖI8, ÖI6).

The implemented social innovation projects, created in this environment but not necessarily as a direct effect of the PSI, not only aim at changing practices but also intentionally address structural aspects. The Social Investment Fund (SIF) as well as the *Rehabiliterande Arbetssätt* (REH) project address institutional logics by integrating an output-legitimacy into the provision of public social services (ÖI1, ÖI2). The *Tillsammans för alla barns bästa* (TABB) project aims to develop an integrated case management between school, health, and social care services and thus reduce the fragmentation of these services (ÖI5). Through these collaborative projects, the regional actors did not only jointly develop new approaches to social challenges but also built up a shared and professionalised understanding of how to implement change processes. European and national project funding (e.g., CHERRIES) provided further agency to network actors to pursue change in social care according to their vision for the future. This experience in social care and the policy push towards close care encouraged actors to extend their activities with a more pronounced focus on healthcare. Whereby, the idea is that collaboration between healthcare providers and CSOs in preventive and rehabilitative services for elderly people would reduce the pressure on the healthcare system (ÖI8, CHERRIES).

In the context of an FP project (CHERRIES), first experiments have been conducted following this reasoning. The healthcare management, which is organised in a different unit of the Örebro County administration, is struggling to respond to these new actors (ÖI10, ÖI6). While there were ongoing cooperations with municipal social care services, the sentiment was that first, you need to establish a cohesive system of the classic actors of health and social care before you open towards CSOs (ÖI10). Further, in a time of budget restrictions the healthcare system is challenging the legitimacy of investing funds, that are meant for the healthcare sector, in collaborative pilots with actors outside this budget line (ÖI10). In parallel, the PSI network actors miss an arena for exchanging ideas with the healthcare sector that they established in the context of social care (ÖI8). In general, the institutional differences are perceived as challenging for this cooperation:

> *"Social innovation is a strange thing for many healthcare professionals because social innovation is something that is well, you don't know what it is when you start, you don't know where you land"* (ÖI6)

In Örebro County, the establishing of the PSI, consolidated an active community searching for new practices and collaborations in a multi-scalar and multi-level governance system of social and healthcare services. This structure empowers this system of actors and supported an alignment of perceptions. The policy push for close care is further enabling change agency with the objective to alter the relations between actors and in "*the ways we work*" (ÖI7, ÖI8) on the intersection of social and healthcare practice.

Discussion

The starting points for the observed trajectories depart from different actor networks and governance structures. In Murcia, the intra-organisational structuration of SMS shapes current practices while in Örebro the multi-level governance between municipalities and County creates a collaboration-oriented, yet complex environment that creates silos and fragmented practices. Further, the impulse for change arose in different loci. In Murcia, the entrepreneurial digital healthcare actors aimed to push their vision of the future into the system while in Örebro, the search for new practices arose from public actors and CSOs. This path-depended differences in structuration and actor constellations shapes varying directionalities for the search for new practices.

The main narrative in both regions is that actors aim to find new practices to provide and structure healthcare and social services as a reaction to increasingly unsustainable dynamics within the regional healthcare systems. This process in both regions is place-based and path-dependent and thus varies in processes and outcomes. The cases of Murcia and Örebro show how actors negotiate future healthcare practices as a dialogue between change and reproduction and how these dynamics shape and are shaped by structures. The regional opportunity spaces are shaped by both the regional structures as well as actors that aim to embed change within these complex systems.

As a reaction to these developments, both regions established new structural elements, the SMS IU and the PSI respectively, which provide and themselves have agency geared towards change. The SMS IU is a result of a supply-oriented approach as an interface for exploration and early testing, initiated by FP funding. It adds a new system element that has a (limited) mandate to engage in change processes through international R&I projects. The location of the unit within the healthcare system is important, as, first, it situates its work within the healthcare community of practice and, second, gives them an intimate understanding of the pressures on the provision of the healthcare practice. The PSI, in contrast, is picking up and strengthening a paradigm to solve problems that is rooted in regional cultural institutions. It did not create but systematise this approach by building a network and arena for deliberately tinkering with potential future practice. Through its project support the PSI is also providing change agency to the network partners.

In both regions, this structural change transformed the regional opportunity spaces for experimenting with future practices and solidified new healthcare paradigms. Thus, both regional systems created their own dynamics to address major challenges, which can be interpreted as a first level change within the structural selectivities. This opens possibilities for searching and experimenting with potential future practices. This search is based on projects and experimentation processes that aim at deinstitutionalisation of current, stable practices and, thus, changing the selectivities for potential future practices, which can be interpreted as a second level change. However, these experiments come with the caveat that experiments hardly transform structure and thus cannot overcome the need for a co-evolution between practice and structure. In the case of Murcia, the non-adoption of solutions illustrates this difficulty.

Over the series of experimentation, the actors' characteristics as well as the composition of actors changed. The experience gained by key-actors altered their approach to these projects and thus, in Murcia, the processes got opened while in Örebro an alignment between the social innovation work and transformation towards close care was initiated. As such, the experiments were a central element for producing situated, experiential knowledge and use it to adjust the visions of future practice as a foundation for transformation. The interaction of these different actor groups in the experiments can be interpreted as a negotiation process between transformation and conservation. In Murcia, radically new approaches from external companies changed when healthcare professionals and patients were included in the definition of innovation needs and solutions. In Örebro, social care actors developed new approaches and now want to expand towards healthcare, whose actors are reluctant to and prefer change within the existing system.

In both regions, the development and implementation of novel practices is mostly organised through experimentation in projects and pilot actions. Whereby, actors agree that change is needed, however, struggle to negotiate change in organisational and institutional structures. The gatekeeping and conserving approach of dominant actors can be an obstacle for embedding innovative practices, especially when created by external actors. And whilst the experiments are supported by those dominant actors themselves, through establishing the SMS IU or the PSI for instance, they remain non-threatening to established actors and structures. This becomes especially visible when it comes to implementations, as conflicts arise that hamper the adoption of new approaches.

These conflicts arise from two aspects. First, the contestation of future practice, and second, the need for co-evolution in the agency-practice-structure relation. In both regions, actors developed strategies to engage with this difficulty. In Murcia, the focus on demand-orientation and co-creation aims at developing accepted solutions and early support from relevant actors, however, they still search for implementation approaches to overcome structural resistances. In Örebro the strategy builds on establishing arenas for deliberation to create shared imaginaries and a joint understanding of sectoral needs. Its discursive nature enabled successful transformations within one epistemic community but faced issues when trying to expand to a different community that is not part of the original arena.

In the specific and highly structured context of healthcare systems, experiments are key for shaping future healthcare practice and subsequently, they test emerging opportunity spaces for novel practices. In healthcare, no actor can implement future practices on their own but rather needs to engage in a multi-actor negotiation process, about the nature of the future practice. Thus, these actors, based on their power and position in the system, create and transform the opportunity space for healthcare innovation in a collective effort. The opportunity space, in the specific and highly structured context of healthcare systems, can be interpreted as the sum of all potential future practices and it is shaped by actors and structures, from within or outside the region (e.g., EU policies and funding), and is thus path dependent as well. In both regions, the opportunity space has been part of a dynamic development during the last years. The new structures created opportunities for change agency through new projects for embedded actors as well as for actors that are outside the core of the healthcare system, e.g., the eHealth companies in Murcia or CSOs in Örebro.

Through the series of projects these nascent development trajectories stabilised and new practices were established in Örebro and new business opportunities were created in Murcia.

Thus, the experiments created tangible outcomes in both regions. The system level agency, in the form of establishing the SMS IU and the PSI, and the experimentation through projects strengthened the digital healthcare eco-system in Murcia and the CSO network in Örebro. These actors gained capabilities to engage in change agency activities and actively shape the future of healthcare practices. In Murcia, the technology-supported practices are contested within SMS but some of the solutions are further developed and marketed outside the regional context. In Örebro, the CSO sector is embedded in social services and increasingly cooperates with the public actors in the implementation of services, which allows to maintain the level of services while reducing the pressure on municipalities.

Conclusion

In this paper we investigate the role of agency in the transformation of healthcare practices in two regions. We argued that a time- and space-sensitive focus on the agency-practice-structure relationship is well suited to understand opportunities and constraints of actors that try to transform dominant healthcare practices. Whereby the transformation of practice, as the embodied, materially mediated arrays of human activity, is negotiated between interconnected actors and structures with different interest in transformation and conservation through which they generate, maintain, and change social systems. By introducing practice and the societal negotiation of future practices as intermediate level between agency and structure, our framework supports the reconciliation of evolutionary and institutional perspectives on change. As future practices are shaped and positioned within socially constructed opportunity spaces, we contribute to the emerging stream of literature in regional development studies on agency.

Our approach to study the transformation of practice combines a micro-perspective on agency with meso-perspective on changes in regional structures and is thus well-suited to trace changes in complex social systems. We demonstrate the applicability of our framework by studying the development trajectories of Murcia and Örebro. In both regions, actors aim at transforming the embedded development directions by institutionalising new ways of developing innovative practices. However, these new approaches are nascent and the transformation in the making. While both regions face similar challenges, the observed development trajectories diverge as differences in organisational and institutional structures enabled change agency in different actor groups with varying perceptions of future practice. These actor groups accumulated expertise and professionalised their change actions as their perception of "*what is possible*" changed over time.

The reciprocal relation in the agency-practice-structure relation is critical to understand the transformation trajectories in both regions over time. Both regions established new structural elements that provided change agency to regional actors, which changed the selectivities of the regional sectors in favour of experimentation and the search for future practice. This space has been used by actors to experiment with alternative future practices. These experiments, despite their non-adoption, change the narrative and alter the selectvities towards transformation. The change in structures can be interpreted as first level change in the selectivities while the alternative future practice creates a second level change on the level of the practice. The co-evolution between actors and structures that new practices require, however, leads to contestation and creates an adoption barrier.

The healthcare sector, as a part of the foundational economy, provides a specific context for methodological approach. The required reconfiguration processes in actor-relations and capacities, as well as organisational and institutional changes makes the transformation of healthcare contested and the process inherently political. It is depending on an alignment between different actors with different resource and power endowment as well as competing visions of future practices. This negotiation and alignment are achieved in experiments and projects that produce knowledge about advantages and issues of potential future

practice. These projects take place outside established structures and are not threatening to established actors and structure, who, however, are able to obstruct an adoption at a later stage. This accentuates that experiments provide a context for learning but fall short when the objective is to adopt new practices or transform structure as these questions are inherently political and depend on multiple actors and decision-making power.

These results, thus, have implications for regional development and healthcare policy. Collaborative and practice-orientation innovation strategies in the healthcare sector, with its effect on the quality of life and high employment share could provide a means to combat social polarisation and interregional inequality (Hansen, 2022). Both cases illustrate that changes in structures that enable regional actors to experiment with future practices can initiate a dynamic development that has the potential to further transform regional actor's capabilities as well as the organisational and institutional structures that shape public services. However, the directionality that change is taking depends on the negotiation between different actor groups. Thus, a policy intervention should support the deliberation within the problem-solution space (Wanzenböck et al., 2019) and aim at achieving an alignment of actors' visions as basis for experimentation. The case of Murcia illustrates how the public sector can use such a strategy to gain access to innovative solutions and licencing fees at the same time. Thus, the healthcare systems with their purchasing power could be an element of an entrepreneurial public sector (Mazzucato, 2016).

The purpose of this paper is to shed light on the role of agency in the transformation of healthcare practice and on the processes through which actors create and act upon opportunities and constrains. While our findings provide valuable insights in this field, there are also certain limitations to the paper that indicate further research needs. First, the extent of spatial and specialist variation in regional healthcare systems will require a complementation of our cases with other contexts. Applying our conceptual framework to other sectors of the foundational economy could additionally provide valuable insight on the innovation dynamics in a part of the economy where these processes are not understood well. Second, the transformation in both regions is in the making and studying more advance contexts could help to identify promising practices of adoption. In this regard, an exchange with implementation sciences could lead to fruitful results (e.g., May et al., 2016). Third, the multi-actor dynamics in the development and alignment of visions of future practice puts the power struggles between actor groups into focus, which demands further inquiry (Avelino, 2021).

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Supplement data

Interview code	Interviewee
MI1	Innovation manager in SMS
MI2	EU project manager at TBM
MI3	CEO of TBM
MI4	Innovator and entrepreneur
MI5	Innovator and entrepreneur
MI6	Doctor in SMS
MI7	Innovator and entrepreneur
MI8	Data Scientist in SMS
MI9	Innovator and entrepreneur
MI10	Nurse in SMS
MI11	Doctor in SMS
MI12	IMIB
MI13	Senior official Murcia Region
MI14	SMS
MI15	Senior official Murcia Region
MI16	Innovator and entrepreneur
MI17	IMIB
MI18	Patient Organisation Representative
MI19	Patient Organisation Representative
MI20	Senior official Murcia Region
ÖI1	Senior official in municipality of Örebro
ÖI2	Senior official in municipality of Örebro
ÖI3	Senior official in municipality of Örebro
ÖI4	Professor in nursing and innovator
ÖI5	Senior professional in education system
ÖI6	Senior official in Örebro County
ÖI7	Senior official in Örebro County
ÖI8	CEO of CSO
ÖI9	Senior official in Örebro County
ÖI10	Director Healthcare - Örebro County
ÖI11	Director Regional Development – Örebro County
ÖI12	Manager Healthcentre Karlskoga

Annex

Informed consent

Purpose

The purpose of this study is to better understand innovation pathways in healthcare and subsequently inform policy makers on regional level what policy instruments might be best suited to achieve set aims based on regional specialisations and priorities. The results will inform the implementation of the CHERRIES project and will be published in academic journals.

Privacy and confidentiality

Responses you give in the interview will be documented in anonymised form. Hence, it will not be possible to identify you as the source of information, unless you explicitly wish your name to appear (please inform us if this is the case). Regarding the documentation, please let us know whether:

- You are ok with being audio/video recorded (provided that data is anonymised; speaking off record is possible at any time upon your indication).
- You are explicitly do not want to be recorded, but I agree with Cherries researchers taking notes.

Your documented data will be stored on secure servers at ZSI, Vienna, until further notice. We will do our utmost to protect data and ensure privacy. Data will be processed for scientific purposes during the phase of data analysis. Data will be shown in project-related publications (project reports, scientific journal publications, conference presentations, blog posts, tweets, etc.) in anonymised form only. Results may be used in further studies. Nothing of the provided personal data will be handed out to third parties.

Your participation in this study is voluntary. You can cancel the authorisation for the use and access to the information you provide at any moment during the project runtime. If you should decide to do so, please contact the leading investigator and let her/him know of your intention of leaving the study.

Benefits and risks

No direct personal benefit is offered for your participation in this study. With your participation you will make a substantial contribution to the understanding of innovations in the healthcare sector as they are currently perceived and shaped, and could plausibly evolve. No risks are foreseen. You are only requested to be available to participate and to give the answers you deem fit to the questions that will be asked on the basis of the project objectives. If you do not want to answer a question, you are not required to do so.

Incidental findings

In case of incidental findings (findings not directly related to the research questions behind the interview), the CHERRIES researcher(s) and you have the possibility to review them after the data collection and decide on the need to remove them from our analysis.

Contact persons

In case of any questions or requests, you are invited to inform the Project Coordinator, Mr. Stefan Philipp, via email, at philipp@zsi.at.

Confirmation

I understand that my participation in this study is only possible if I freely and independently sign this consent to authorise the use of the data I provide. I hereby declare:

- I am 18 years or older and am competent to provide consent;
- I have read, or had read to me, a document providing information about this research and this consent form. I have been fully informed about the aims and purposes of the Cherries Project.
- I have been given the opportunity to ask questions regarding the purpose of the study.
- I understand that I may withdraw my participation at any point during the project runtime.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I agree that my data (collected by surveys, questionnaires, interviews or focus groups) is used for scientific purposes and I have no objection that my data is published in project-related publications in a way that does not reveal my identity.
- Information may be shared between any of the other researcher(s) and partners participating in this Project in an anonymous form. All information I give will be treated as confidential.
- I understand that no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team;
- I have received a copy of this agreement and understood its content.

This consent form is made pursuant to the relevant national, European and international data protection laws and regulations and personal data treatment obligations. Specifically, this consent document complies with the following laws and regulations: Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.

.....

Name and surname of participant

.....

Place, date and signature of participant

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

.....

Name and surname of the researcher

.....

Place, date and signature of the researcher

Interview guidelines

The interview consists of six thematic areas, that will be covered in the course of the interview. Each of these areas starts with a narrative question. Should the narrative part not cover the most critical aspects of the innovation's history; the secondary set of inquiring questions can be used for covering these aspects.

Area: **Person**

Narrative-generating question:

generating question:

1. **What is your background and what brought you here?**

Inquiring questions:

a. What is your educational background?
b. What is your role in the organization?
c. In which relation are you standing to the project we are discussing today?

Area: Motivation

Narrative-generating question:

1. **What was the initial motivation for the project?**

Inquiring questions:

a. What was the problem (or new solution) that you wanted to tackle (or exploit)?
b. What was the consequence of the old approach?
c. How did you identify a field of application for the new approach?
d. If you did not develop a new approach, how would the situation be today?

Area: **Idea**

Narrative-generating question:

2. **How did the project start and what happened until today? What is the core-idea behind the project?**

Inquiring questions:

a. Where did the inspiration for your project come from? Which existing knowledge contributed to your project?
b. Did you start from a specific problem or from a new technique? Can you describe this problem/approach and its impact?
c. Which (new) solutions to these problem(s), need(s) or shortcoming(s) does your project offer?
d. Was it linked to a specific event or initiative (e.g., business culture, funding scheme, policy, an emergency, a casual meet, etc.)?
e. Did you fail with some idea(s) before coming up with the solution that you implemented? How did the idea evolve over during the process?
f. What do you think is at stake for whom, if you look at what the idea / process / innovation is trying to achieve?

Area: Implementation

Narrative-generating question:

3. **How did the project evolve over time? What were the different phases of the project? What were the deciding factors for success and which barriers did you discover?**

Inquiring questions:

a. How do you finance this process, what, if any, is the underlaying business model?
b. Which strategies were pursued by the initiators to implement the innovative solution in the existing context?
c. Which barriers existed in the implementation phase?
d. Which critical situations existed since the beginning of the project and how were they dealt with?
e. Have critical attitudes in the project-environment or the project-ecosystem changed? And if so, how could you describe these changes?

Area: Actors and Networks

Narrative-generating question:

4. **Which actors and institutions were crucial in the implementation of the project? Which persons, groups or initiatives have enabled the process and which have rather impeded it?**

Inquiring questions:

a. Which cooperation/partners existed at which stage of the project and what were their roles?
b. Did healthcare professional, and especially hospitals, play a role in the project implementation? If yes, which was the added value provided?
c. Did patients or other Civil Society Organizations play a role in the project implementation? If yes, which was the added value provided?
d. What was the role of research organizations and universities in the project implementation?
e. What role did public institutions play in the process?
f. How did the collaboration with other actors play out?

Area: Impact

Narrative-generating question:

5. **The innovation/project has been fully developed in the future – what changed in the work of the healthcare sector and for the patients? What was the impact of your project?**

Inquiring questions:

a. How were the following dimensions transformed?
    - Healthcare and societal impact
    - Institutional impact on your organization or implementing/costumer
    - Economic impact
    - Environmental impact
b. Were these goals already defined at the beginning of the project? By whom were they defined? How were they defined and how was the accomplishment of goals assessed? Did the definition of those goals change over time?
c. Did you define your main KPIs before the project and if yes, how were they selected?
d. Was the initiative imitated/copied by other organizations or associations? Was it transferred to another context (also in a modified version)? How did this work out?
e. How sustainable are those impacts?

Ending the interview

Inquiring questions:

a. Was there any aspect during the innovation process you didn't expect or that surprised you?
b. What do you understand as innovation?
c. How would you define a successful innovation in healthcare?

d. Do you think that an engagement of various stakeholder groups in the innovation process, would increase an innovation's quality?

Anything else you would like to share with us?

CHERRIES Partners

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