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Roberta Cuel
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Exploring Digital Resilience

Challenges for People and Organizations

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Exploring Digital Resilience Challenges for People and Organization: An Introduction

Society is heading toward a future in which organizations and people are increasingly dependent on digital technology. Switching to processes that are less dependent on digital technology is often no longer possible. People and organizations are often unaware of the extent to which they rely on digital technology or the associated risks. Therefore, the need for digital resilience has never been greater. The concept of resilience originates from ecological and engineering paradigms focusing on the system's capacity to deal effectively with change, and threats, to recover quickly from challenges or difficulties, or even to withstand stress and catastrophe [1, 6].

The term *digital resilience* refers to the phenomena of designing, deploying, and using information systems which help individuals, organizations, communities, governments, or other entities to quickly recover from disruptions or exogenous shocks.

In recent years, an unprecedented number of shocks have exposed organizations to new fragilities from overlooked risks embedded in the design of organizations, supply chains, decision-making processes, and the underlying information systems. As a result, a fundamental change has occurred in the way people and organizations understand digital technology risks and opportunities [2, 4, 5].

This book contains a collection of research papers exploring the multidimensional issues of digital resilience, by analyzing how people and organizations enhance, maintain, and protect value stemming from digital technology.

The aforementioned dimensions of digital resilience—enhancement, maintenance, and protection—do not intend to add yet another framework to the abundant theoretical analyses and definitions of resilience. As recently highlighted [3], in the last ten years, thousands of papers have been published on resilience in various disciplinary domains in Web of Science (e.g., Psychiatry, Environmental Sciences, Environmental Studies, Psychology, Public Environmental, Engineering). In such a populated and diverse scenario, this book aims to capture three major recurring research themes which investigate how resilience is emerging in the digital transformation arena. The contributions in the first section (Resilience as protection) show how digital resilience can help not only to survive and resist shocks, but also

to find innovative business models and modus operandi. The contributions in the second section (Resilience as maintenance) investigate ways to maintain a prolonged, resilient, and healthy operative state even under shocks. Finally, in the third section (Resilience as protection), a plurality of studies illustrates how digital transformation could act as a shield against adverse events or situations.

The content of the book is based on the revised versions of a selection of the best papers (original double-blind peer-reviewed contributions) presented at the Annual Conference of the Italian Chapter of AIS (ItAIS), XVIII edition, held in the University of Trento, during October 15–16, 2021. The following chapters provide a plurality of views that makes this book not only relevant for scholars, but also for practitioners, managers, and policy makers.

Part 1: Resilience as an Enhancement

Resilience as enhancement supports and enables innovative changes by both people and infrastructures—groups, organizations, and technology—as a reaction to exogenous and endogenous tensions. Such innovative changes could therefore be regarded as resilience-driven enhancements. At a micro-level, people are willing to participate in programs that support them in developing new skills which enrich their strengths and enhance resilience.

An example of micro-level resilience-driven enhancement is reported by Nabil Georges Badr and Maha Dankar, who critically reviewed studies of the assistive healthcare robotics in the elderly care sector. Authors investigate how assisted healthcare robotics can enhance a shift in the unsettled resource-demand balance of nursing by examining benefits and potential hurdles in human–machine interactions. Although assistive humanoids were not strongly adopted, they did perform a variety of physical, cognitive, and social duties to help people live healthier.

Alberto Bertello, et al. unveiled the micro-level foundations of relational capabilities of open innovation for five SMEs operating in Northern Italy in the Industry 4.0 field. Disruption in our society demands collective rather than isolated efforts. To address societal challenges and resilience, organizations are increasingly called to enhance innovation across organizational boundaries.

In this context, theories on e-HRM are more than welcome not only to improve the competitive advantage obtained from resource configuration, but also to enhance individual change.

Elia Pizzolitto and Ida Verna proposed a study on resource orchestration theory and electronic human resources management configuration. Research orchestration theory (ROT) is an expansion of resource-based theory. It considers the role of managers in the selection and configuration of resources and aims to explain the process of achieving a competitive advantage as well as to exploit the dynamic capabilities of resource configuration.

Individual behaviors can collectively be engaged at a meso-level, where people coherently act in a coordinated way to deal with sharing and co-production processes. Andrea Spasiano et al. studied the engagement of online communities

within a citizen science framework for improving innovative participation models. The study focuses on new crowdsourcing activities for social engagement, volunteer recruitment, and organization in hydrology and water resources management. Maddalena Sorrentino, et al. presented an assessment regarding co-production, nudging, and citizen behaviors via ICT. In particular, the chapter explains how behavior-based tools such as co-production and nudging enhance the development of new paths taken by governments in the digital transformation age. The authors demonstrate that the joint adoption of co-production and nudging enhances public governments to design and deliver services that better meet citizen needs.

At the macro-level, a systemic perspective could support an enterprise when integrating multiple organizational aspects in order to enhance the implementation of sustainability in work practices. The study by Lucia Pascarella and Peter Bednar explores sustainability in SME work practices by proposing a systemic approach in the development of a systemic sustainability model. The systemic sustainability model aims to enhance sustainability by understanding and decreasing system complexity inherent in the work practices. Their analysis emphasizes the importance of interactions to achieve sustainable development goals in a work practices context. Finally, Markus Makkonen, et al. examine the potential gender and age differences in the use intention of mobile payments and its antecedents, with an empirical investigation based on Finnish data sets. This study, which adds new evidence to the ongoing research debate on causal factors and policies for digital inclusion, suggests that policy measures for social resilience should promote the protection and inclusion of digital immigrants in the use of mobile payments. Social resilience can therefore be pursued through specific interventions addressed to digital immigrants.

More empirical research based on specific and focused analyses about resilience as an enhancement is therefore welcome.

Part 2: Resilience as Maintenance

The second part of this book investigates resilience as maintenance and the factors connected with the maintenance of resilience. This section contains contributions which analyze the private and public sectors as well as the scholarly communication sector. Digital resilience may well be maintained by balancing processes, technologies, human resources, and strategies with the new requirements generated internally or externally to an organization. The first set of three papers explores how new requirements could arise from the change in the habits of stakeholders.

Antonia Hanesch et al. focus on how digital resilience traverses the need to clearly comprehend the point of view of customers in a traditional industry facing complex innovations, for example, the introduction of connected IT services in the automotive industry.

In a period of digital transformation, resilience could be maintained by correctly organizing the internal makeup of an organization. In their study on interrelated digital infrastructures, Anna Sigridur Islind et al. show that maintaining resilience

could also mean creating workarounds, like practices of flexibility, efficiency, and responsibility, to innovative ways of working.

Walter Castelnovo explores the specific topic of social innovation in public administration as a tool for reforming the public sector. His study confirms that the topic is still underexplored while suggesting possible research directions to bridge this gap.

The second set of three papers explores the notion of maintaining digital resilience in the scholarly sector.

In the first contribution of this set, Maria Rucsandra Stan and Eliana Alessandra Minelli explore the relationship between organizational change and institutional logics. They show how this specific scientific literature has evolved over time and how it became a florid field of research.

On the other hand, Elia Pizzolitto and Stefano Za explore the concept of maintaining sustainability in terms of collaborations among scholars. They focused on the higher education scientific community and, using a bibliometric research technique, highlighted many crucial elements of collaboration.

Finally, Asad Mehmood et al. explore the scientific literature on the relationship between hybrid organizations and diverse themes and issues including social enterprises, institutional logics, social entrepreneurship, governance, sustainability, non-profit organizations, and benefit corporations.

Part 3: Resilience as Protection

The third part of this book looks at digital resilience in different organizational instances from the perspective of protection, i.e., being able to reduce the negative impacts of potentially harmful events or conditions.

Henriika Sarilo-Kankaanranta and Lauri Frank consider the importance of protecting organizations from passive resistance to change in the adoption processes of robotic process automation, with a focus on accounting and payroll services. Resistance to change can emerge at any stage of the innovation-decision process and fluctuate throughout the continued adoption, causing wasted investments, capabilities, and resources.

Mohammad Ali Kohansal et al. consider legitimacy building as an important factor for protecting organizations against Enterprise Architecture Management (EAM) failures. Through a case study analysis, they show how pragmatic legitimacy can positively affect EAM at early stages, while regulatory legitimacy can play a primary role in EAM success.

In global companies, potentially harmful situations can, on occasions, emerge from the governance of complex decision-making processes involving conflicting local vs. enterprise-wide perspectives. According to Marcel Cahenzli et al., the challenge is to harness, rather than eliminate local autonomy. Through a Design Science Research (DSR) study, the authors propose the creation and evaluation of a "nudge-based label" as a governance mechanism based on nudge theory. Nudge theory hinges on the idea that, by shaping the environment, the likelihood that one

option is chosen over another by individuals can be influenced. A key factor in nudge theory is the ability for an individual to maintain freedom of choice and to feel in control of the decisions they make. Their contributions include design knowledge about labels and the investigation of nudging as an intra-organizational governance mechanism.

A form of protection against complexity in organizational decisions and actions can also be obtained by introducing agility. Oleg Missikoff addresses business process analysis with a knowledge management approach, adopting an agile philosophy. It is based on the progressive, iterative construction of a knowledge base of the business organization, and, specifically, the process to be innovated. The methodology proposes a set of information structures, in the form of a sequence of seven different knowledge artifacts that starts with a simple, intuitive process specification and evolves toward richer models.

Globally, the COVID-19 pandemic is leaving a permanent mark on our contemporary history. To meet the major challenge of protecting our lives, our society, and our economic operations, corporations have adopted remote work in record numbers. The contribution of Sabrina Bonomi analyzes practices and tools which were finalized to support distance workers during the COVID-19 pandemic. According to the author, that peculiar situation constituted an important "opportunity" for companies to re-affirm the centrality of well-being and the need to oversee it. The analysis was carried out in the case study of a large MNC. The results offer interesting stimuli for practitioners and scholars in the field of HRM and OB with regard to the "new normal".

Besides suggesting new HR practices, the current pervasive adoption of remote work as a protective response against the pandemic is also innovating organizational design toward more agile and dynamic structural configurations. Roberta Cuel et al., by adopting a socio-technical systems perspective, analyze the emergence of organizational needs for the new role of "head of remote work".

The unprecedented leap forward in the diffusion of mediated communication was also experienced in the education field. The chapter by Fatema Zaghloul and Peter Bednar explores blended and online learning environments, from the perspective of students, through the lens of Activity Theory (AT). Based on 12 virtual semi-structured interviews with master (MSc) students at a university in England, the authors show how to understand and cultivate, even during distance learning, student motivation underlying engagement by taking into account tensions and contradictions in the activity system.

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Contents

Humanoids at the Helm of the Nursing Profession in Elderly Care: Critical Review

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Abstract. Older persons and carers benefit from the use of healthcare robots. Many scientists and academics have looked at using robotic technology to assist both elderly individuals and their caregivers. We provide a contemporary overview of care robotics through a survey of the literature and an in-depth analysis of published articles. We discuss what we know about the use of assistive robots in elderly care, their benefits, and potential hurdles in this research. We investigate how assisted healthcare robotics can help to shift the nursing function's unsettled resource-demand balance. We review recent research on the use of care robots from a sociotechnical viewpoint, which examines human-machine interactions and focuses on results that may or may not be beneficial to the setting. Principles of responsible autonomy and adaptation with the goal of performing tasks that are meaningful. These humanoid resources perform a variety of physical, cognitive, and social duties in order to help people live healthier lives. We concentrate on the current and future difficulties of healthcare robots, as well as how such technology might benefit healthy aging, healthcare personnel, particularly nurses, and our healthcare system as a whole. Despite the potential benefits, we conclude that adoption of care robots is still limited. We pave the road for identifying elements of adoption that may influence the adoption process using the sociotechnical lens.

Keywords: Elderly care · Nursing care robots · Assistive healthcare robotics

1 Introduction

An aging population poses significant challenges to health and social care systems with limited resources. People around the world are living longer and the population growing at a rate of around 1.05% per year. The current average population increase estimates at 81 million people per year[1]. The trend is such that, by 2050 there will be more people over 60 than under 15, with a total population of seniors jumping to 2.1 billion up from 901 million in 2015[2]. There might not be enough people to care for elderly in the future. For instance, Western Europe's population over 60 years old will increase from 21% in 2015 to 33% by 2030, while the available health worker per elderly citizen is

[1] https://www.worldometers.info/.
[2] https://www.un.org/development/desa/disabilities/disability-and-ageing.html.

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expected to drop from 3.5 to 2.4, which is also 30%, however, in the opposite direction[3]. When society's age structure shifts, a smaller number of trained caregivers and other practitioners would be required to care for a growing elderly population, extending the stress on the nursing professionals.

The nursing profession employs the highest proportion of the healthcare workers; nurses are the backbone of the industry [1–3]. The continuous nursing shortage, combined with a high turnover of nurses and support staff at elderly-care facilities [4], has resulted in unresolved healthcare and social concerns that constitute significant barriers to integrated nursing care services [5, compromising the safety and quality of treatment]. Nurses have reported increased stress [5], emotional weariness, a lack of motivation, and a sense of dissatisfaction [4] as a result of their unsustainable workload. One technique that is gaining traction in an attempt to provide technology help to the nursing function is the use of robots in the care of old persons [6–8].

1.1 Motivation

Healthcare robots are beginning to take center stage in supporting older persons in maintaining their autonomy and caring obligations, as well as compensating for the absence of carers [9]. Robotics technology, which is powered by artificial intelligence, has made great progress in recent years [10] in a range of industries, including healthcare [14]. Elderly people can live independently at home with the help of robots, and healthcare workers can work more efficiently in hospitals. Assistive technologies have been hailed by the elderly, health care workers, family members, and the general public. While there is still a low demand for care robots for the elderly and disabled, it is expanding rapidly as robot applications improve and become more user-friendly [11]. The industry forecasts that 79 million homes, globally, will have a robot in residence by 2024[4]. Despite their amazing capabilities, the use of care robots in nursing is currently uncommon. What role do assistive healthcare robots play in nursing? What are the possible advantages in terms of utilization and positive outcomes? What does the literature say about the problems and drawbacks of using care robots in nursing? The answers to these questions may aid in the understanding of the design principles required for a better task-technology fit [47] in the context of patient care for the nursing function.

2 Background

Our research is a conceptual investigation into the phenomenon of assistive technology, specifically assistive healthcare robots, for the nursing profession in their care of elderly people and caregivers, using a sociotechnical system (STS) approach. The observation of sociotechnical aspects through the eyes of the impacted stakeholders ensures the creation of a long-term system of interaction that is both engaging and beneficial to all parties concerned [12]. The interconnectedness of social and technical aspects of an

[3] https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf.

[4] https://www.industryweek.com/technology-and-iiot/article/22028128/79-million-homes-globally-will-have-a-robot-in-residence-by-2024.

organization or system is referred to as sociotechnical theory (ST) [48]. Often depending on technology to promote a smart connection with society, ST provides tools to improve the performance of work systems by understanding how human actors' actions affect the system's performance.

We hope to learn about potential benefits in use and positive outcomes, as well as revisit a summary of barriers and downsides to the use of care robots in the nursing role, through this effort. We create a contextual overview of assistive care robots, then conduct a critical assessment of the literature to uncover the sociotechnical phenomena. We establish a decision plan for where to search, which phrases and sources to utilize, and how to find relevant research, among other things, as we prepare for our critical evaluation. Two searches are carried out. The first concentrates our attention on the various applications of assistive care robots in senior care and nursing (Sect. 2.2). Then, for the second search, we emphasize on what the literature says about current and potential benefits, potential challenges and drawbacks. The search encompasses online databases including but not limited to EBSCO, PubMed, Google Scholar, identifying and isolating key informative papers for our study. Then we arrange our results under themes, revealed in paragraph 3. Finally, we provide some reflection on the findings and close with comments and suggestions for further research prospects.

2.1 Assistive Healthcare Robotics and the Sociotechnical System Perspective

Assistive technologies are devices that are used to improve the efficiency and efficacy of healthcare by enhancing the organization's and people's capacities to complete tasks [49]. Current breakthroughs in care robotics are founded on this basic concept. The fundamental hypothesis, which is based on sociotechnical systems theory [50], is that the technological components of a device's design will have an impact on its users (Fig. 1). This puts a strain on the operators' perceptual, cognitive, and motor capacities, and as a result, unfavorable results are possible, especially when workers are fatigued, which compromises human potential [51].

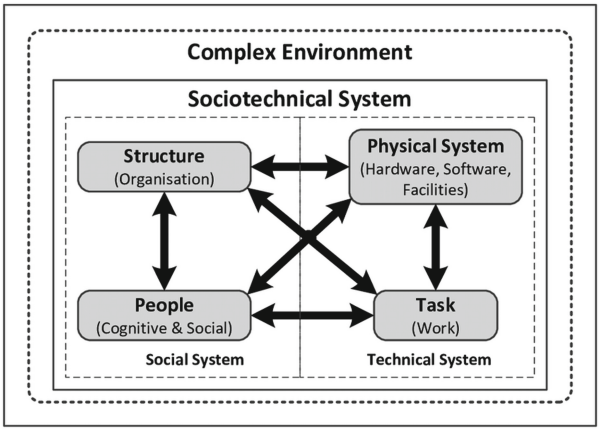

Fig. 1. Sociotechnical system (STS) – [50]

2.2 Elderly Assistive Care Robots Join the Nursing Job Function

Closer to the nursing function, assistive technology is expected to play a rising role in elderly-care systems [13], despite the fact that there are various feasible alternatives, ranging from better paying, valuing, and professionalizing caregiving to current community nursing models [8]. Assistive technology aims to improve people's functions, consequently improving their well-being [14]. Robots have made their way out of operating rooms in recent years to help with diagnosis, therapy, recuperation, and nursing [5, 15, 16]. Varieties of robots that assist the elderly are currently available in a variety of applications [17].

Those who care for the elderly benefit greatly from the use of robots [18]. Nursing robots can do routinely planned rounds and provide a pleasant reprieve to the nursing staff because they are not vulnerable to weariness, boredom, burnout, or amnesia [19]. For example, they save time and effort for healthcare staff while also providing vital patient information [20]. In response to the current lack of nursing and caregiving practitioners, as well as rising healthcare expenses, a variety of technological solutions have emerged [21]. Because robots, by definition, connect with and impact their surroundings [22], it has become vital to develop care robotics for and by nurses [5].

Monitoring vital signs, improving communication with family, and providing medication reminders were the most popular jobs and applications for robots in the previous decade [23]. According to Lee et al. [5], the top three nursing tasks that robots could assist with are "measuring/monitoring," "mobility/activity," and "safety treatment," with the most popular robot tasks being "detection of falls and calling for help," "lifting," and "location monitoring," while healthcare professionals preferred the use of robots in service tasks, monitoring/alarms, telemedicine, and communication. In home health monitoring robots are used to track physical health status (weight, sleeping patterns, high blood pressure, and so on) utilizing clinical and medical information, with the goal of informing the patient and making the caregiver's job easier. Fall detection and prevention robots are among the health monitoring robots that can detect and avert falls [18]. Other domotic devices include reminder robots, which are designed to keep older persons on track with their medicine and appointments, and entertainment robots, such as card-playing robots that enhance cognitive abilities and memory function [18].

Assistive robots are defined in the literature as partially or entirely autonomous robots that conduct care-related duties for people with physical and/or mental disabilities as a result of age and/or health limits [4, 11]. They've evolved to help nursing personnel, older individuals, and their families in care settings when providing physical, cognitive, or emotional support [14, 22]. They have the potential to improve the quality of life for the aged and/or handicapped by boosting autonomy, providing security [11], and improving cognitive function and depression [5]. Until date, elderly robots have mostly assisted with daily activities, allowing for detailed real-time tracking of habits and wellbeing, as well as companionship [14]. The literature attests to the importance of the subject. Physically or surgically helpful robots account for the majority of robot utilization in the healthcare industry, but they do not address the rising mental health burden among the elderly [2]. Physically assistive robots introduce support for daily physical activity to improve the overall health of the elderly [18], while socially assistive robots maintain

social contact through companionship, which has a positive effect on general mental and physical wellbeing, lowering the chances of depression [24].

Physically Assistive Robots (PARs) are service robots that help older individuals with daily duties [25]. They include smart houses with a variety of technologies that let patients stay autonomous by assisting them with simple activities [30]. Sensory assistive robots and robotic wheelchairs for mobility aid with manipulators for reaching and carrying, personal care, eating and drinking [18]. Rehabilitation robots (e.g., Physically-Assistive Robots, PARs, such as Zora) targeted to increase movement performance [16, 20, 26]. They were designed for recovery training and agility improvement. Finally, mixed aid robots are the most entertaining of all. Domestic chore robots, such as cleaning and cooking, are aimed to aid the elderly in doing simple tasks of independent living [18].

Socially Assistive Robots: Companion robots used to boost one's psychological well-being are known as Socially Assistive Robots [30]. Robotic technology systems with audio, visual, and movement capabilities are known as socially assistive robots. They are frequently shaped like a pet (cat, dog, etc.) or a humanoid that can listen, converse, touch, and sense light and sound [18]. These robots are capable of assisting people during social interactions. They provide a physical embodiment that boosts likeability, commitment, motivation, adherence, and task performance in long-term healthcare programs. Furthermore, by evaluating and providing feedback, they assist patients in using physiological parameters [16, 27, 28]. These "Companion robots" have been related to enhanced mental health in terms of stress reduction, agitation, and relaxation [25, 26, 29, 30].with decrease in care provider burden [8, 20, 29, 31]. For more than a decade, conversational robots have been conversing with people demonstrating levels of empathy in their encounters with humans [32]; a robotic contribution, shown to improve the overall well-being of its users [2]. Other Socially assistive robots help with autism patients and often used for telepresence make two-way contact possible between the older adults and their surroundings.

3 State of the Literature

There is a dearth of material about assistive care robots at the head of the nursing profession in senior care. Nonetheless, our critical examination discovered a number of concepts relating to potential benefits in use (Reported Value in Use), as well as a number of potential challenges and drawbacks affecting the user's experience, which we labeled as emerging themes in Table 1:

3.1 Potential Benefits in Use

Several possible benefits of deploying social robots in the care of the elderly have been thoroughly investigated. According to research, the majority of older people's attitudes are positive, and they are delighted to have a robot aid them in their daily lives [8, 14] and appreciate the benefits. Cost-effectiveness, satisfaction with care, reduction in incidences of violence, physical safety, security for personal privacy and integrity, psychological

Table 1. Summary of the state of the literature – Illustrative example

Reported Value in Use – With Examples from the literature	
Better Access to Care	• Extend benefits of care in remote areas [45, 46]
Cost-effectiveness	• Significant economic benefits and cost reduction [17] • A robotic device can save money by reducing labor costs and performing tasks that humans may find repetitive. [34]
Satisfaction of Care	• Enhance physiological/psychological state of patients [17] • Improve quality of life by increasing autonomy/security [11]. Comfort disclosing information to virtual humans [35]
Reduction in Incidents of Violence	• Reduce the risk of physical/ sexual violence [31] • Less irritable/less likely to induce emotional stress [8]
Physical Safety	• Logistical or surveillance tasks in the care environment [22]. Sentinels for physical safety in sensing fall risk [16, 20, 26]
Personal Privacy	• Care robots as agent of personal privacy and dignity [8, 32]
Psychological Benefits	• Improved social interaction [36], empathy [32], stress reduction, agitation and relaxation [8, 25, 26, 29, 30]
Decrease in Care Burden	• Decrease in care provider burden – Physical and psychological [8, 20, 29, 31]
Potential Challenges & Drawbacks - with examples from the literature	
Potential Risk of Injury	• Malfunctions or lack of upkeep may lead to injuries [8, 16]
Perceived Loss of Control	• Feeling of even loss of control [20]
Isolation Risk	• Effect of reduced human contact and social interaction [8, 20, 29]; risk of surveillance anxiety [15, 20]
Ethics Issues	• Feeling of unreal empathy [8, 29, 32]
Technical Annoyances, Cost of Acquisition, and Maintenance:	• Lack of technical knowledge was perceived as a barrier to technology adoption [38]. High cost of most devices [20]. Potential anxiety caused by klunky or loud noises [20, 28]
Communication Disruption among Care Personnel:	• Hinder clinical staff communication [2]; Perception of the technical staff on the humanoid's lack of compassion [29]

(*continued*)

Table 1. (*continued*)

Reported Value in Use – With Examples from the literature	
Perceived Impact on the Nursing Career:	• Fear of robots taking the place of human [39], which could change the character of society [20]. Balance between workload reduction and maintaining human touch [8]

benefits, and a reduction in care burden are some of the advantages of deploying care robots in nursing.

Better Access to Care: Elderly persons who live alone are more prone to falls and accidents, and they often have difficulty accessing health care when they need it. The employment of intelligent care-providing equipment increases access to speciality care services that may not be available in the patient's location [45]. People who live in locations where there aren't many mental health professionals, for example, can benefit from interactive virtual human care providers [46]. Virtual care provides information about health conditions, conducts question-and-answer assessments, and provides self-care counseling and therapeutic interventions. It is accessible anywhere and at any time, including on mobile devices.

Cost-Effectiveness: The development of intelligent machines in healthcare has the potential to deliver considerable economic benefits to healthcare providers and services for an aging population, in addition to improving patient outcomes and quality of treatment. These robotic care providers can help government programs or care-assurance budgets save money [17]. Software-based intelligent devices, by bringing the economies of scale to care delivery, can help to offset the estimated global cost of care, which is expected to exceed $6 trillion dollars by 2030, according to a World Economic Forum analysis. In general, a robotic device can save money by lowering labor expenses and automating jobs that humans find tedious. However, it's probable that the cost of human resources to maintain and run the system will rise as a result of the required capital investment to sustain quality care levels [34].

Satisfaction of Care: Important potential benefits of social robots in care are related to structure (efficiency) and outcome; they have the ability to improve both physiological and psychological variables, as well as the satisfaction of those who are cared for [17]. Human therapists may be viewed as having personal prejudices, but care robots may not. It has the potential to make daily activities easier for the aged and/or crippled, increase autonomy, and provide security [11]. Robots may appear to be always friendly and available. When discussing intimate, private matters with a computer, care seekers may feel less anxious than they would with another person. Others may feel more at ease providing information to virtual persons during clinical interviews and prefer to interact with them over medical personnel [35]. For example, a virtual nurse could adapt their demeanor (e.g., eye contact), spoken dialect, use of common terms, and other features to fit the needs of a certain ethnic group, allowing them to build rapport with patients and improve overall communication.

Reduction in Incidents of Violence: Physical, sexual, psychological, financial, administrative, performance, and neglect are all common forms of violence experienced by elderly patients in care homes. Robots have been demonstrated to lower the danger of physical, psychological, and sexual assault by providing 24 h care without tiring or becoming irritable, and are less likely to exhibit any of the negative personality traits associated with human employees [8].

Physical Safety: In addition to reacting to persons in the care setting, these devices can perform logistical or surveillance activities [22]. Residents may be able to give comments on whether or not they prefer being treated or touched by robots. Robots can also serve as sentinels for physical safety, monitoring the risk of falling and promoting movement performance [16, 20, 26].

Security for Personal Privacy and Integrity: When our freedom is threatened, some of us are more likely to consider, or even prefer, the assistance of a care robot [32]. Older adults particularly those with intellectual disabilities, need ongoing assistance with everyday activities such as toileting, showering, and dressing without feeling undignified or embarrassed (if naked) by another person assisting in his or her intimate tasks, even if that person is a nurse. They may reduce the functional burdens of coping with incontinence, wandering, and uncertainty [8]. Thus, the use of robots could be an agent of personal privacy and dignity.

Psychological Benefits: Some of us are more likely to contemplate, or even desire, the assistance of a care robot when our freedom is threatened [32]. Even if the person assisting in his or her intimate tasks is a nurse, older adults, particularly those with intellectual disabilities, require ongoing assistance with daily activities such as toileting, showering, and dressing without feeling undignified or embarrassed (if naked) by another person assisting in his or her intimate tasks. They may help people cope with incontinence, roaming, and uncertainty in a more practical way [8]. As a result, the deployment of robots may be a safeguard for personal privacy and dignity.

Decrease in Care Burden: The use of social robots has also been linked to a reduction in caregiver load [8, 20, 29, 31]. These robots can also help relieve some of the psychological strains on professions, particularly for overwhelmed family members and informal caregivers who are witnessing their loved ones' capacity erode, creating a great deal of distress.

3.2 Potential Challenges and Drawbacks

In contrast to the benefits, the literature outlines current challenges associated with the use of assistive robots, such as the risks of moral hazard concerns related to unintended changes in direct relationships between robots and older adults, such as control, isolation, deception, and impact on the nursing career [8], as well as a widespread fear of dehumanization in society.

Potential Risk of Injury: Robot interactions can be dangerous. Any failures or a lack of regular maintenance that could result in an accident or injury [8, 16]. When robots are employed for purposes other than therapy, such as turning patients in beds or bathing them, the problem becomes even worse. Another factor to consider is the usage of sex robots in nursing homes, which would demand extra precautions. Failsafe devices are necessary, which detect and adjust the behavior of malfunctioning robots [8].

Perceived Loss of Control: When robots are used to care for the elderly, the robots are responsible for their own maintenance. This is a classic case of moral hazard, when one group controls resource allocation while another bears the brunt of the benefits or costs. A decrease in the quality of social interactions with certain individuals [8] may lead to reliance and even loss of control [20].

Isolation and Psychological Risk: The possibility of robots generating feelings of isolation and less social connection has been mentioned in the literature. Because they limit human contact and autonomy, the introduction of social robots could have a negative impact on the care process. There is concern that adding robots into eldercare would result in fewer good interactions and less human contact [29]. One of the ethical issues is that personal human contact will be supplanted by robot-assisted activities. Social interactions would surely suffer if robots entirely or partially replace human jobs [8, 20]. Academic bodies have also voiced concerns, such as the risk of surveillance, the feeling of being watched or followed with inadequate data protection, the fear of being tracked, and the fear that robots would undermine capabilities and thus have negative consequences on psychological health [15, 20].

Ethics Issues, Deceit and Embarrassment: Empathetic robots give elderly individuals with long-term companionship. Mood swings, a lack of patience, or tiredness will not affect these creatures. Robot care, on the other hand, can be harsh, insensitive, and even deceitful. Based on the notion that robots' empathy is deceptive, if not nonexistent, there is growing concern that deploying robots to deceive elderly people is unethical [8, 29, 32]. Despite a fragile older person loving robot pets and maybe not discerning between live and non-living, families may assume they are enduring embarrassment and loss of dignity as a result of deception, according to Bradwell et al. [29]. (although it is also possible this tension would ease upon witnessing potential quality of life benefits).

Technical Annoyances, Cost of Acquisition, and Maintenance: Technology adoption was seen as being hampered by a lack of technical understanding [38]. The objectives of the staff and their facilitation of support are critical in promoting robot use. The exorbitant cost of most devices, which makes them unaffordable for both consumers and businesses, is a key hurdle to robotic system application. It's also unclear if health insurance or social assistance will cover these costs [20]. Other potential impediments to robotic settings mentioned in the literature include potential anxiety induced by klunky or loud noises, "not being adapted" to the intended context owing to being too large, and "failed technology" in certain areas [20, 28].

Communication Disruption among Care Personnel: Care robots may obstruct communication between nurses and patients, as well as among medical workers, restricting

the flexibility and adaptability of personalised nursing services [2]. While robots can remedy human nature's bad features, they lack the human senses of compassion, empathy, and comprehension [29].

Perceived Impact on the Nursing Career: Robots have the potential to cause undesirable behavioral changes. The rising usage of robots for elderly persons may provide incentives for health bodies to reduce or even eliminate human jobs in favor of artificial jobs, thereby altering society's character [20]. Because of concerns and reservations about the probable substitution of their occupations and positions, healthcare personnel' attitudes toward the deployment of assistive healthcare robotics are negative. Many people are concerned that robots will eventually replace humans in the workplace [39]. As a result, the fear of doctors and nurses being replaced by robots is a major impediment to deployment. While it is widely acknowledged that robotic systems are not meant to replace human interaction in health and social care [20], but rather to reduce workload [2], these issues must be addressed. The attempt to establish robot professions may lead to a drop in interest in nursing as a vocation, which will exacerbate professional shortages [8]. However, because most existing nursing robot prototypes are designed as aides rather than autonomous professions, the care resource gap will surely worsen.

4 Reflections and Critical Review

The nursing bodies (in a caregiver model) and the elderly (in self-care use cases) in the healthcare ecosystem are the social systems in our paper's environment. IS research has looked at the social-technical relationship as interactions [52], with a focus on the dynamics of interplay between the two components, such as fit, alignment, entanglement, and so on [47], as well as analyses of the issues users face as a result of potential mismatches.

Investigations have looked into how work routines and healthcare information technology (HIT) co-evolve and interact in an HIT implementation to produce or hinder the desired outcomes [33].

Other studies looked at medical assisting technology such as robotic surgery [53] and rehabilitation techniques [54, 55]. Principles for transitioning to sociotechnical ecosystems for elderly care [56], system design for disabilities [57], and user requirements for inclusive technology [58] have all been discussed in other contributions.

We discovered that the literature focused on the phenomena and its main determinants in the following areas: caring for persons with learning impairments [59], geriatric care [60], physical disability help [57], chronic care [61], and fostering better caregiver relationship [62]. The adoption of technology by the healthcare workforce is primarily dependent on the system's dependability and, as a result, their trust [28]. The elderly will become more receptive of healthcare robotics as healthcare practitioners adopt them [17]. It has become clear that the acceptance of robotics in care settings is affected by the behavior of the end users, "the elderly", and 'the caregivers" [14].

Our research has found that there is a lot of evidence that healthcare robots can help with nursing care. Our critical analysis goes a step further to explain how technological advancements may assist and risk nurses and care seekers at the same time [48]. As

we report on our findings linking the good outcome of the usage of care robots, in the form of value in use, and disadvantages in the form of unintended consequences of benefits, we reframe the conversation to demonstrate evidence of value in use (Sect. 4.1) and highlight potential drawbacks (Sect. 4.2). Technology's quick advancement and the relatively gradual advancement of concepts about how to organize and manage change may obstruct the realization of benefits (Sect. 4.2). Caring robots may be appropriate to react to and provide the illusion of care for their users, even if they are unable to deliver genuine care. As long as human care is in short supply, robots may be able to assist the vulnerable and relieve caretakers. Nurses, on the other hand, acknowledge that machines have drawbacks and that having a nurse present is advantageous to patients.

This study summarizes how disruptions in care robotics can have organizational and societal repercussions, some of which have been addressed in research studies and others, which will need time and more use to appear.

4.1 Evidence of Value in Use

Robots will have a role in nursing facilities, supporting carers and even offering company to the lonely. While different cultures have varied perspectives on the employment of robotics, the hope is that robots will make aged-care vocations less hard, more autonomous, and allow seniors to live a safer and longer independent life in their own homes. Many older people prefer to live in their familiar social setting at home rather than in residential aged care facilities that are equipped to support the health and social wellbeing of elderly people, but some are unable to do so due to family issues, illnesses, impairments, immobility, and social limitations.

Our research found that intelligent care-giving equipment, such as care robots, have the potential to enhance health outcomes by tailoring treatment for patients. Based on a patient's diagnostic profile, preferences, or treatment progress, these systems might be programmed with the knowledge and abilities of various evidence-based practices and then administer the most appropriate therapy or integrate several approaches. While their growing ability to detect, identify, and respond to the emotions and other stimuli of the patient (user) can be extremely useful in a therapeutic context, care robots can also assist professionals in providing high-quality care.

4.2 Unintended Consequences of Benefits

Human beings gain from technology advancements while also being threatened by them [48]. Although STS theory and practice have been in the background for some time, the rapid advancement of technology and the relatively slow advancement of ideas about how to organize and manage change may obstruct the realization of advantages.

The use of technology in close proximity to human function may have unintended or unforeseeable consequences. These results could mean more work for practitioners, as well as changes in communication patterns and workflows, which can lead to an overreliance on technology [42].

These unintended repercussions can be both positive and negative, with results that differ from what was originally intended (Table 2). This phenomena has been linked

to the introduction of technology in various contexts, particularly in healthcare settings [43, 44].

Our investigation discovered several instances of unforeseen repercussions of the use of a care robot in the nursing function for aged care (Table 2). The literature reveals the cost-effectiveness of care robots when assigned repetitive and banal care activities, higher satisfaction with care, and a decrease in violent events, with the possibility of including logistical or surveillance for physical safety monitoring. However, because of their machine nature, robots may necessitate costly routine maintenance and technical advancement to lessen the risk of malfunctioning annoyances [34]. Any flaws or errors.

Another example comes from the practitioner's experience, in which robots have been discovered to reduce the caretakers' burden of care in specific situations. They do so by taking over some of the more monotonous and time-consuming activities, but they must operate entirely under the supervision of a health care provider in order to maintain the "human touch" and avoid unethical practices.

Table 2. Unintended consequences of care robots – sociotechnical perspective (our review)

STS dynamics	Benefit	Unintended consequences
Organization	Essential where care workers are unavailable	Reliance on robots care hinders communication among personnel
People	Promotes personal privacy and dignity through companionship and conversation	Potential increase in feelings of isolation owing to less social interaction
	Decrease the burden of care of the caregivers	Supervision of health care provider required to prevent the unethical use
System	Cost-effectiveness of care robots repetitive/mundane care tasks	Require costly regular maintenance and technological enhancement
Task	Increased safety and reduction of violence due to monitoring	Malfunctions or lack of proper upkeep lead to accidents or injuries

Assistive healthcare robots are critical in situations where care personnel are unavailable owing to resource restrictions, a lack of training, or a lack of time to give proper care. However, in certain cases, reliance on robotic care has hampered communication among healthcare workers [5], and ethical concerns have also been noted as barriers to adoption that must be handled properly [29]. As a result, the contextual use of these robotic helpers must complement the role of coordination and care of their settings, ensuring that humans and humanoids collaborate for better care and reducing the impact of such unintended outcomes.

4.3 Value Co-creation Opportunity Involving Users in Care Robot Design

Frameworks for evaluating the role of robotics in healthcare across socio-ecological levels have been described in the literature, with specific concerns at each level as well as design, development, and implementation considerations for healthcare robots [40]. The acceptance of care robots is influenced by the attitude, ability, and skepticism of healthcare staff regarding the use of modern technology [39]. Personality traits, cognitive capacity, education, and community influence the acceptance of care robots.

Some investigations of people's views about care robots appear to show negative and unpleasant consequences. To accommodate these differing perspectives, a thorough needs assessment must be conducted, which will ensure successful implementation. Guidelines for user incorporation in ambient assisted living projects effectively summarize the importance of such evaluation: 'Determining individual user needs rather than merely guessing or generalizing can mean the difference between a true breakthrough for users and a cool technological advancement for the shelf.' This involves a thorough understanding of the requirements and wishes of older persons in terms of these gadgets.

Although previous research has primarily focused on existing robot acceptance, it is critical to understand why older people embrace or oppose assistive robots, as well as their perceptions of them, in order to improve not only the design of these robots but also to develop successful marketing strategies.

Before deployment, users should be actively involved in the development process and receive proper training and knowledge. In health and social care, diverse stakeholders with very different requirements might engage with robotic systems. It is difficult to introduce such intrusively disruptive ideas if the real results do not meet the users' expectations. Early conversations about potential roles and flaws should begin to overcome this barrier, and an iterative process should be used to include individual experiences.

4.4 Care Robots, Viable Actors in Optimizing Health System Performance

The ability of virtual humans and robots to recognize, respond to, and express emotions is being improved. Robots may also be sensitive to and adapt to features of a patient's culture, such as race/ethnicity or socioeconomic level. Intelligent care-giving devices that combine sensing, artificial intelligence, and emotive computing technologies have the potential to significantly enhance health outcomes for care recipients by tailoring their care. These systems could be programmed with knowledge and abilities from a variety of evidence-based treatments, and then offer or combine the most appropriate therapy or approaches based on a patient's diagnostic profile, preferences, or treatment progress. Intelligent care-giving machines could also be sensitive to and adapt to specific features of a patient's culture, such as race/ethnicity or socioeconomic status.

AI, robotics, and smart technologies, on the other hand, have yet to fully compete with the warmth of human presence. Basic human touch, such as shaking hands before and after a session with a patient, resting a hand on the shoulder of a grieving person, or providing a patient a tissue to wipe their tears, are still invaluable.

Care robots, on the other hand, can be viewed as viable players in improving healthcare system performance. At the service of patients and their healthcare providers, intelligent machines provide a number of benefits. Modern expert systems and other intelligent

machines can aid in the completion of highly complex tasks with greater efficiency, accuracy, and consistency. Hospital robots can complete normal rounds and are not affected by weariness, boredom, burnout, or amnesia [19]. Nonetheless, the usage of care robots serves the quadruple goal of care, health, cost, and purpose in work [41], emphasizing that patient care necessitates provider care. In this study, we apply the quadruple objective to the nursing function, where assistive care robots can help improve patient experience, population health, and work life while keeping a focus on enhancing health care providers' work lives.

5 Conclusion and Further Research Prospects

For future study, the literature review might be expanded to include more sources, such as systems thinking and robot-human interaction, while also considering future research approaches linked to the STS approach, as well as contextual and cultural elements. We do, however, make some useful recommendations for future research and translation of the quadruple aim for health improvement in the context of the nursing function, where assistive robots can help improve patient experience, population health and life, and health care personnel' work lives.

This research examines the sociotechnical aspects of robotics and their practical ramifications. Because the field of robotics is seen as part of the next prospective Kondratiev wave (together with biotechnology), greater breakthroughs in robotics are likely as humanoid innovations spark technical revolutions, resulting in leading industrial or commercial sectors. Because the potential benefits for healthcare are immense, early implementation in this field is advantageous. Finally, caregivers recognize that resistance to welfare technology adoption derives from organizational, societal, technological, and ethical problems. Individual acceptance is required for robotic systems to be adopted in real-world circumstances, according to sociotechnical principles of technology adoption. Because disruptive inventions might be difficult to accept, user participation is a key factor in determining whether or not assistive robots will be accepted.

While demand for assistive healthcare robots for the elderly and disabled is currently low, the market is expanding as robot care applications increase and become more user-friendly. The truth is that the maturity and readiness of the technology are still unknown. On the adoption front, assistive gadgets have been appreciated by older clients, health care providers, and family members, but further research into their results and efficacy is needed. Future research should look into whether these issues will endure or if new technologies can help to improve the user interface and safety perception.

User participation studies will help guide principles of usability (fit for use) and usefulness (fit for purpose) of care robots. Here too, we sense that additional research on the established environmental barriers, such as overall noise levels or spatial arrangement would be useful.

We observed some critical gaps in priority issues, notably for ethical usage of companion robots with older individuals, between the robot ethics community and real-world stakeholders, using the academic perspective of this review. It is clear that ethical and social concerns play a role in the opposition to the employment of care robots in elder care. Ethics is a delicate subject that has aroused both positive and negative responses.

As a result, we realize the necessity for ethical investigations that take into account the implications for stakeholders as well as the seeming lack of consensus on often debated problems [37]. Robotic care might be seen as heartless and unsympathetic, as well as deceitful. From an ethical standpoint, assistive healthcare robots should not be viewed as a substitute for human care, and they should be utilized under the supervision of caregivers to preserve the dignity of the elderly.

Will synthetic gestures of empathy and goodwill be perceived as similar to the genuine thing? Will science advance to the point where data and decision-making replace the requirement for human interaction? What impact would this have on mental health?

These issues require further study, as we continue to develop intelligent care machines.

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How Do Individuals Engage in Open Innovation? Unveiling the Microfoundations of Relational Capabilities

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Abstract. Disruption in our society demands collective rather than isolated efforts. In order to address societal challenges, organizations are increasingly called to innovate across organizational boundaries. Literature on open innovation, however, has mainly focused on the organizational-level, neglecting the individual-level, or what has recently called 'the human side' of open innovation. This study sheds light on the microfoundations of open innovation by unveiling the micro-level foundations of relational capabilities from the analysis of a multiple embedded case study on five SMEs operating in Northern Italy. Results suggest perspective taking, balancing skills, and negotiation skills as individual-level features that aggregate at a higher level through a dynamic process. By doing so, this study contributes to the discourse on microfoundations of organizational capabilities for open innovation.

Keywords: Open innovation · Microfoundations · Organizational capabilities · Individual skills

1 Introduction

The key pressing challenges of our world, such as climate change, poverty, and digital transformation, require coordinated and collective efforts from a variety of actors engaging in collaborative and shared innovation. Since its original conceptualization, open innovation has been studied from different facets and particular attention has been paid to its antecedents. However, most of these studies reside at the organizational-level [1–5], while a multi-level perspective would be indeed crucial for: a) extending the open innovation body of knowledge by breaking concepts into multiple component elements, b) tracing links among them at different levels of analysis, and therefore grasping the nature of this complex phenomenon [6]. In this regard, the microfoundational approach represents a useful theoretical basis to understand how the organizational context to which individuals are exposed and their actions and interactions influence organizational capabilities [7–10]. Therefore, the microfoundational approach reveals its usefulness in

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assessing the under-investigated topic of the human side of open innovation [11–13]. Moreover, it helps in connecting the individual level to the organizational formation of open innovation-related capabilities that are often used as theoretical concepts to explain heterogeneity in firms' open innovation-related outcomes [14, 15].

Also, most of the open innovation studies leveraging the capabilities perspective have explained the effectiveness of open innovation bringing up the concept of dynamic capabilities [15–17]. However, dynamic capabilities include a wide set of different capabilities that are expected to influence differently the three types of open innovation, namely inbound, outbound, and coupled. In order to understand inbound open innovation, for instance, the literature has principally analyzed absorptive capacity [18], intended as the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends [19]. On this basis, several studies have adopted a microfundational approach to explore absorptive capacity, e.g. [20, 21]. Although these studies do not frame explicitly their study in the open innovation literature, implications are strongly linked to this stream of research and to the inbound perspective of open innovation for the reasons aforementioned. The outbound and coupled modes of open innovation are instead less investigated by the literature [22, 23], and there is not yet an established set of dynamic capabilities that have been linked to them. This study takes this challenge by focusing on coupled open innovation, a term introduced by Enkel Gassmann, and Chesbrough [24], to describe a two-way interaction that implies co-creation processes combining inbound and outbound knowledge flows. With this purpose, we investigate the concept of relational capabilities as a key dynamic capability for coupled open innovation. Relational capabilities can be defined as the ability of a firm to enter into and to manage relationships across boundaries in order to obtain access and develop resources and skills that are complementary to the firm's activity [25, 26]. We explore the microfoundations of relational capabilities in open innovation contexts by studying the case of five Italian firms. In fact, despite the importance attributed to relational capabilities in inter-organizational relationships [27–29], there is still little evidence on the microfoundations of relational capabilities in open innovation contexts. Hence, this paper seeks to assess the multi-level nature of open innovation and to explore the role of human resources in bringing about relational capabilities for effective coupled innovation, positing the following specific research question: "What are the skills and abilities of professionals involved in inter-organizational collaboration that influence relational capabilities for coupled open innovation?". To address our research question, we have developed a multiple embedded case study on five SMEs operating in a Northern Italian Region with firms as units of analysis and individuals as sub-unit. We only considered those companies that in the last three years had developed both inbound and outbound open innovation (the so-called coupled mode) as the result of participation in inter-organizational projects aiming at the adoption of Industry 4.0 technologies.

2 Microfoundational Approach in Strategy and Organization Studies

Greater attention to micro-level elements in organization studies is required to capture the complexity of organizational performance [8]. Not surprisingly, macro-management

theories in their origins have investigated micro-level phenomena. For example, Barnard [30] argued in strikingly strong terms that "the individual is always the basic strategic factor of organization". Similarly, Simon's early work on administrative behavior was explicitly linked with individual-level foundations [31], concerned for example with questions addressing individual decision-making, motivation, and organizational performance (for a review, see Felin and Foss [32]). However, this emphasis was gradually lost over time and, as Gavetti and colleagues have noted in their review of behavioral theories in macro management [33], organizational research has been considerably less focused on linking individuals' interests and cognitions to organizations' actions and decisions. The subsequent trajectory of organization studies as well as strategic management was heavily focused on macro factors, at the expense of the micro [34], with a focus on organizational environments in the form of theories such as institutional theory [35, 36], and resource dependence theory [37]. By emphasizing a focus on homogeneity rather than heterogeneity, these theories have often overlooked the role of individuals. Organization studies can help understand open innovation from different levels. Against this background, greater attention to the microfundations of open innovation and multi-stakeholder collaboration and related capabilities is called to assume relevance in the years to come [38, 39].

3 Methodology

To address the research question of this study we have developed a multiple embedded case study on five SMEs operating in a Northern Italian Region with firms as units of analysis and individuals as sub-unit. We only considered those companies that in the last three years had developed both inbound and outbound open innovation (the so-called coupled mode) as the result of participation in inter-organizational projects aiming at the adoption of Industry 4.0 technologies. SMEs are an interesting field of research for more than one reason. Indeed, they are characterized by a high level of flexibility which is often reflected in a highly innovative spirit. However, their innovative potential is often harnessed by a lack of resources, which therefore makes it necessary to develop certain capabilities that allow them to exploit and combine their internal and external knowledge sources in the best possible way. We collected data through interviews with both managers and employees directly involved in open innovation activities. A total of 9 formal interviews has been conducted between 2018 and 2020. We conducted 7 interviews face-to-face and 2 interviews online. The number of interviews was determined following the principle of theoretical saturation, until the information gathered was considered sufficient and no further relevant information could have been added by additional interviews [40]. We conducted interviews in Italian, transcribing and analyzing them in the same language to ensure greater rigor. Data from interviews have been triangulated with participant observation (consisting of firm visits, consultancy, informal interviews, participation in meetings) and document analysis. The data analysis followed an abductive approach aimed at combining theory and empirical insights [41]. We theoretically drew on the concept of relational capabilities (for a definition and the coding summary see Fig. 1). We then explored organization members' individual characteristics to shed light, through the empirical analysis in our sample, on the microfoundations of

relational capabilities through an iterative approach between empirical data and existing literature.

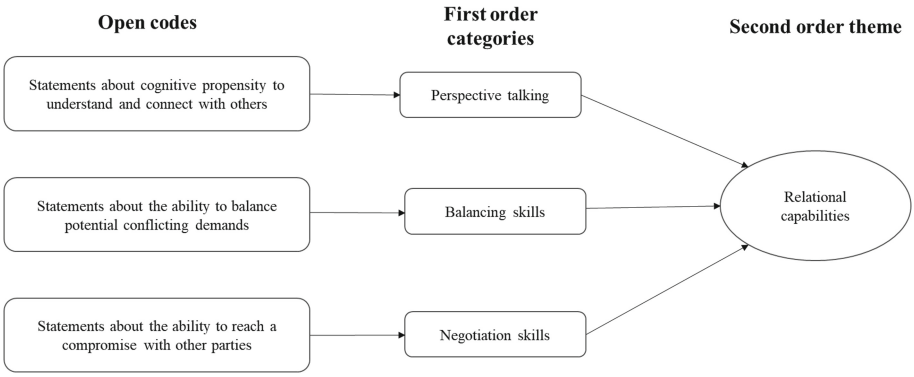

Fig. 1. Coding summary. *Source:* Author's own elaboration

4 Findings

> "Collaboration is a matter of social interactions between individuals. I can say on the basis of my experience that whenever I have collaborated with individuals who exclusively pursued their perspective, the collaboration has never turned out in the desired results, to the detriment of both".

This excerpt of interview highlights the importance of adopting alternative points of view when engaging in collaboration with other individuals and/or organizations. This ability is expected to play a pivotal role in inter-organizational collaboration, as directed at firm-external actors belonging to the firm's supply chain such as customers and suppliers, or other stakeholders such as universities, government, and citizens [20, 42]. Despite the ability to consider how someone else may think about something is strictly related to personal traits, we also found that working daily in environments that stimulate confrontation can increase individual's propensity to look beyond their own point of view. For instance, during an informal interview, we were informed about how one organization was pushing the members who were in charge of following open innovation projects to map their partners for enabling more effective knowledge of them and thus improving strategic collaboration:

> "Part of our R&D efforts take place jointly with universities and research centers. In accordance with my organization, I map the partners to know in advance which professor is expert for instance of sensory analysis or microbiology or whatever. The objective is to understand what to expect from them and what they can expect from us. An early knowledge of the characteristics and expectations of our future partners facilitates both the project proposal and the collaboration along the project".

However, this ability can only be partially induced by the context of reference. During field observations, we realized how some individuals were more likely to adopt the perspective of others. Usually, this propensity was associated with distinctive traits such as high curiosity and creativity. Moreover, considering the perspectives of others can also stimulate the production of new and useful ideas, combining, building on, and experimenting with different viewpoints [43]. Nevertheless, seeing problems from others' perspectives can stimulate the tendency to ask new questions, identify nonobvious linkages, and apply interpretations to unusual domains [20]. Consequently, this can positively affect individuals' divergent thinking abilities [44], fostering both individual and organizational propensity towards sensing and discovering new business opportunities.

Drawing on previous studies, we have conceptualized this social competence as perspective taking, following Galinsky, Maddux, Gilin, and White [45], that define perspective taking as the cognitive capacity to consider the world from other viewpoints.

A second skill relevant for inter-organizational collaborative innovation is the ability to balance potentially conflicting demands. The art of balancing can assume different meanings in practice. As put forward in previous studies [46, 47], individuals' ability to handle contradictory forces, such as between competition and collaboration, is essential in inter-organizational contexts. This dimension is also linked with the previously introduced dimension of perspective taking. The ability to balance formal and informal meeting opportunities is indeed essential for increasing group cohesion and, in turn, facilitating perspective taking. The chief executive officer of one of the firms under analysis evidenced his strategy to take advantage of steering committee meetings in open innovation projects as a way of both discovering new opportunities and negotiating new collaborations:

> "Any partner has its own specific characteristics. With some of them it is easier to communicate during the formal work tables, with other ones, maybe the less experienced, you have to change your tune, avoid technicalities and bureaucratic language and immerse in their reality. In these cases, coffee breaks allow you to be informal and to break down barriers".

A relevant problem also emerges when disruptive ideas need to be integrated into the business strategy. This in fact requires the ability to balance competing demands such as change and stability and external and internal ideas. This often happens when a specific team collaborates with external organizations in open innovation projects. In this case, the team can develop potential new products or services across organizational boundaries. However, it can experience resistance to change [48–50] when the innovative ideas need to be implemented in the organization (e.g., the top management does not recognize it as strategic or the employees feel uncomfortable). Some firms have solved this problem by directly involving the chief executive officer as a supervisor in the project. However, when this is not possible, especially in larger companies, we found the relationship between firm executives and the (open) innovation manager, or whoever is in charge of leading the project, to be relevant. As evidenced by the innovation manager of one medium-size firm:

> "I am daily in contact with the CEO regarding the projects we are carrying out with other organizations. The main goal of course is to follow the organization's targets, but it is also true that projects often take a different turn and sometimes we identify with my team and our partners' unexpected solutions. In recent years, I have worked to build a relationship of trust with the CEO so that there is a continuous and transparent dialogue. So we can understand together to what extent the ideas from the project can be integrated in our own strategies".

This ability to balance potentially conflicting demands, for which we have provided some examples, has been conceptualized, in line with previous studies [51], under the label balancing skills.

Another individual ability that emerged as relevant in this study is the ability to reach a compromise with partners. This dimension is strictly related to perspective taking and balancing skills. Looking at others' perspectives and balancing conflicting demands is, in fact, essential in order to reach a compromise with other parties. We have conceptualized this ability as a negotiation skill, an element that can become a key resource for maturing relational capabilities. When coupled open innovation is at stake, negotiation is a continuum process in which individuals are engaged in different activities. For instance, to ensure value co-creation, it will be important that every network partner participating in an inter-organizational project contributes to shaping the initial project proposal. This implies different rounds of review of the project initiation documentation in which negotiation plays a fundamental role. Moreover, negotiation is also important during the execution of the project and it can also be stimulated by some organizational solutions at the project-level. For instance, a chief executive officer referred to as the collaboration during the steering committee meetings was:

> "facilitated by the presence of different tables in which companies can confront with the leaders of the various work packages. The presentations are all open. So, everyone can see what the companies are doing and get to know each other [...]. We specifically do not know what all the other partners are doing, but we get a general idea that allows us to develop relationships during the project with organizations with which we have elements in common".

However, negotiation skills are not only essential to build new relationships but also to re-negotiate goals over time. During field investigations, we also had the opportunity to discuss with a professor who was collaborating with one of the SMEs that we had selected as a case of study:

> "Our partner had clear ideas about the project but unfortunately we realized over time how difficult was to achieve the original objectives. However, they were very skilled, in concert with us, to reformulate the plans and promptly communicate to the project manager the new, more realistic, objectives we were setting".

The propensity to (re)negotiate represents a key ability to secure new opportunities, acquire external knowledge, and transfer internally this knowledge to the organization. Excellent negotiation skills prove to be fundamental not only regarding inter-organizational relationships but also regarding intra-organizational relationships. As a manager revealed:

> "The negotiations that must then take place within the firm to communicate the benefits of certain innovations to managers and employees that are not directly involved into the project are often more exhausting than those that take place with external organizations".

The adoption of open innovation practices, in fact, requires negotiation processes with or between managers to implement at the organizational level what is going to be developed at the project level. In other words, negotiation is essential for absorbing knowledge from external sources as well as for transferring knowledge to others.

5 Summary of Results and Conclusions

To summarize results, we found three skills to be particularly relevant for firms to nurture relational capabilities when they engage in coupled open innovation. These skills have been conceptualized following existing categories in previous literature and they are perspective taking, balancing skills, and negotiation skills. These three skills are dynamically interrelated since the ability to consider others' perspectives (i.e., perspective taking) is an essential step to consider both poles of potential conflicting elements (i.e., balancing skills) that in turn is of the utmost importance for negotiating with partners (i.e., negotiation skills). Successful negotiating outcomes can then stimulate perspective taking since actors recognize the importance of looking at others' perspectives.

The results of this study thus contribute to investigating the human side of open innovation by adopting a microfoundational approach. More specifically, we have investigated how specific skills and individual abilities may aggregate at the organizational level in higher relational capabilities, a sub-set of dynamic capabilities that are essential in coupled open innovation. Focusing on coupled open innovation as a context of analysis, we shed light on the human side of this open innovation model, extending previous microfoundational research that had mainly prioritized the inbound mode of open innovation and related concepts such as absorptive capacity (e.g., [20]). More generically, this study responds to calls for microfoundations of organizational capabilities [8–10, 52]. Indeed, while numerous studies have already proved the positive effect of organizational capabilities on open innovation performance, there is still a paucity of studies regarding the microfoundations of capability development in the open innovation domain [12].

The findings of this study have also implications for policymakers, especially in government-funded open innovation projects. A good outcome of open innovation projects depends in part on the ability to stimulate organizational capabilities and individual social cognition and behaviors. In this regard, it would be important to leverage human-centered innovation methods such as design thinking [20, 53] to nurture perspective-taking, balancing, and negotiation skills.

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Resource Orchestration Theory and the Configuration of Electronic Human Resources Management

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Abstract. Electronic human resources management (e-HRM) as a field has been developed on an exploratory basis, thus lacking theoretical foundations. Research into its theoretical underpinnings is therefore needed. Research orchestration theory (ROT) is an expansion of resource-based theory. It considers managers' roles in the selection and configuration of resources, and it aims to explain the process of achieving a competitive advantage and exploiting the dynamic capabilities of resource configuration. This study is based on Strohmeier's [34] framework and focuses on the configuration of e-HRM and its underlying elements: actors, strategies, activities, and technologies. We propose ROT as a solid foundation for the empirical investigation of e-HRM.

Keywords: e-HRM · Resource orchestration theory · Resource-based theory · Configuration

1 Introduction

Research has provided several definitions of electronic human resources management (e-HRM) depending on the historical period and the scientific development involved. A recent review by Marler and Fisher [23] proposed the following definition: "e-HRM consists of configurations of computer hardware, software, and electronic networking resources that enable intended or actual HRM activities (e.g., policies, practices, and services) through individual- and group-level interactions within and across organizational boundaries" [21, 23]. Nevertheless, researchers have not reached a consensus about the definition of e-HRM and the theoretical basis of this field [23, 24, 29, 34]. Identifying a solid theoretical foundation for the e-HRM structure is a critical challenge.

Strohmeier [34] published one of the most relevant reviews of e-HRM. He identified a framework for the structure of e-HRM, which categorized publications on e-HRM based on three elements: context, configuration, and consequences. Each of these and the connections between them require underlying theories to help researchers base their research on solid conceptual foundations [23].

The present study focuses on configuration, which includes four fundamental elements for management. In particular, we analyze resource orchestration theory (ROT)

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[32] as a possible conceptual basis for the configuration of e-HRM. ROT is based on the intersection of resource-based theory (RBT), contingency theory, and dynamic capabilities theory. It includes two main phases: search/selection and configuration/deployment [32]. Given the connection between the second phase of ROT, dynamic capabilities, and orchestral direction, we believe that ROT can serve as an excellent conceptual basis for the development of future theoretical and empirical works on the configuration of e-HRM and its connections with context and consequences.

The rest of the article is structured as follows. Starting with a description of Strohmeier's [34] framework, we focus on configuration. We describe RBT (already proposed by Strohmeier as a possible theoretical explanation of the relationship between configuration and the consequences of e-HRM) and ROT as extensions of RBT. Finally, through a joint study of RBT, ROT, dynamic capabilities, and e-HRM configuration and through clear analogies with orchestral direction, we make some reflections about the opportunity to use this theory as a theoretical basis for the future development of e-HRM research.

2 Strohmeier's Framework: The Configuration

In 2007, Strohmeier [34] proposed a framework for e-HRM based on a literature review (see Fig. 1). Through an in-depth analysis, Strohmeier identified three fundamental elements of the e-HRM structure: context, configuration, and consequences. Within the structure, the context generates the configuration, and the configuration generates the consequences. Each of these dimensions consider the micro and macro levels of analysis. For the micro level, the framework considers an individual or a group. For the macro level, it refers to other conditions, such as culture or the socio-economic context. For the macro-level, Strohmeier referred to Snell et al.'s [33] work, which distinguished between operational, relational, and transformational consequences.

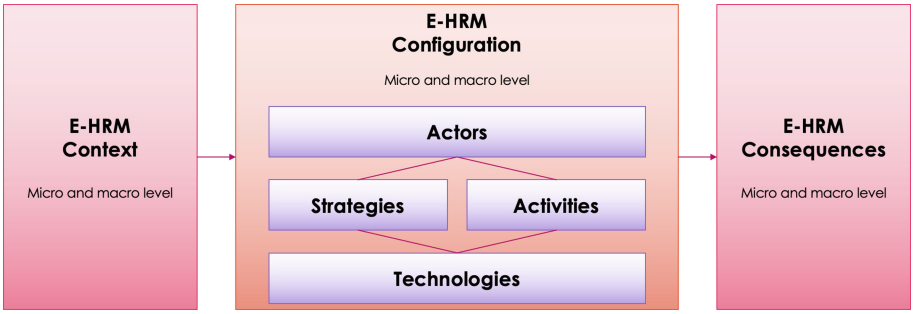

Fig. 1. Strohmeier's framework (2007: 21)

The configuration represents a critical node of Strohmeier's [34] framework. This led us to reflect on the opportunity to analyze its theoretical underpinnings.

According to Strohmeier, the configuration is composed of four elements. The actors "are all those who (plan, implement and) perform e-HRM" [34:21]. Strategies concern

the "establishing of constitutive objectives and the implementation of e-HRM" [34:21]. Activities "encompass the single HR functions, like recruiting and selection, training and development, compensation and benefits that are performed in order to provide and deploy the needed human resources" [34:21]. Finally, attention should also be given to "the HR-related properties and functionalities of the employed technology" [34:21].

3 RBT as a Conceptual Basis for ROT

The connection between superior performance and the achievement of a competitive advantage is one of the most studied topics in the management literature [5, 13]. Scientific analysis focuses on the sustainability of such a competitive advantage [31]. In this context, RBT is one of the simplest, most direct, and most cited theories in management history [21].

RBT is based on the analysis of the relevance of organizations' internal variables. Its main aim is to understand opportunities for exploiting the uniqueness of firms' resources in order to create and maintain a competitive advantage over time. RBT highlights the opportunity to concentrate on investments in order to develop rare and inimitable resources for firms. The objective is to achieve resource exploitation for market needs, which must be performed through a firm's strategy [21].

As proposed by Wernerfelt [39], RBT interprets firms' resources as mirrors of their competitive abilities. Rumelt [30] stated that a firm should be considered a set of productive resources whose development and use could guarantee different results, depending on the diverse contexts in which the firm operates. In other words, product competition should be considered as a competition among firms' internal resources [6]. According to Barney [4], the development of internal resources can lead to a superior competitive advantage compared with the acquisition of external resources. This process is based on the firm's and the market's needs. Therefore, such a development is a function of the expected return in that specific market. In this sense, the investments made to develop an organization's existing resources are the basis for the formulation of RBT and the idea of a firm's differentiation.

Although RBT is a commonly used theory, it has not been exempted from criticism. Kraaijenbrink et al. [21] studied the main critiques of this theory. Although all are interesting and can help further refine RBT, the most relevant critique for our study is that RBT "has no managerial implications" [21:351].

This critique highlights that RBT gives a general recommendation that resources should be acquired and developed correctly. Unfortunately, the process through which it is performed has not been examined in depth. It appears that RBT is based on the assumption that managers have total control over their resources, as if this process were simple and as if the competencies for their development can be easily acquired. Although this critique can be said of other theories, the popularity of RBT implicitly requires a complete work of its theoretical framework. Therefore, ROT was developed further with this aim.

4 ROT and e-HRM Configuration

A professional orchestra can count on the best musicians, who study and learn their scores with precision and interpretative efficacy. A single performance is the responsibility of the musician, who studied for years and perfected the practice, the reading, and the interpretation of the score, depending on the musician's cultural factors and on the historical moment the composition was written.

Unfortunately, a single musician's in-depth knowledge, no matter how excellent, is not sufficient to ensure that the orchestra plays a symphony as a unique entity. For this reason, it is impossible to guarantee to the public that, without a professional guide, the effectiveness of each musician leads to a perfect performance of the entire orchestra. In this regard, the role of the orchestra leader is fundamental.

The orchestra leader cannot play all the instruments and cannot know by memory all the scores. The role of the maestro is to coordinate the performance, focusing on the volume, prosody, and tone of every single instrument. The leader is the only person who knows with certainty who and what is playing at every specific moment of the performance. Consequently, such a position is comparable to that of the manager.

Firms' managers possess managerial competencies, which are not technical in nature. Their coordination and supervision capabilities go beyond the praxis and employees' knowledge. While employees are responsible for their respective assignments, managers must ensure that all tasks are completed and coordinated to achieve the final objective.

Just like orchestra leaders have to pay attention to the overall score, managers are focused on the orchestration of every task to ensure that the achievement of the objective is in line with the initial planning and efficiency requirements. These two roles have considerable similarities. Both managers and orchestra leaders must be mentors, adapting the performance of their subordinates to ensure that it is adequate to complete the comprehensive initial set of objectives. Just like orchestra leaders adapt agogics, managers adapt the velocity of project execution. Just like maestros control the music articulation, managers verify the efficiency of results achievement. Both maestros and managers have to be leaders; their role is based on their subordinates' trust, which is earned through their work and attitude.

The final performance of a symphonic orchestra is comparable to the achievement of an objective defined in the initial phase of strategic planning. The maestro prepares the performance for months before the moment of execution in front of spectators. Musicians meet at the rehearsals, playing and perfecting the volume and the timbre, as well as creating synergy among the different interpretations. Similarly, managers supervise work for months before achieving a specific objective. The only difference is that the maestro receives applauses, whereas managers receive promotions.

RBT was not able to conceptually describe the role of managers completely. According to Sirmon et al. [32], owning resources means being aware of how to use, orchestrate, and synchronize them. From the perspective of value and competitive advantage creation, the way resources are included, distributed, transformed, and mutually exploited to achieve predetermined objectives is critical for gaining a leadership position in the market. For this reason, referring to the basic principles of dynamic capabilities theory and contingency theory, as well as leveraging its connection with RBT, ROT has been used as an extension of the fundamental framework of the resource-based view

for emphasizing the positions of managers within firms [15]. In summary, ROT states that firm resources should be organized dynamically and should be used through a complementary perspective. Consequently, managers' roles are fundamental, and so is the coordination of all the managers of a firm [9].

ROT and Strohmeier's [34] framework are connected. In their book *Dynamic capabilities: Understanding strategic change in organizations*, Helfat et al. [16] identified two main processes for resource orchestration. The first, called search/selection, is the phase that includes creating conditions for performing resource orchestration. During this phase, managers identify the right resources and prepare them to be orchestrated. They invest in materials and training to ensure that such resources acquire the fundamental dynamic capabilities to be organized and integrated. The second phase, called configuration/deployment, refers to the act of orchestration. This phase is conducted through a perspective focused on the dynamic effects of resource preparation. In other words, resource orchestration prepared during the first phase allows the creation of conditions for innovation and adaptation.

Practical resource orchestration is a fundamental praxis in management. Evidence in the literature shows that failure in resource orchestration (i.e., orchestration shortfall) results in organizational ineffectiveness, economic loss, and inferior performance [19]. A disappointing performance is often connected not with the absence of resources but with the absence of orchestration capabilities. In this regard, achieving a clear and stable definition of managers' roles within organizations is critical.

According to Sirmon et al. [32], managers' roles have three main dimensions: structuring, bundling, and leveraging. In summary, these three dimensions represent managers' roles in the definition of parameters through which resources are selected and exploited, depending on the external opportunities that a firm wants to intercept.

Moreover, resource orchestration does not concern only the intervention of managers in the development of resources under their control. It involves the joint and structured actions of all the managers of a firm. The literature recognizes the critical roles of CEOs and boards of directors compared to managers' roles [11], but coordination among managers should be present.

Concepts related to dynamic capabilities are widely used to explain resource orchestration. According to Teece et al. [36:516], "dynamic capability is the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions." Dynamic capabilities are based on previous knowledge, available resources, learning, time, and investments [25]. Therefore, all combinations of these elements could allow firms to adapt to the external environment [7]. The effects of resource orchestrations are based on dynamic capabilities and, if resources are selected effectively, can promote the generation of competitive and strategic advantages through the continuous adaptation of organizational abilities.

The two phases of resource orchestration, as well as the correct configuration, highlight the positive effects of dynamic capabilities. In Strohmeier's [34] framework, the configuration is between context and consequences. Given that the configuration (and

implementation) of resources is one of the most critical phases of resource orchestration, we propose the conceptual connection between this element of Strohmeier's framework and ROT. In Fig. 2, we show Strohmeier's framework, completed with the theoretical foundations we propose and the theoretical underpinnings put forward by Strohmeier [35] for e-HRM consequences (i.e., voluntarism and determinism), with their intermediate shades (strict and moderate voluntarism; strict and moderate determinism).

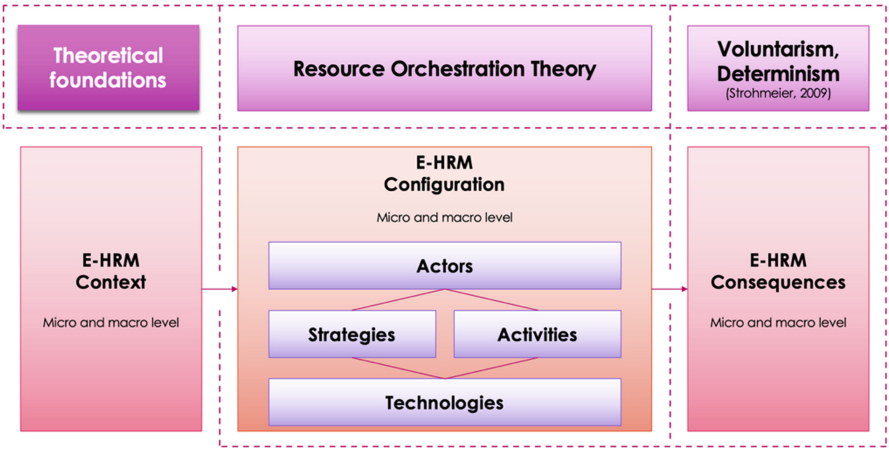

Fig. 2. Strohmeier's framework with theoretical foundations

The analogy with the direction of an orchestra is clear. Performance is dynamic, and so is the preparation for a performance. Musicians' preparation goes beyond ensuring the quality of their performance. Together with their colleagues and the director, they prepare to solve problems related to the execution and interpretation of music at the exact moment in which they emerge. The role of the director is critical. The maestro produces a configuration of available resources (i.e., musicians who interpret the symphony). This configuration can adapt to unexpected conditions. At that precise moment, both musicians and the orchestra leader learn and improve their vocational abilities, promoting innovation within their organization, which is the most critical foundation for an orchestra, as well as for a firm.

5 Use of ROT in the Literature

To the best of our knowledge, no research has used ROT as a conceptual basis for explaining the elements of e-HRM configuration and the connections among them. Nevertheless, this theory has been used in the literature as the theoretical foundation for scientific contributions that consider, beyond other objects of study, actors, strategies, activities, and technologies.

In this section, we present some examples of such research. In particular, we consider strategies, activities, and technologies because actors are included—directly and indirectly—in most of the works we studied.

This set of examples does not aim to be exhaustive. Nevertheless, in our opinion, there are promising opportunities for using ROT as a fundamental theory to explain configuration, together with its elements, in the field of e-HRM.

5.1 ROT and Strategies

The use of ROT according to the definition and implementation of strategies within a firm's context has been widely discussed in the literature. One of the most cited articles is that of Hitt et al. [17], highlighting the importance of leaders' actions in process and resource synchronization and analyzing the single orchestration procedure within a strategic entrepreneurship context. In such a study, more integrated orchestration processes were identified: structuring, bundling, leveraging, and value creation and appropriation. In general, analyzing such processes shows the critical importance of exploiting market dynamism and discontinuities.

The literature examines the synergies created by an adequate resource orchestration system [3]. In this context, ROT is also used to analyze the efficacy of the processes of dynamic resource organization in the field of selling [2].

Internationalization strategies, mainly referring to the best practices of resource recombination and orchestration, have been studied by Verbeke and Kano [37]. In this case, ROT is not a theoretical basis for the study but a practical basis for developing a solid global strategy for multinational firms.

5.2 ROT, Activities, and Processes

The intersection between ROT and activities has been studied from different perspectives. For example, Ketchen et al. [19] examined the orchestration of activities concerning product recalls. Cui and Pan [12] used ROT to understand the foundations of activities related to the activation of e-commerce services. Queiroz et al. [28] applied ROT as a basis for comprehending the impact of efficiency on the processes with which information technology (IT) applications are substituted.

The accumulation of resources needed to realize good orchestration is critical. For example, Wright et al. [42:911] studied the university context. Applying ROT as a theoretical basis for their study, they proposed analyzing the "heterogeneity of growth across different types of university spin-offs."

Pavlov et al. [27] investigated the interaction between performance management and HRM. Their study showed how the efficient organization of performance management processes produces positive effects on firms' performance. Hodgkinson et al. [18] explored the effectiveness of resource orchestration processes that analyze how managers orchestrate different typologies of capital (e.g., human and organizational capital) to improve competitiveness and realize ambidexterity. Burin et al. [9] also investigated ambidexterity, which refers to the dynamism of supply chains, emphasizing the efficacy of IT instruments and their synergy. The findings confirmed that achieving ambidexterity promotes the efficient use of resources, simplifying their orchestration.

5.3 ROT, Technology, and Innovation

Concerning technology and innovation, ROT is used in a different context. For example, Nambisan and Sawhney [26] studied network orchestration processes to emphasize their effects on the main components of innovation planning and realization. The processes connected with innovation were also analyzed by Carnes et al. [10], who examined the managerial interventions that, through resource orchestration, can introduce innovation to firms' lifecycles. In the context of innovation, ROT is used as a conceptual basis for understanding the time and methods for implementing an Enterprise Resource Planning system [1].

Liu et al. [22] proposed ROT as a conceptual basis for comprehending the effects of technology adaptation on firms' performance. Wales et al. [38] and Koufteros et al. [20] also considered the relationship between technology and performance, basing their line of reasoning on ROT. In particular, Wales et al. [38] underlined the role of IT and communication, whereas the latter analyzed the diagnostic and interactive applications of performance indicators.

Sustainability has also been studied by integrating technology and ROT. For example, Wong et al. [41] considered green supply chain integration and identified ROT as an ideal instrument for this kind of analysis. Gong et al. [14] analyzed the theme of supply chain and sustainability, mainly referring to the need to learn sustainability-related concepts for the supply chain. Wong et al. [40] used ROT to emphasize how structural intervention for cost reduction contributes to supply chain efficacy, especially to sustainability.

6 Theoretical and Practical Implications

e-HRM is considered an emerging area of research. The increasing number of papers and chapters published in this area can make e-HRM grow as an empirically based field. Nevertheless, the literature highlights the need for a solid theoretical foundation for the subject. The first important implication of our study, therefore, is opening up a discussion about the theoretical underpinnings of the first two elements of Strohmeier's framework. Strohmeier started this work in 2009 with his article "Concepts of e-HRM consequences: a categorization, review and suggestion" [35:528], in which he described the theoretical foundations of e-HRM consequences (i.e., the third element of his framework).

In particular, he highlighted that the concepts of voluntarism and determinism, with their intermediate shades, could explain the different consequences of e-HRM implementation. Strict determinism "views technology as the exclusive origin of consequences" [35:530], whereas moderate determinism considers technology the most important factor that generates consequences. Strict voluntarism considers human organizations as "the sole origins of consequences" [35:532], whereas moderate voluntarism considers this factor the most important vehicle for consequences. According to Strohmeier [35], these philosophical conceptualizations help researchers identify the theoretical underpinnings of empirical studies of e-HRM consequences.

We propose using ROT for the same objective—to develop the theoretical foundation for the empirical analysis of the second element of Strohmeier's framework, which is the configuration of e-HRM. This configuration is composed of actors, strategies, activities, and technologies. Coordination among these components is fundamental to ensuring the

effectiveness of e-HRM implementation. Therefore, ROT can be used to underline the importance of managers' roles in defining configuration and connecting its elements. For this reason, we hope that future research can consider ROT as a solid foundation for the empirical analysis of e-HRM configuration and its relation to consequences.

We identify a practical implication of our study in the definition of managers' roles during e-HRM implementation. To the best of our knowledge, there is no evidence of the definition of the managerial position being devoted explicitly to implementing e-HRM. In most cases, the empirical literature shows that organizations perform this implementation through HR managers and employees. Nevertheless, the increasing importance of e-HRM and the increasing complexity of related systems could lead to the employment of a professional manager—or a project manager—precisely devoted to building and maintaining e-HRM-related systems, processes, and procedures. Therefore, we identify the opportunity to consider the e-HRM implementation manager as a new professional figure.

7 Conclusions

As a field, e-HRM has been developed mainly on an empirical and explorative basis [34]. Scientific research considers e-HRM a relatively young field, but advancing the understanding of its theoretical foundations is critical to ensuring the consistent development of its practical applications and empirical tests [8]. On these bases, we attempted to integrate previous theoretical contributions to the field of e-HRM.

In this study, we proposed ROT as a conceptual foundation for one of the three fundamental elements of Strohmeier's [34] framework, the e-HRM configuration, which represents the second phase of ROT. As an extension of RBT and an intersection of RBT, contingency theory, and dynamic capabilities theory, ROT allows us to develop a more consistent idea about the positions and roles of managers within organizations [15].

Resource orchestration is as fundamental as resource acquisition [32]. All the elements of configuration in Strohmeier's [34] framework (i.e., actors, strategies, activities, and technologies) could be integrated dynamically through managers' actions, which create and exploit firms' dynamic capabilities and resources.

For these reasons, in our opinion, ROT shows promise in discussions of the four elements of Strohmeier's [34] framework and the organizational and dynamic connections between them.

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Engagement of Online Communities Within a Citizen Science Framework for Improving Innovative Participation Models: Insights from Hydrology and Environmental Monitoring

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Abstract. Citizen science is a set of methodological approaches aimed at engaging general public in the processes of co-production and sharing of scientific knowledge to face societal needs and environmental challenges. Its main fields of application concerns environmental sciences, earth observation and urban planning, by introducing human and socio-cultural perspectives into technical and scientific tasks. New developments in Information and Communication Technologies (ICT), remote sensing and data processing pave the way to new crowdsourcing activities for social engagement, volunteers' recruitment and organization. In particular, social media systems allow rapid sharing of information at low cost connecting and organizing people within online communities. Citizen science can constitute an innovative theoretical framework within which online communities can be engaged for production of new forms of knowledge and for giving innovative perspective in organizational processes. The aim of the paper is to pose general reflection to build a conceptual transdisciplinary framework for the integration of online communities as part of citizen science projects integrating insights deriving from its application for hydrology and water resources management.

Keywords: Citizen science · Online communities · Public engagement · Knowledge co-production

1 Introduction

Citizen science is a set of methodological approaches aimed at increasing public participation in scientific research activities through the co-production of knowledge and useful

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tools for data collection, data processing and dissemination of results [1]. Its main fields of application concerns environmental sciences, earth observation and urban planning, by introducing human and socio-cultural perspectives into technical and scientific tasks. In this way, citizen science support expert researchers in the definition of practical solutions that intercept research questions with social needs [1–5]. Citizen Science involves the use of crowdsourcing models and participative approaches for the sharing of ideas, the development of projects and the organization of volunteers in research projects [6].

New developments in Information and Communication Technologies (ICT), remote sensing and data processing pave the way to new crowdsourcing activities for social engagement, volunteers' recruitment and organization [7, 8]. In particular, social media systems allow rapid sharing of information at low cost [9] connecting and organizing people within active communities [8, 10]. Citizen Science can constitute an innovative theoretical framework within which online communities can be engaged for production of new forms of knowledge and for giving innovative perspective in organizational processes. Citizen science, firstly, encourages dialogue and the exchange of information between citizens and experts, in order to increase awareness on public interest issues and in decision-making processes [1, 2, 11, 12]. Dialogue and information exchange are also functional to collaborative modelling of tools and processes [13, 14]. Volunteers' engagement and participation in a citizen science framework is not limited to data collection only but extends to the shared definition of research problems and the co-production of results for understanding the phenomena [1, 15].

Despite the developments and integration of ICT and new recruitment methods through social media systems in participatory approaches to scientific research and environmental monitoring, the engagement of online communities in citizen science activities constitutes a research gap. This gap is found both at theoretical and empirical level, where citizen science initiatives are generally conducted on field activities coordinated by experts. The use of ICT and digital technologies, in this context, is usually supportive. Yet, the role of online networks and digital communication tools is increasingly pervasive in the information gathering and exchange between people aimed at knowledge co-production through cooperation and organized collective action [10].

Starting from this gap, the aim of the paper is to provide a conceptual framework for the integration of online communities as part of citizen science projects integrating insights deriving from its application for hydrology and water resources management [3, 16]. The research method adopted is a theoretical literature review on the concept of citizen science and its implications related to engagement of online communities. Finally, this contribution presents three illustrative cases from hydrology and water resources management to contextualize practical and organizational issues in citizen science projects to hypothesize possible scenarios for the engagement of online communities. Starting from Shirky's [10] indications regarding the organizational issues posed by online networks and digital communication tools, this contribution tends to outline possible potential scenarios of online communities' engagement in a citizen science framework aimed at co-production of knowledge through information sharing, cooperation and collective action between users. The paper is structured as follows: in Sect. 2, authors introduce theoretical concepts related to citizen science and explain ideal typical users' attitudes within an online network. In Sect. 3, authors illustrate research gap in

investigating the role of online communities in a citizen science framework. Sections 4 and 5 are focused on insights derived from application of citizen science principles in hydrology and water resources management from theoretical contributions and practical applications. Then, in Sect. 6 authors will provide final considerations focused on possible organizational scenarios for enhancing the role of online users in a collective action towards achievement of social and environmental goals, by application of citizen science principles.

2 Theoretical Framework

A common and statutory definition of citizen science is still missing [17] and its application in research tasks usually reflect empirical concerns. Definition of methodologies, protocols and research methods is the result of dialogue and shared points of view between experts and engaged volunteers [2, 18]. Citizen science aims to promote peer collaboration between experts and citizens, even if first group often leads research projects because of its level of expertise on scientific topic [1]. In fact, experts refer to professional researchers involved in academic context. While volunteers represent a heterogeneous group, within which individuals can differentiate themselves by level of education, cultural and social background, professional expertise, motivations and interests [13, 19].

Furthermore, volunteers can represent different interest or social groups. Expert researchers often engage generic volunteers through call to action or crowdsourcing techniques [7, 20, 21]. In other cases, volunteers' engagement aims at representatives of local communities, bearers of social and territorial needs, such as bottom-up associations, neighborhood committees or ethnic and linguistic minorities [2].

These aspects are crucial for achieving common research objectives, defining shared research design, adopting, and implementing suitable tools for data collection and processing aimed at the co-production of knowledge and scientific activity. Starting from these theoretical assumptions, citizen science is usually structured in (1) contributory, (2) collaborated, and (3) co-created typologies according to the level of engagement and tasks assigned to volunteers [22–24]. This tripartition can represent ideal types on which setting up participation strategies. From a contributory perspective, experts maintain their leading role, controlling all stages of the research process. The role of volunteers is limited to the collection and sharing of data useful for research purposes [22, 23, 25]. From a collaborated perspective, volunteers' engagement includes refining tasks of research question, activities and roles set by experts [22, 23, 25]. Participants act in cooperation to experts in order to give them insights to analyze under scientific lens. Finally, co-created typologies constitute the highest level of citizen science, in which co-production between experts and volunteers is more evident. Co-created citizen science implies participants' engagement in all stage of research process [22, 23, 25]. Volunteers' participation is expressed in a call to action in which participants act as peer with experts [26].

Based on this ideal–typical tripartition, an organization involved in citizen science activities has a complex and circular structure (Fig. 1). The complexity derives from the coexistence and co-participation of different types of actors, coordinated by experts.

Circularity depends on constant dialogue between actors that interact as peers. Circularity guarantees a constant flow of information between participants at the basis of feedback actions and in support of collective actions within the processes of knowledge co-production, co-management of public and scarce resources (such as water, land, woodlands and food systems), co-assessment of related risks (floodplains, rainfalls, drought, soil erosion) supporting for concerted and shared decision-making processes.

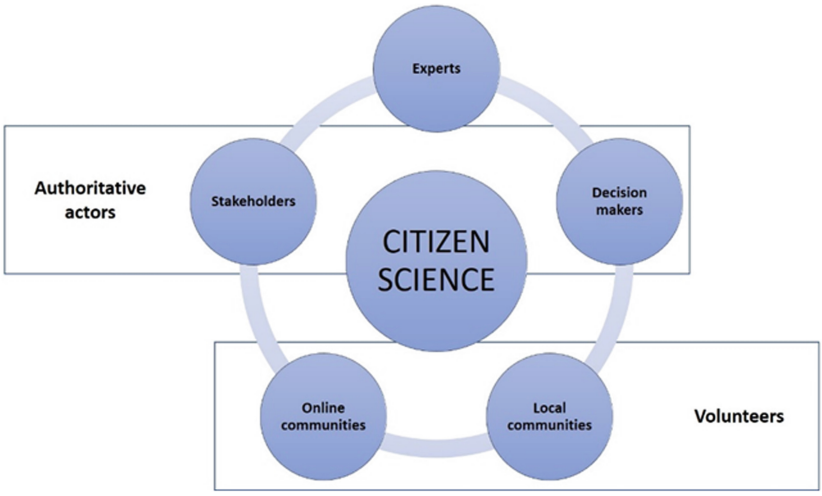

Fig. 1. Cyclic configure of citizen science participation (Source: Authors)

Advances in Information and Communication Technologies (ICT) and digital technologies open new scenarios of knowledge co-production by expanding research tools and methods to social media [9, 18, 27]. In this context, online communities come into play as a new actor for the co-production of information and data useful for knowledge, innovation and creative solutions [28, 29] for organizations enrolled in scientific research [16]. The engagement of online communities, thus, transfers the participatory modalities of citizen science within digital platforms in which volunteers can share data and information, organize themselves and take collective actions [30, 31]. Virtual platforms to share creative ideas to organizations and also to interact between users and experts, building social networks and establish a sense of community [29]. Online technologies support unformal communities in organizing tasks for common efforts [30–32]. According to Shirky (2008), online interactions among users differentiate in three kinds of effort: sharing, cooperation and collective actions [10].

Sharing represents the simplest way to interact within an online community or to take advantages from social media tools [10]. Participants' behaviors are similar to contributory citizen science because their tasks are limited to data or information sharing [15, 22, 33]. Cooperation represents a second intermediate level of engagement in an online community. It implies changing in individual behaviors because participants need to synchronize their action in order to create a group identity [10, 27]. Cooperation

presents strong similarities with collaborated citizen science because it stimulates dialogue and conversation between participants around issues that defines research question and design, opening new way of knowledge and tools co-production [15, 22, 33]. Collective action is the highest level of engagement in an online community. It requires that participants act as a single entity in achieving a specific goal [10]. Decisions are binding and individual behaviors must reflect a general attitude [10]. Participants not only share information and awareness but also responsibility of their action. Collective action is the base of co-production. In this way, it can pose at the base of co-created citizen science because group actions define research scope, methodologies and tools to adopt [15, 22, 33].

These similarities, therefore, lay the foundations on which to set framework models to conceptualize the engagement of online communities in a citizen science framework bringing insights from theoretical and practical application in hydrology and water resources management as an application field of knowledge co-production, as summarized in Fig. 2.

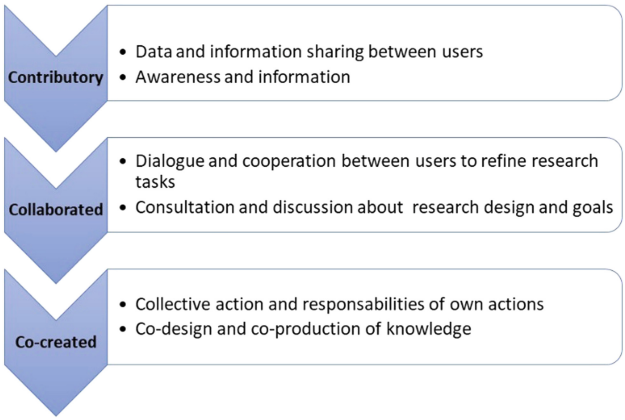

Fig. 2. Summary of main synergies between citizen science ideal types and online communities' attitudes, according to Shirky's tripartition (2008) (Source: Authors)

3 Research Gap

Despite the growing pervasiveness of digital technologies in hydrogeological research and ecosystem management that leverage Volunteerd Geographic Information (VGI) [34] and User-generated contents (UGC), there is a gap with the application of citizen science methodologies with the involvement of online communities. User-generated content data collection usually follows the application of crowdsourcing principles [21, 35] and the involvement of volunteers at a first level of data sharing under the supervision of experts or according to involuntary and anonymous data sharing methods [3, 6, 21]. In recent years, however, there have been several attempts to create active communities as part of citizen science-based research activities [26, 36]. Studies on this topic focus

not only on identifying profiles of participants [36, 37] but also seek to investigate the knowledge acquired by volunteers and the level of awareness on the issues addressed [38–40]. Research on the latter aspect puts volunteers in a perspective of greater interaction between themselves and with experts in the definition of research projects and evaluation of results [40, 41]. Investigating acquired knowledge and awareness projects volunteers towards the development of skills is useful to undertake collective actions and intervene on all phases of the research process with the support of experts [40]. The development of digital platforms therefore allows to contextualize the actions of the participants in a virtual context, often different from the field surveys [40].

Investigating on application of citizen science in hydrological science and water resources management provides several insights to develop a conceptualization of the engagement of volunteers in scientific research processes and in organizational issues related to participatory approaches supported by digital tools and social media contribution. Practical applications in hydrological research and monitoring provide terms of comparison and cases-studies to engage online communities in co-production of shared knowledge, co-design of monitoring tools and in promotion of collective action based on users and online communities' contributions enhanced by means of digital platforms and social media contents. Practical applications from hydrology and water resources management give conceptual and theoretical insights to reduce gap in the enhancement of online communities' contributions into citizen science.

4 Insights from Citizen Science in Hydrology and Water Resources Management

The application of citizen science offers to the hydrologists and water management scientists new research skills for implementing analytical models through the integration of traditional data collection methods with information provided by volunteer citizens, using their own personal mobile devices [3, 21, 35, 42]. The advantage offered by personal mobile devices is the ability to offer a continuous flow of data, constantly updated and with a widespread geospatial coverage, at low cost [2, 35, 43].

Studies on citizen science in hydrology and environmental sciences is mainly focused on the development of organizational and participatory models for the collection and integration of crowdsourced data [14, 18, 44]. These models are usually based on stakeholders' participation and cooperation in terms of increasing participation of general public, reducing social conflicts, building consensus and promoting negotiation between participants and experts on topics of common interests such as management and sustainable uses of water resources [14] or risk and flood hazards communication [18]. The adoption of computer-based models – by means of software platforms, suitable smartphone applications for technical data collecting and processing and communication tools – is functional to (1) support communication efforts directed to general public or specific community groups and to (2) analyze social networks patterns in order to identify potential stakeholders to involve, defining roles and tasks within the organization [45–47]. Social network pattern analysis allows not only a mapping of organized groups of online users but also to investigate interactions between members of an online community [48] and between users and their context of interaction [49, 50]. Context

of interaction is composed not only by peer volunteers but also by stakeholders and institutional actors, such as local authorities and research centers that conduct and coordinate scientific activities or commission research based on co-production of knowledge and co-design of tasks and goals [45]. Introduction of social media tools in citizen science investigation is reshaping socio-spatial networks of participation, projecting the engagement of volunteers from community-based approaches towards virtual contexts [51].

Some peculiar factors stem from literature review supporting engagement and organizational processes in the application of citizen science in hydrology, both in physical and virtual context. These factors can be summarized in (1) the simplicity of the procedures adopted in the engagement of volunteers through simple instruction to carry out [18]; (2) development of suitable tools for data collection and processing – such as, smartphone applications or surveys by means of social media – functional to perform technical tasks in an intuitive and immediate way [18]; (3) development of communication strategies aimed at organizing users and optimizing communications and information exchange between participants [18, 51]; (4) stakeholders' analysis to assign roles and tasks within the organization and define levels of participation and collaboration [14].

User participation is an interactive and iterative process that involves different types of volunteers depending on the level of education, expertise, motivations and interests [14, 19]. These aspects are strategic factors for durability of citizen science projects and the organizational structure of a cohesive and active community [2, 52, 53]. Stakeholder's analysis determines the level of engagement of volunteers within an organization. Their engagement includes different level from participation in terms of information, awareness and consultation to active collaboration in public discussion for definition of research design, co-production of knowledge and co-decision making [14]. Motivations and interests can vary from personal interest to gaining power within a community by means of knowledge [22]; from improving social relationship to social learning [2, 13]; from promotion of joint action to civic participation in co-management of common resources, such as water or agricultural services [54]. From a technological perspective, keeping high motivation relies on development of dashboard of data visualization and digital interactive tools to make user aware on volunteered contribution in research activity. Frequently call to action and feedbacks by email can enhance user's role within online communities, making them feel part of a group [2, 13].

Several studies investigate on novel tools offered by the use of digital technologies and the role of social media in gathering data and information for implementing hydrological and water resource management models [18, 21, 55, 56], monitoring flood risk and disaster risk reduction [7, 9], measuring streams flow and water levels [55, 56]. Expert researchers assimilate information observed by users for the implementation of hydraulic models based on time-series and large geospatial coverage of contributions [57]. However, many applications of this kind rely on crowdsourcing activities that are often involuntary, where the production of data is not the result of deliberate actions within a citizen science research purpose [7, 44]. This issue often occurs in the cases where contribution derived from social media contents, where users are not directly involved or engaged in scientific activities [44]. The illustrative cases in the next paragraph show how the development of digital and web-based platforms is functional

not only to offer technological solution to data collection but also to the construction and enhancement of online communities engaged in water resources management and hydrology under supervision and coordination of experts.

5 Digital Platforms for Engaging Communities in Hydrology and Environmental Monitoring

Several citizen science initiatives on community-based approaches focus mainly on the topic of water management with particular attention to atmospheric phenomena that affect the water cycle and water quality intended as an essential ecosystem service for functioning and social well-being [2, 35]. In this sense, such initiatives tend to create active communities around water management and monitoring through the development and implementation of digital platforms and the use of suitable and ready-to-use apps. The development of online platforms is part of citizen science's progress towards new conceptual, technological and communicative paradigms aimed at widening interactions between users in a common and shared effort [58].

Spotteron, CitSci.org and AnecData represent three illustrative cases that exemplify the application of citizen science in environmental research and monitoring through engagement and enhancement of online communities. The purpose of these platforms is not only to collect data, but also to create operating communities that can constantly share and update personal and collective opinions and experiences in relation to topics of scientific interest, highlighting their impacts on daily experiences. The Spotteron platform offers, for example, advanced digital tools (such as digital maps) for the collection and mapping of information by citizens on various topics of scientific interest. As part of hydrology and water management Spotteron has developed the CrowdWater app [59] in order to collect information on water level and estimate water flows [59]. The application has been used in several studies since the estimation of flows [55, 56] to monitor microplastic pollution of waterways [60]. The involvement of citizens takes place through training and gaming phases in order to build a community attentive, educated and sensitive to the purposes of research and above all to keep the motivations of citizens within the community high through rating and ranking systems of the information received [56, 61]. Through the training and gaming system, the researchers wanted to set up the construction of a community attentive to water management issues in order to obtain active citizens as sensors on a specific geospatial context to provide data and at the same time improve their perception of water resources and the risks related to them for greater sensitivity in terms of water use and consumption.

CitSci.org platform supports collaboration between researchers and citizen scientists in research and decision-making activities [62]. Users can freely access to the platform defining research questions, shared issues and scenarios, developing shared research plans and activities with a view to promoting online collective action initiatives [23, 62]. Users can also build models, collect data and view results according to a shared participatory model in order to create inclusive and participatory management protocols [23].

The AnecData platform provides tools for crowded data collection and interpretation towards the solution of common issues addressed within Citizen Science [58, 63].

Available tools include datasheets, image uploads, charts, and data mappings [58, 63]. Communication tools underpin the potential to create cohesive and active communities through online channels [58, 63]. The platform supports collective actions aimed at solutions to collective problems by creating networks between experts and citizens. Its function is not only limited to the production of knowledge but also to promoting class actions [58, 63].

Digital platforms – like those illustrated above – provide technological support to citizen science projects with wide range of features and advanced tools. Social community extensions – such as newsfeeds, forum, comments, liking and user following, data visualization and summary – constitute many advanced functionalities that facilitate interactions and information exchange at the base of communication strategies, community building processes and new forms of distributed collaboration [64, 65]. Scope of citizen science platforms is to generate measurable results for scientific research and evidence-based decisions [65]. Data quality extensions offers tools for analyzing and validating of citizen observation and for reducing errors and biases [65].

6 Final Considerations

In this contribution, authors have examined the main characteristics of citizen science as a theoretical framework for the engagement of online communities in the processes of scientific knowledge co-production in support of innovative and shared solution for water and hydrological resource management and assessment. Authors have, therefore, examined three illustrative cases aimed not only at investigating the technological aspects, but above all at focusing on the methods of creating communities in order to identify essential and peculiar characteristics that can integrate online communities in a citizen science framework. Finally, the contribution aims to provide insights for the engagement of an online community to support citizen science initiatives across a transdisciplinary application between social and hydrological sciences with the support of digital and information systems.

The role and potential of online communities in a citizen science framework is currently still little explored.

The theoretical insights and practical examples shown in this contribution offer general guiding principles for setting up the organization of online communities in a participatory scientific research process. Digital platforms, such as Spotteron and CitSci.org, offer interesting digital solution to be replicated in several study contexts for the construction of active communities around environmental issues to support scientific research and decision-making processes. These platforms constitute not only a digital solution for a large-scale data collection, but also lay the foundations for the construction of communities engaged in the monitoring and management of socio-environmental processes. In some cases, the team of researchers experimented with the use of dashboards and gaming for long-term engagements of participants and to evaluate the effectiveness of volunteered observations. These solutions can constitute long-term monitoring tools to verify and quantify the contribution provided by volunteers not only in terms of data provided but also for measuring validity, effectiveness and temporal continuity.

The online communities can broaden the recruitment area of volunteers by the support of digital technologies and social media. Digital solutions facilitate the communications within the organization offering the ideal medium to involve non-expert volunteers using user-friendly and intuitive tools. Citizen science provides the theoretical framework on which experts can set up participatory research works and develop participatory processes aimed at the co-production of scientific contents not only and not so much to solve academic research questions, but above all to find concerted solutions to contemporary challenges, such as consequences of climate change or assessment of scarce resources.

In this context, social media (1) implies the adoption of new data collection methods; (2) offer new tools for communication and rapid online interaction between experts, stakeholders and citizens; (3) they constitute investigation tools to identify attitudes and behavioral patterns at the basis of the organizational structures of groups of volunteers.

In the light of the examination of the literature and illustrative case reported, three possible scenarios for integrating online communities into citizen science framework can be outlined. The first scenario is of a collaborative type, in which users contribute to the co-production of knowledge by sharing data deriving from direct observation of phenomena. In this context, users act as widespread human sensors, autonomous in their action with a low level of interaction. The second scenario is cooperative, in which users' actions are synchronized within an organizational structure coordinated by experts. In this context, data collection activities and interactions among users are guided according to specific goals fixed by experts. The third scenario is collective. It represents the highest level of integration of online communities into citizen science processes. In this scenario, the community building is completed. Users share common values and visions at the base of joint action with experts.

Citizen science initiatives in hydrology and water resources management are usually based on community-based approaches and crowdsourcing activities. Community-based approaches not necessarily imply the use of digital and web-based technologies and crowdsourcing activities are often unintentional and not specifically aimed at full engagement of volunteers in scientific research processes. Engagement of online communities in citizen science would make systematic data collection in a context of continuous and active monitoring aimed at intercepting collective social and environmental needs and directed towards concerted solutions to problems related to urban planning and environmental management. Another peculiarity is the virtual interaction of online communities. This aspect allows the replicability of organizational and communication models on different geographic large-scale application contexts and case studies, not only limited to assessment of environmental and water resources but also extended to other fields such as public sector accounting, assessment of public services (transportation, health, education), ecosystem and agro-food systems assessment, co-management of network services and infrastructures.

Despite the wide availability of publications, application cases, tools, techniques and digital platforms related to citizen science, the impacts of this approach at the level of human behavior and cultural change represent a field of investigation that is still little explored and in an experimental phase. Further studies on the topic will have to be directed to shed light on the ability of citizen science to create cohesive and organized

communities and on behavioral changes both individually and collectively. The study of these aspects will be able to shed more light on the motivations and interests underlying the involvement of citizens in the production of scientific knowledge and in decision-making processes. Aspects that complement and integrate with the collection of data and observations and their validation through the implementation of traditional analysis models.

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Co-production and Nudging: The Enabling Role of ICT

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Abstract. Co-production and nudging reflect the new paths taken by governments in the digital transformation age. Both are behaviour-based tools of public action. Both are premised on the idea that citizen engagement in public services is essential for problem solving. Thus far, however, these topics of debate have been addressed in isolation. The aim of this explorative paper is twofold: to come to an overall assessment about the potential of co-production and nudging, analysing the links between them, and the role that ICT plays in improving citizen behaviours. Drawing on a service lens, the paper makes the case that co-production and nudging can be combined to support citizens in their 'service user journey'. This tentative exercise is a conceptual one, but hopefully one that broadens the understanding of citizens' participation mediated by digital technologies. In essence, the joint adoption of co-production and nudging could help design and deliver services that better meet citizen needs.

Keywords: Co-production · Nudging · Public services · ICT platforms · User experience

1 Background

Influencing citizens' behaviour is central to problem solving, and a large variety of instruments are used for this purpose in various policy areas and public service sectors. Ideas on co-production or "the mixing of the productive efforts of consumer/citizens and of their official producers" [1] have been widely discussed by local and central governments across developed and developing countries since the 1970s. In the last few years, the notion that citizens can be encouraged to act in socially beneficial ways has been referred to by the term nudge (i.e., light touch interventions), popularised by Thaler and Sunstein [2] bestseller. As citizens, communities and policymakers, we want to stop 'bad behaviours': people vandalising our cars, stealing our possessions or threatening our children. We want to encourage 'good behaviours': volunteering, voting and recycling [3].

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It is commonly assumed that the crucial problem of co-production at an organizational level is that it is challenging and complex [4], while nudging (as a light-touch technique) tends to be narrow in scope, easy to implement and is characterised by less persistent effects [5]. Scholars also underscore how co-production and nudging – despite arising from divergent cognitive assumptions – go hand in hand with social innovation, defined as "innovations that are social both in their ends and means … that simultaneously meet social needs … and create social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act" [6: 9].

To date, the two strategies have been largely investigated in isolation and from distinct academic backgrounds. Further, the role of information and communication technologies (ICTs) for effective citizen engagement in service design and implementation has remained an under-researched topic in Behavioural Public Policy.

In response to these gaps, the qualitative paper addresses a main question: *What role does ICT play in enabling the public action tools of co-production and nudging?* and aims to provide answers, adding on to the scholarly discourse on behavioural policymaking [7], public service management [8] and related developments.

Investigating the potential of the two tools is both necessary and timely because of the extent to which many contemporary policy challenges are being addressed through strategies of citizen engagement in problem solving. The paper argues that co-production is much more than a form of service delivery, and nudging is wider than "giving messages or creating defaults" [5: 11]. Specifically, the confluence of two broad factors sets the context for positive combination between nudging and co-production strategies: on one side, the widespread presence of ICT tools and social media at all levels of society and in government activities, which has significantly expanded the diversity and convenience of the interactions across 'service journey' [9]. And, on the other, some recent studies [10, 11] that propose the 'hybridisation of nudge', or a joint use of nudging and co-production, as an enhancement to the current behavioural tools.

The line of argument unfolds in four steps. The paper first illustrates the research approach then selectively summarises the debate on co-production and nudging in public domains. Second, it pinpoints the key features of these tools of action according to diverse interrelated dimensions, including the assumptions of behaviour change strategies and the role of citizens at individual and collective levels. Third, it outlines the role of ICTs to enhance customer interaction and to ensure ongoing citizen engagement. Fourth, the paper proposes a conceptual framework that summarizes the essence of co-production and nudging from the service standpoint. The paper concludes with an overview of the key issues that reinforces the need to further study the nexus between co-production and nudging.

2 Research Approach and Theoretical Framework

Given the relatively novel and broad topic of this paper, the most indicated research method is a qualitative approach [12]. Specifically, the following sections conceptually explore co-production and nudging, and their potential. Here, we do not address the issue of whether citizen engagement in public services is a good idea but how the new policy tools can be characterised and what their main organisational implications are.

To situate three key concepts—in particular, co-production, nudging, ICT—in the larger context of behavioural service logic, and thereby evidence the ensuing managerial issues for PSOs (Public Service Organisations), the paper applies a service-based lens [13] as this perspective has much to offer contemporary public sector organisations engaged in the reconfiguration of their delivery systems. As Grönroos puts it, '[PSOs] can be as user-focused and service-oriented as private service organisations. Therefore, what is required is good service management' [8: 788].

The research path begins by discussing how the surge of co-production and nudging reflects in literature. To this end, the paper selectively reviews the latest evidence from information systems, service management and public management studies. We included relevant research work based on our reading that reflects our own viewpoint and expertise.

The paper then introduces ICTs as key enablers of communication and interaction between public service providers and citizens. In light of the evidences gathered, and on the basis of the Grönroos and Voima model [14], we offer a conceptual framework that captures different concepts and issues which underpin a broadened view of co-production and nudging across the citizen journey. In our opinion, the proposed conceptualisation shows convincingly how, taken together, nudging and co-production can co-exist and mutually support each other *also* thanks to the pervasiveness and influence of Internet and social media.

Informed by a service logic, the overall aim of the proposed research path is to develop a stronger understanding of user involvement in an era of increasingly complex citizen behaviour fostered by digital technologies.

3 User Involvement in Public Service Delivery

The environmental pressures and public needs that public service organisations face in our society are dynamic and evolving, 'creating mounting challenges for a single government agency to cope with alone' [15: 199]. These challenges require governments to set out 'new approaches to public service delivery that emphasise the power of civic society to tackle the big social challenges' [16: 157]. Citizens play a decisive role in the success of policies. Without their response, governance remains limited [17].

Therefore, influencing behaviour is central to public policy design and implementation [3, 7, 18]: "when citizens are engaged, motivated and willing to change their behaviours, it is much easier for governments to achieve their policy objectives. …. When citizens are switched off, antagonistic to governments…, public policy gets much harder to implement and poor outcomes are the result" [19: 1].

3.1 Co-production

Co-production and co-creation have become ubiquitous terms in contemporary policy [20, 21]. 'Co-creation' is conceptualised as collaboration in creation of value through shared inventiveness, design and other discretionary behaviours, whereas 'co-production' is more narrowly defined as participation within parameters defined by the focal organisation (e.g. selecting from predetermined options). The importance of co-creation is "in the capacity to use previously unexploited citizens' resources and capabilities" [22: 7], namely knowledge and expertise.

Recently, the Web 2.0 and the advances in ICT have inspired the development of interactive platforms that build on extensive input from citizens, integration of knowledge and user participation with important potential impact on public service delivery. At the instrumental level, the advent of the Internet's unique many-to-many interactivity enables 'ubiquitous co-production' in virtual or physical spaces [23]. At the institutional level, the new media foster a sense of shared identity with public-sector organisations as well as a sense of community among citizens. For example, an analysis of the co-production of public service support and safety in the Netherlands [23] points out that the new media not only shift co-production away from a rational approach to a more social approach, but also strengthen the emphasis on social and playful interactions by transforming participation into a real-life game.

3.2 Nudging

Nudges are private or public initiatives that steer people in particular directions but also allow them to go their own way [17]. Nudges are 'relatively unobtrusive measures' [24] aimed at obtaining a behaviour that generates a collective benefit. For example, reducing water consumption through nudge has an immediate impact on the users' bill but generates beneficial results on the environment that increase when the new behaviour becomes a habit. A reminder is a nudge, so is a warning. A GPS device nudges; the same applies to a default rule [17]. According to Sunstein and Walmsley, "to qualify as a nudge, an initiative must not impose significant material incentives (including disincentives)" [17: xix]. Nudging also uses technology to deliver desired changes in behaviour. In this case digital nudging can be considered a subtle form of using design, information and interaction elements to guide the user behaviour in digital environments [25].

A tangible example of nudging strategies at work in public institutions is the United Kingdom Behavioural Insights Team (BIT) [26]. BIT is a Cabinet Office partner that works with more than 50 public institutions in the UK for finding innovative ways to improve public policy through choice architecture. Nudge units and teams can also be found in the US, the Netherlands, Australia and Canada, to name just a few [17].

3.3 Critical Voices

Recent research on behavioural public policies increasingly reports criticisms. In a chapter significantly titled 'The dark side of co-creation and co-production', Steen and colleagues [27] address 'potential evils', including the deliberate rejection of responsibility, failing accountability, rising transaction costs, loss of democracy, reinforced inequalities, implicit demands and co-destruction. Not even the application of nudging is exempt from criticism. For example, according to [28], nudges target citizens biases and heuristics by modifying the choice environment in which they operate and as such, they often leave citizens out of the deliberative process, compromising their ability to own and sustain long-term behavioural changes. A nudge is often deemed to be opaque and manipulative, one that co-opts the internal cognitive processes of individuals and overrides their consent.

In terms of legitimacy, nudging, but above all co-production initiatives, risk breaking the link "between citizens and the services they receive in return for the taxes they pay". [29: 38]. As observed by Salamon, "it is not surprising that citizens might begin to wonder where their taxes are going and what they receive in return" [29: ibidem].

The review of critical voices could go on further. However, what we want to highlight here is that recent elaborations increasingly address the broader ethical and moral implications of behavioural policymaking, and crucial issues such as the autonomy of the agent and the transparency of tools.

4 Framing the Debate

Reconstructing systematically the debate about co-production and nudging is beyond the scope of this paper. A useful starting point is to consider both as 'tools' or 'instruments' of public action, which is "an identifiable method through which collective action is structured to address a public problem" [29: 19].

This broad description suggests that—in addition to their *defining* features—tools vary in the level of specificity with which they define eligible purposes and in the range of eligible recipients (ibidem, original emphasis). Additionally, and more interestingly, tools are institutionally relevant, in that they 'structure action', which means "they are regularised patterns of interaction among individuals or organisations" [29]. They define the 'choice architecture', that is, who are involved in the operation of public programmes, what their roles are, and how they relate. In this view, interaction is meant as a mutual or reciprocal action in which the involved parties have an effect upon one another [30].

John and colleagues [31] identify two possible ways in which public administrations can induce citizens to adopt responsible behaviour:

- acting on awareness and active participation with respect to objectives of common well-being (*Think* strategy); and
- trying to involve citizens with emotional incentives to obtain effects that overcome any barriers and inertia (*Nudge* strategy).

Volunteering and co-production are two notable examples of *Think*-based strategy [25] in that they assume reflexivity, sharing values and civic-minded behaviour by the citizen/service user. This distinction between Think and Nudge will be resumed in the concluding section.

Table 1 (below) outlines in a simplified way several analytical dimensions of co-production and nudging, derived from top international studies. The list, far from exhaustive, gives a broad view of the variables at work. It should also be noted that policy tools rarely appear in a pure form [29]. For example, co-creation and co-production often have overlapping that makes them difficult to distinguish. Table 1 captures the overall diversity of co-production and nudging, in terms of objectives and role of public institutions. The two tools also carry different understandings of human behaviour and theory of change and, as a result, stand for different approaches to mobilise action in the public realm [31]. For a discussion, see also: [11].

Table 1. Key characteristics of co-production and nudging (authors' elaboration)

Dimensions	Co-production	Nudging
Goals	Increase the effectiveness of public services according to the needs of users and reduce inefficiencies, with the ultimate goal of increasing the well-being of the community and nurturing consensus towards the political entity. It is essential, but not obvious, to obtain the involvement of service recipients Citizens' preferences are malleable, because individuals are open to reasoning and questioning to achieve a higher collective good The approach is typical of modern democracy, with a medium-long-term horizon, in which people are willing to invest their energies	Making individual behaviours harmonious, channelling them in a more or less conscious way towards collective action. Obtain socially desirable behaviours, especially when they are daily and for which an immediate change is desired (short-term horizon) Citizens' preferences are understood in this sense to be fixed and rather elementary. Governments are therefore confronted with people centred on individual benefits, and as 'cognitive misers' they assume that citizens tend to assimilate simple concepts and mental shortcuts. A change in behaviour therefore occurs more for the perception of a personal benefit than a collective one

(*continued*)

Table 1. (*continued*)

Dimensions	Co-production	Nudging
Theoretical underpinnings	The concept of co-production is originally developed as part of the studies in Political theory and Policy analysis. On the political science side, a conceptual difference is theorised between the production of goods and services. On the economic science side, the traditional distinction between consumers and producers is broken Co-creation mostly focuses on the ability and the opportunity to involve users in the definition and design of the services	Nudging builds on economic theory and psychology: the first identifies the costs and benefits of the behaviours that the second allows to study and understand. Nudge marketing finds its theoretical foundations in the contributions of neuromarketing. Drawing on studies of the brain responses of individuals, neuromarketing has demonstrated the nature of human beings as 'cognitive misers', i.e. they tend to have the maximum result with the minimum (cognitive) effort. This leads them to repeat decisions that in the past may have had a positive result (heuristics, such as cognitive shortcuts)
Role of the citizen	The citizen is the recipient of public policies, the user of the services, an unpaid volunteer. He/she is a lay actor. Is also a source of competence. The user contributes directly to the production with the 'regular producer' and, in some cases, the service cannot proceed without the consumer being at the same time willing to get involved in the production. In co-production, the investment by the citizen is on average significant. The consumer is asked to share own knowledge and skills to directly contribute to the service performance. The user learns, experiments and engages with the provider organisation	Someone who can be induced to do something in line with the organisation's objectives by overcoming psychological barriers through the use of emotional incentives capable of shifting the focus and reducing the typical decision-making process Consumer analysis and demand segmentation are mainly aimed at knowing the traits and points of possible 'activation' Nudging aims to orient a final behaviour in one direction or the other. The citizen's effort is often in having to change habits that can be harmful. Unhinging habits is anything but simple and immediate

(*continued*)

Table 1. (*continued*)

Dimensions	Co-production	Nudging
Role of the public service provider	The PSO designs the service by providing for the presence of input from the citizen	Is the main source of stimuli and incentives. The PSO is the client of the nudge to induce changes in the attitudes and behaviours of the service recipients

Literature agrees that communication among public organisations and citizens plays a central role in ensuring successful behavioural strategies [32]. This is not surprising, since conventional tools of government have always had an informational core [33]. In the case of nudging, communication using distinct media induces the policy recipient to behave in the desired way, leaving the citizen to believe that he/she is faced with a 'free' choice (and not 'conditioned'). In the case of co-production, however, communication has an impact on how the service process proceeds, and on how interactions (with the provider and with other recipients) are performed.

Whatever relationship approach the PSO adopts when embarking on a strategy of citizen engagement, effective communication and interaction processes should be properly designed and mobilized [13]. Thus it is imperative for PSOs to develop structures and processes that engage citizens "coherently and consistently over time and space and across a multitude of service interfaces" [9: 43].

5 The Roles of ICT

Technological advances affect citizens' ability to participate in government services [34]. This opportunity, on a *systemic* level, could reshape the role of government in society and the role of citizens in public governance [28]. On a *meso* (organisational) level, however, IS/IT technologies induce the redesign of internal processes: "Internet becomes part of the service process" [13: 290]. On a *micro* level, technology impacts citizen experience [13].

According to an extensive study developed by Lember [35], ICT plays three possible roles: indirect, transformative and substitutive. In the first case (indirect role), digital technologies can enable effective co-production by allowing for more efficient information flows and providing support functions. Digital nudges utilise many online technologies and channels, including e-mail, SMS, push notifications, mobile apps, social media, gamification, e-commerce, e-government and location services [36]. In addition, digital nudges offer three key advantages to PSOs: they are relatively inexpensive, they are able to spread quickly, and they facilitate data production and increase outcome measurability [36].

For example, in the field of local utilities, such as energy, water and waste management, real-time data collection and provision can provide governments with an opportunity to nudge how citizens contribute to service delivery: users can be notified of

how their real-time energy consumption compares to their neighbours', consequently nudging them to change their behaviour and thus how they co-produce environmental protection [37]. In the education field, digital nudges have shown a promise for combating persistent disparities in educational outcomes. Parents and students are provided with small bits of information regularly with easily operationalised tasks and practices "in order to overcome both information asymmetries and the cognitive load required for behaviour change" [38: 568]. This support encourages service recipients to behave in ways that are more consistent with positive educational outcomes [38].

Technologies can also transform the traditional forms of co-production. Digital tools can create entirely new practices, whereas some just add a digital layer on top of the usual human-centred co-production [35]. This is the case, for example, of assisted living solutions such as telecare and telehealth. Hackathons represent both a new tool of co-production and a source for new co-production initiatives, including apps and other ICT tools. Living labs are a bottom-up approach to directly test digital technologies with their users and solve local issues through community-focused civic hacking.

Through various digital platforms, governments can tap into the collective wisdom of crowds by systematically collecting ideas, opinions, solutions and data from service users and civil society. Well-known examples include participation platforms, such as 'We the People' in the USA; 'Grand Débat National' in France. Digital platforms supporting constitutional reforms were used in Iceland and Estonia [35].

Finally, there are technologies that have the potential to substitute the traditional co-production practices. According to Lember and colleagues [35], current technological developments mean, on the one hand, the co-production process can be fully or partly automated, changing—paradoxically—the role of the engaged citizens from active to passive. Consider, for example, the use of the remote monitoring sensors that can provide 24/7 real-time and automated feedback about the health conditions of a patient. In parallel, there is also an increasing presence of ICTs that give the full control of service provision to users *without* a need for direct or even indirect government participation. When citizens own and decide on the initiatives, choose the design and implementation methods, and co-create digital solutions without the presence of the central coordinating authority (e.g., the government), digital transformation may effectively substitute traditional service provision models with models of self-organisation.

In sum, the main argument to arise from the current debate is that new forms of responsiveness in public service delivery are emerging [39]. At the centre of these developments is the inclusion of user needs into the service process. This integration enabled and enhanced by ICT allows services to be dynamically recomposed and delivered [22].

6 Conceptualizing the Citizen Journey

How can we, in light of recent developments, conceptualise efficaciously – meaning in a way that fully captures also the technological advancements and the evolution of the research agenda – the joint adoption of co-production and nudging strategies across increasingly complex and diverse citizen interfaces?

A useful starting point here is the concept of 'value creation spheres' elaborated by Grönroos and Voima [13, 14]. This conceptualisation includes a distinct provider sphere,

a customer sphere and a joint sphere. In the provider sphere, processes and activities are performed by the organisation to create an engagement platform for the co-creation of value. In the customer sphere, the customer creates value-in-use independent of the provider and may also integrate with resources from other sources. The organisation can influence customer value creation efforts and act as a co-creator in the joint sphere [40]. The flow of the value process moves from the joint sphere to the citizen sphere.

The conceptual framework outlined in Fig. 1, which draws on the Grönroos and Voima model, captures the different issues that underpin a broadened view on co-production and nudging across the citizen journey. The framework consists of three parts: two areas that partially overlap (provider and citizen spheres) with a central area of intersection (joint sphere). The chart distinguishes between the context of interaction (e.g., ICT platform), represented by the grey circle, in which the provider and users may interact, the flows of communication (mono and bi-directional), represented by the three horizontal arrows, and the service lifecycle. The white dots orbiting the grey circle identify the touchpoints in which the interactions occur, meaning all those moments of learning that can translate into the acquisition of valuable knowledge for the provider. The triangles indicate the direction in which the information flows. The outer circle delineates the relevant activities in which the principle actors are, respectively, the provider and the user, with different levels of engagement (service concept, design, development, delivery, experience, post-experience assessment).

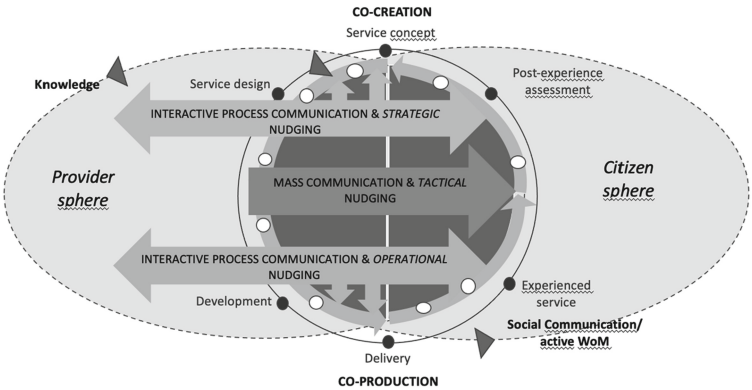

Fig. 1. A broadened view of co-production and nudging across citizen journey (adapted from: [13, 14: 286]

Citizens are directly involved in the service system as co-creators and co-producers. Encounters take place in an environment that is partly planned and controlled by the service provider. In the joint sphere, co-creation and co-production take place. The core of the process is the series of service encounters where the provider and the user, supported by digital and physical resources, "meet and interact" [13: 494]. These encounters influence user's value-creation [13: ibidem]. The social/Word of mouth (WoM) communication between citizens allows the recipients to exchange shared impressions about the service and, more generally, their consensus of the public provider. The social/Word of

mouth (WoM) communication is situated to the right of the chart (user sphere) because it takes outside the direct reach of the provider [13: 359].

Overall, the chart connects communication, nudging and co-production to the different phases of the service life cycle:

1. In the service design phase, in which prevails an interactive and bidirectional *process communication* aimed at co-creation, citizen engagement has a strategic nature (**strategic nudging**), insofar that it inspires the concept service/concept design. Importantly, the same kind of process communication also occurs in the final phase of post-experience assessment because it reflects the public provider's strategic need to be able to assess user satisfaction and thus consensus;
2. The development phase sees *mass communication* (one-directional and comparable to advertising) prevail. Here, the PSO works in isolation in the provider sphere. Mass communication is also important in the consumption/experience/assessment phase inasmuch that it helps to reassure the users of the choice they have made. The provider's use of nudging focuses on behavioural goals that are measurable in the short term (**tactical nudging**). The PSOs tend to outsource the management of tactical nudging to external communications agencies, whereas in the Concept and Design phases (point 1), nudging is itself embedded in the public actor's service culture;
3. The service delivery phase sees the return of *process communication.* However, unlike the first phase (point 1), process communication here is a necessary condition to operationally support the user once they have accepted the "promise" (offer) of those activities in which they are an active player (co-production) for what concerns the delivery and the actual 'consumption' of the experienced service. It is therefore always an interactive communication, a precious occasion in which the digital applications can extract information useful to the decision-making process. This type of nudging activity (**operational nudging**) should be handled by the provider's internal staff (not third-party suppliers) because the various forms of contact enable the acquisition of a growing understanding of the user's needs, values, intentions and habits.

7 Managerial Implications

Supporting citizen engagement in public services poses big challenges at an organisational level. For the behaviour change to be successful, process communication and mass communication both need to be properly planned and implemented. PSOs therefore must integrate multiple organisational functions, including information systems, service operations, human resources and even external partners, to create and deliver positive citizen experience.

The extent of these changes could be tremendous, especially where the capability gaps are remarkable, and the roots of the traditional bureaucratic paradigm (e.g., silo structures) are very deep. Consequently, the PSOs need much more than generic skills. For example, ICT skills *tout court* are not enough to manage digitally mediated co-production, such endeavours require project teams with inter-disciplinary skills (mirroring the big data analytical approach of the tech giants, which hire staff from social

sciences and humanities faculties). What makes the difference is to create digital channels in which the text, images and the structure of the apps facilitate participation, both on an emotional level (from 'I like it aesthetically' to 'it touches me emotionally') and on a cognitive level ('the site or the app is easy to use, and I understand what to click/fill in'). In other words, the PSO needs to simultaneously juggle several balls to create and exploit collaborative spaces; above all, it needs to apply the values and culture of service logic and lend an empathetic ear to the citizens and their needs.

8 Final Remarks and Contribution

It has been our goal to open up new debate on recent developments in public service strategies. In response to the question "*What role does ICT play in enabling the public action tools of co-production and nudging?"* we can say that nudging relies mainly on top-down logic designed by 'choice architects' [16], while co-production has a bottom-up logic and assumes that the public service provider is willing to permanently reconfigure its service offering. Co-production and nudging can operate independently or in combination with 'traditional' tools of government. ICT-based systems and platforms play a pivotal role in supporting and guiding relevant actors in their exchanges. Importantly, technologies act as generators of *actionable information* that PSOs can use for developing and adapting their service offering and for the measurement of outcomes.

The foregoing discussion also lends initial support for bridging co-production and nudging strategies, as suggested in recent studies [11: 10, 28], according to which 'hybridisation of nudge' can be a combination of the best features of reflexive strategies (like nudges) and reflective (or *think*) strategies. In this sense, the conceptual framework presented in Sect. 6 (Fig. 1) should be considered as an attempt to "connect the dots" and to start to understand in which way the two policy tools taken together could complement and refine the public service offering. Although, the policy context may be the factor that determines where one tool may be appropriate and not the other [11: 216–17].

From a conceptual standpoint, the paper has heuristic utility in that it recognises the differences between emergent forms of citizen engagement and thus can assist our understanding of the complexity of behavioural public policy in the digital era. The scheme contains significant departures from past research, not least the distinction between interactive process communication, mass communication and interactive process communication, and the distinction between strategic, tactical and operational nudging.

At a practical level, the framework helps to map the links between the contextual implications of blending co-production and nudging. Co-creation, co-production and nudging become blended whole and can become synergic within the life cycle of the relationship between the public service provider and the citizen. The service view looks beyond the instrumental role of ICTs to ensure continued citizen engagement across 'customer' journeys. However, there is no road map to citizen engagement in public services. Another key advantage of the framework is that is offers a practical tool for identifying and analysing the organisational and managerial capacities needed for PSOs to revise their traditional ideas of service design and operations.

As with any exploratory study, this paper raises even more questions than answers and comes with important limitations that we plan to redress in future research. First, we

acknowledge that our reading experience could have biased the analysis. Second, our framework addresses only a small number of complex issues related to citizen engagement. Third, the PSO perspective is skewed on the supply side. Finally, the application of service science principles in the conceptual framework needs to be empirically tested.

Our conclusion is that co-production and nudging are closer than they appear in the policy agenda. Therefore, we call on scholars to devote more resources to investigate this promising relationship.

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Systemic Sustainability as Multiple Perspective Analysis

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Abstract. A systemic perspective could support an enterprise to integrate multiple organizational aspects to facilitate the implementation of sustainability in work practices. The study explores sustainability in SMEs work-practices from multiple stakeholder' perspectives following a systemic approach to developing a systemic sustainability model proposal. This model intends to investigate sustainability' relationships to uncover the business's level of interactions, which results in a sustainability real-practice approach. In this context, the sociotechnical approach is essential for integrating sustainability in work-practices as it aims to balance technical and human systems to improve the quality of work context. Furthermore, an empirical study supports the creation of the model, which emphasizes the possible failure of the current sustainability approach implementation in practice. Overall, the systemic sustainability model intends to explore a systemic perspective to understand and decrease systems' complexity in enterprises' context to develop sustainability in work-practices. The analysis' result emphasizes the importance of interactions to achieve sustainable development goals in a work-practices context.

Keywords: Sustainability · Work practices · Systemic perspective · Sociotechnical perspective · Interactions

1 Introduction

This research intends to develop an integrated approach to sustainability, drawing upon an empirical study based on an ongoing three-year project started in 2019. The investigation aims to uncover the crucial point to individuate sustainability areas interactions. Therefore, this study focuses mainly on understanding the current situation to gather the third dataset through a new systemic sustainability questionnaire that will focus on sustainability interactions.

The sustainability questionnaire is one of the themes of the information gathered by trainee analysts and is only one part of the overall project based on the Socio-Technical Toolbox [STT]. STT "is a collection of tools, techniques, and pragmatic methods which can be used to support organisational change" [1:3]. The main focus of STT is the work system, which is the core of organisational change [1]. This toolbox helps change organisational practices to reach business excellence [1].

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The STT questionnaire focused on sustainability is the basis of this research. Open and closed questions are included in the sustainability questionnaire. This research focuses on observing the analysis of sustainability interactions in practices is the sustainability questionnaire 2021. The latter questionnaire results from the analysis of the previous studies, each of them rely on a specific sustainability questionnaire version (see Fig. 1). After the analysis path, the sustainability questionnaire 2021 has 35 questions divided into the following parts: economic sustainability, social sustainability and environmental sustainability and sustainability interaction. This version aims to investigate the essential critical sustainability points and the integration and impact that each area has on the other. Overall, the 2021 analysis is intended to understand "how the different sustainability areas are linked, and dependent on each other. The explanation of sustainability interaction and aims to explore the impact that each area has on the other. That helps uncover the interaction between sustainability areas and investigate the critical points in the specific area but overlapping between them to achieve sustainability understand interconnections is crucial" [2].

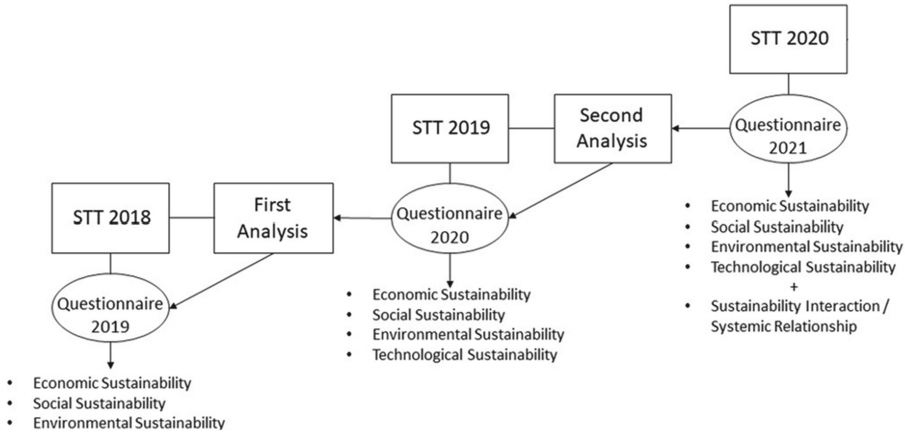

Fig. 1. Overview of the empirical studies.

The systemic sustainability model suggests integrating technological areas in the analysis subsequently first dataset analysis. Therefore, the shared data available with the three datasets are the Triple Bottom Line sustainability investigations areas. The 2018/2019 and 2019/2020 analysis aim to include a comprehensive overview of sustainability and investigate how enterprises integrate sustainability issues into their work practices and their interconnections. Hence, this comprehensive research intends to understand stakeholders' sustainability behaviours to provide an overview of examples of sustainability integration in work practices.

The following section will describe the project's background and outline how previous work provided the empirical study. Following the methods section, the methodological approach will be presented. The authors will then describe the internal and external stakeholder analysis to gather an overview of the whole enterprise context identifying possible sustainability problems and interactions in practices. Subsequently, the study

focuses on multiple perspective context analysis to investigate sustainability following a systemic approach. Finally, the authors will propose a new 2020/2021 questionnaire to support the systemic sustainability model supported by an empirical study on the current sustainability situation; therefore, the paper will discuss the current analysis and key findings. The conclusion will provide an overview of future analysis and final thoughts.

2 Background

The systemic sustainability model discussed in this paper is based on a sociotechnical foundation and explicitly integrating sustainability interactions and technological areas in the overall analysis and inquiry. The joining of 2018/2019, 2019/2020 aims to include a comprehensive overview of sustainability. The purpose is to delineate the investigation foundations to uncover how enterprises integrate sustainability issues into their work practices and interconnections. Through the years of the study discussed in this paper (2018–2021), the attention to sustainability has been increasing, and the concept of sustainability has radical changes, and the systemic aspect has been made more explicit and expanded.

In recent years, guidelines on sustainability are integrated into regulations in Europe [3]. National requirements and legislation focus not only on the environment, energy use but also, in particular, on the rising demands and legal requirements on non-financial reporting. Sustainability in many European countries is integrated into the rules, becoming a fundamental requirement for many companies [4]. The requirements focus on annual reports which track sustainability in companies [3, 4]. Regulations suggest guidelines on what large companies should follow, ignoring small and medium-sized businesses there is a need that any solution and company must involve enforced mandatory requirements.

The sustainability perspective is evolving, going beyond the traditional triple bottom line (TBL) concept, which relied on the integration of corporate social responsibility to pursue economic goals and environmental and social [5]. The introduction of system thinking takes to develop the sustainability' TBL concept further to systemic sustainability. Laszlo defined systemic sustainability as "a process of development (individual, organisational, or societal) involving an adaptive strategy of emergence that ensures the evolutionary maintenance of an increasingly robust and supportive environment" [6]. This perspective highlights that the individual is at the center of sustainability, creating present and future value for himself and the organisation.

The integration of people, communication, knowledge sharing enables collaboration which is the basis of evolution and progress. The latter is essential to develop a competitive advantage and long-term robustness, making it sustainable. Hence, enterprises need to work together and collaborate with their stakeholders for sustainability. The systemic sustainability model aims to include the social, technological, economic and environmental issues in the business agenda to achieve sustainability in work practices following a sociotechnical approach to emphasise technical and human value [7].

Not integrating sustainability practices into the company can lead to loss of competitive advantage, resulting in long-term vision loss [8]. To integrate sustainable development into the company requires a significant change in tools, practices, technologies, enterprise's vision, and management approach [9].

2.1 Methodology

An enterprise context is a complex adaptive holistic system since its component, by definition, can change its behaviour and learn from experience [10]. The Soft System Methodology (SSM) is a systemic approach that helps to address complexity in practice [11, 12]. This methodology is a flexible process that aims to understand the complexity generated by the interaction of multiple parts of the system in problematic social situations.

One of the methods that can support the application of SSM methodology is the Appreciative Inquiry Method (AIM). AIM's primary purpose is to trigger the cycle of learning, understanding the situation and the complex problem that facilitate decision-making [13]. This method is "based upon the ideas of holism and subjectivity that might be used collectively to support the process" [12:50] of knowledge elicitation and a manager' understanding of complex situations [13]. In this context, the use of integration and a system perspective could trigger learning [14]. Bednar and Welch suggest: "a social system as an emergent property of the interactions between unique individuals whose social relations are of interest" [15:4]. Therefore, a focus on human activity systems is essential to achieve the knowledge that is beneficial and creative processes to generate business changes to an organization [15]. Furthermore, Checkland and Holwell 1998 argue that enterprises' stakeholders' inclusion helps achieve a successful change, and Bednar and Welch support this in 2009 [15, 16]). This perspective highlights the importance of individual interaction and integration to overcome reductionism views and encourage system thinking [14].

From Bernd Carsten Stahl' perspective, management "is essentially problem-solving in a complex and changing environment" [17:159]. Successful changes usually should "be accepted by the participants" [18:148] and should create fluidity in a dynamic context in order to achieve a goal [19]. Therefore, management should consider the inclusion of employee participation in decision making. Employee participation in technology design could positively affect their work and job satisfaction [19]. The shift of focus from technology to people and technology could help identify problems in work practices and change them by redesigning the system following the users' needs [20]. Therefore, a sociotechnical approach could help enterprises to improve sustainability and its interactions in practices.

The study aims to explore sustainability in employee work practices in enterprises context from multiple perspectives. The research includes systemic and sociotechnical perspectives following the systemic sustainability model to understand the practical sustainability dynamics and uncover the problematic interaction that hinders collaborative, sustainable development.

3 Empirical Study

The primary scope of the datasets aims to explore sustainability from employees' points of view and how it is implemented in their work practices. In order to achieve that information, the authors focus on the characteristics of the employee open-ended answer. Exploring the completeness and coherency in the responses, we try to understand the level and characteristics of employee involvement and implement sustainable practices in their

everyday work practices. Subsequently, stakeholders and multiple perspective context analysis are intended to describe the existing sustainability practice to outline future systemic sustainability practices under a sociotechnical perspective. Internal and external stakeholder analysis aims to explore the whole enterprise context to uncover issues that could hinder systemic sustainability in practices and highlight possible advantages from its implementation in practice. Subsequently, multiple perspective context analysis through rich pictures aims to understand complex relations in the enterprise context and systemic sustainability.

The methodology which supports the multiple context analysis is SSM and AIM. Following those methodologies, the authors aim to understand the situation and problems in practice to decrease its complexity and understand the interactions that could favour sustainability practices [11]. The resultant perspective supports the systemic sustainability model proposal. An empirical study was developed on the analysis of 2018/2019 and 2019/2020 datasets. The datasets contain all the open and closed answers of the employees involved from trainee analysts divided for each company included in the research. Based on the content of the raw dataset, to support the analysis, the enterprise and sustainability reports were also created. The enterprise report contains the type, size, and economic activity for each company. The "NACE" standard was followed to connect each company to its economic activity [21]. The Sustainability Report, which is the base for this study, contains all the categorized answers of the employees related to and supporting sustainability. This report is based on the elaboration of the enterprise report and raw 2018/2019 and 2019/2020 datasets; hence it is the final dataset at the center of this empirical study. The conclusions of the interpretation of sustainability report data support the systemic sustainability model proposal.

3.1 Stakeholder Analysis

Human activity systems and understanding their context are essential to developing knowledge that supports business changes [15]. It seems essential to include and analyze enterprises' stakeholders to achieve a successful organizational change [15, 16]. The comprehension of the business stakeholder's interaction is essential to delineate how sustainability areas interact. The investigation of stakeholders' interaction will lead to having a systemic multiple perspective overview of enterprise context. Therefore, to gain a systemic understanding of business interaction, the following tables (see Table 1 and Table 2) aim to describe internal and external stakeholders' enterprise contexts in which systemic sustainability could address changes that bring potential advantages and solve possible problems. The analysis in the table below (see Table 1) focuses on the main internal stakeholders. The process making of the table starts understanding the main sustainability problems in context from each internal stakeholders' point of view. Subsequently, previously identified problems help to describe the possible advantages arising from the application of systemic sustainability. Furthermore, contextualized examples facilitate the understanding of the benefits of systemic sustainability. Overall, Table 1 aims to facilitate the analysis and the comprehension of internal stakeholders' context and their possible sustainability' relations and interactions from integrating a systemic perspective.

Table 1. Internal stakeholder context.

Internal stakeholders	Advantages/Problems	Examples
Owner	• Long-term success business • Development of environmental and corporate social responsibility • Enterprise reputation	• Social: loyal customers for high long- term reputation • Environmental: companies environmentally responsible could develop the employee' voluntary environmental responsibility • Technological: companies which have technological and well-integrated innovations could higher their reputation and relations with costumers • Economic: long-term revenue
Management	• Delegation of decision making • Development of guidelines and policy • Development of trust and collaboration with employee • Understanding of problems and solutions in practices (AIM) • Development of more efficient problem solving	• Social: delegation of decision making could develop an integrated system in which employee feel appreciated • Environmental: safe and healthy natural environment could increase employee' trust in the company • Technological: delegation of decision making on technological tools could develop a more efficient problem-solving environment • Economic: delegation of small economic decisions could lead to more work-practices coherent decisions and increase employee's responsibility and freedom
Employee	• Development of knowledge and skills • Value experience (AIM - PEArL) • Work with efficient and well integrate tools/technologies • Follow management policy and guidelines • Development of voluntary problem work- related solution and responsibility	• Social and technological: develop employee' knowledge could lead to an efficient, effective and voluntary work-related problem solving • Environmental: green and integrated technologies could facilitate work in practices • Economic: could lead to less problems economic impact on the business

The following table (see Table 2) focus on external stakeholders from internal stakeholders' point of view. After the identification of the possible external stakeholders, the potential internal stakeholders' problem was identified. Subsequently, the possible advantages deriving from the application of systemic sustainability were highlighted. Furthermore, Table 2 intend to contextualize the internal stakeholders' benefit, which could arise from the external context and the integration of systemic sustainability.

Table 2. External stakeholders.

External stakeholders	Advantages/problems	Examples
Competitors	• Development of competitive advantages	• Social: a loyal employee with developed skills • Environmental: high attention to the environment could lead to achieving customer loyalty • Technological: a well-integrated innovative technology • Economic: revenue advantages due to innovations and integrations in business context
Regulators	• Compliance with laws and in specific cases gain bonuses	• Social: employees could feel safe to work with an enterprise in compliance with regulations • Environmental: a company could gain bonus using recyclable packaging • Technological: a company could gain bonus using green technology, efficiently control its energy usage • Economic: stay in compliance with laws leads to no penalties and gain economic bonus to invest in the business development

(*continued*)

Table 2. (*continued*)

External stakeholders	Advantages/problems	Examples
Supplier	• Development of strong relationship based on the reputational increment	• Social and environmental: some companies do not work with companies with poor social and environmental practices and reputation • Technological: strong relationships could lead to knowledge sharing and technologies innovation • Economic: strong reputation leads to client loyalty and constant incoming
Neighbors	• Development of social and natural good environment and community support	• Social and technological: if the companies have a good relationship with neighbors it is easy to collaborate and cooperate • Environmental: if the company pays attention to the local environment it is more likely the collaboration with neighbors' businesses
Collaborators	• Develop new business and knowledge	• Social, environmental and technological: companies are more likely to collaborate and share knowledge with a company which has a good reputation and does not damage its own image
Customers	• Business/product technological efficient and sustainable	• Social and environmental: if the company is not respectful of its workers such as bullying, misogyny, racism and child labor and with the environment such as harmful materials and pollution customers are not likely to buy the product • Technological and economic: if the company has not efficient technology supporting a positive customer experience and requirements customers are not likely to buy the service

Overall, combining the analysis from these two tables could support a better understanding of the benefits of systemic sustainability application for SMEs. Therefore, the combined analysis of Table 1 and Table 2 perspectives aims to overview the whole enterprise context and its integration with a systemic sustainability perspective.

3.2 Multiple Perspective and Contextual Analysis

The following analysis aims to understand systemic sustainability and its context situations in practices from multiple perspectives. In this context, it is crucial to understand the human system and its relationships with sustainability in practices. A flexible approach is essential to deal with the uniqueness of human systems to manage problematical situations [11]. The SSM methodology is "an action-oriented process of inquiry of problematical situations in the everyday world" [11:22]. This methodology includes rich pictures which aim to capture and understand complex human situations highlighting their relationships [11]. The study also drew upon some rich pictures (see example Fig. 2) to explore sustainable work practices from different perspectives.

The rich picture below (see Fig. 2) describes an example of an enterprise context and its relationship to systemic sustainability. One of the analysis results is that systemic sustainability is poorly integrated into work practices, as shown in the rich picture. The main insider stakeholders seem to act in isolation and therefore hinder participation. The participative approach could help knowledge sharing and better identification of possible problems that hinder sustainability in practice. To develop sustainability, integration of a systemic perspective is essential. The rich picture also shows stakeholders' discontent and inefficiencies due to the lack of sustainable practices within the system. As system parts are interconnected, a lack of a sustainability sphere could affect the internal and external systems. For example, improper use of or the type of technology could increase employee stress and inefficiency, affecting collaborations with other businesses. The consequent lack of collaboration could lead to a decrease in reputation and less profit. Therefore, a problem in the human system could affect the whole business. In this context, it is essential to perceive the business as an integrated whole in which systemic sustainability could bring benefits and, as a consequence, competitive advantages.

The following analysis focused on SMEs and management of the business and problems on the relationship between management and employees. The isolation of stakeholders permeates the internal context of the enterprise. Isolation could derive from the imposition of guidelines from management. In addition, isolation and imposed guidelines hind communication between manager and employee. For example, managerialism could be a hinder for employees to voluntarily solve work-related problems increasing the inefficiency. Furthermore, the decontextualization of a manager's policy could lead to unsuccessful work practices [22]. This situation could result from hard systems thinking as problems are well-defined, but this is not valid in work practices [23].

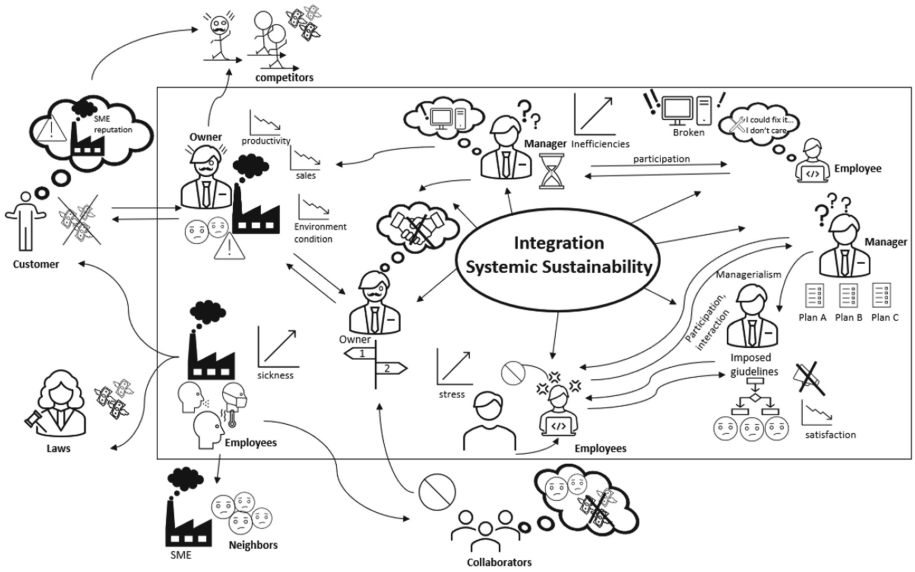

Fig. 2. Rich picture - Integration systemic sustainability.

Further analysis also explored example situations where employees are frustrated, unhappy, and unengaged due to unsustainable work practices. From a sociotechnical perspective, this contrast could derive from different management approaches and the quality of working life, which could impact employee satisfaction [24]. Employees' experience and knowledge are essential for an enterprise; therefore, it should be valued, and employees' suggestions and ideas should be integrated. In addition, the level of challenge of the work should fit the knowledge and skills of the employees. If an internal environment is comfortable and employees are involved and integrated into the workplace, this could increase employees' creativity and voluntary collaboration. Furthermore, it could be helpful to focus on the impact of technology as it could enable communication, information and knowledge sharing, which are essential factors for both an integrated environment and good quality economic, social and environmental of work-life. Furthermore, employee integration could achieve long-term sustainable competitive advantages and systemic sustainability (this is also supported in works by Adams & Lamont) [25].

3.3 Sustainability in Practice

The following analysis aims to uncover the sustainability in work practices resulting from implementing the classical TBL approach, which tries to achieve sustainability by investigating environmental, social and economic sustainability areas in employee work practices. The authors focused on specific questions in the STT sustainability questionnaire to uncover information regarding sustainability in employee work practices. The following questions identified the implementation of sustainability in employee' work-practice (see Table 3).

Table 3. Implementation of sustainability practice.

Sustainability Area	Implementation in practice
Economic	Is local budget surplus carried over to next year?
Social	Is there someone else who can do employee's job if he/she is away?
Environmental	Does the job require specific environmental considerations?

The implementation of sustainability (see Table 3) emphasises the integration of sustainability in work practices. The graphs below (see Fig. 3) show the percentage of problems in implementing sustainability practices from the employee' point of view. Employees show higher uncertainty regarding the economic field; this underlines the miss inclusion of employees in the economic sphere. Additionally, the employees who do not show uncertainty in economic areas highlight that even if money surplus is the fundamental pillar of each business, employees do not implement any practices to ensure surplus for the future development of the enterprise.

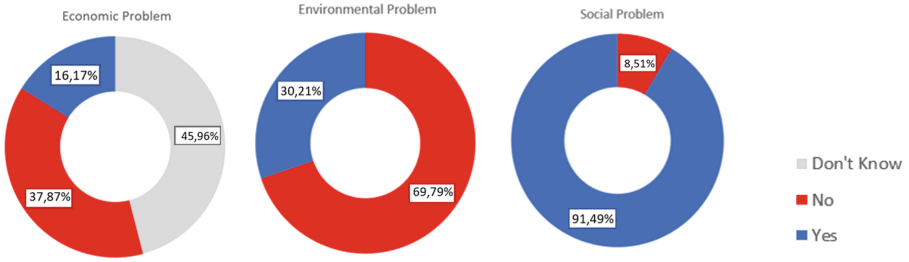

Fig. 3. Implementation in practice.

In the past, the first issues on which arise the sustainability' concept concern environmental area. However, employees show that businesses do not adequately care about the environment as they do not involve employees under this aspect of practices. If employees believe that their work does not need environmental consideration, we can assume that the enterprise does not pay attention to it and does not share environmentally friendly knowledge. Furthermore, the area which has the slightest problem with 8,51% is the social one. The employees attest that there are employees who could do their job if they are away. In this case, businesses valorize knowledge sharing and competencies between employees. However, going deep, it seems that, in general, businesses do not focus attention on the external stakeholder social sustainability as employees show low local community and business neighbours collaboration and integration. The authors then focused their attention on exploring the implementation of practices to create value for the future, which seems essential in business preservation. Hence, the implementation of future value in employee work practices was identified through the following questions (see Table 4).

Table 4. Implementation of practice to create future value

Sustainability Area	Implementation of practice to create future value
Economic	Is the employee expected to keep spare financial reserves/resources?
Social	Does the employee get personal mentoring by an expert in his job?
Environmental	Does the employee get training/advice in environmentally friendly practices?

The graphs below (see Fig. 4) show the percentage of implementation in practice to create value for the future in employee' work-practices. In a specular way, the attention level to create future value is mainly the same as the problem in sustainability areas.

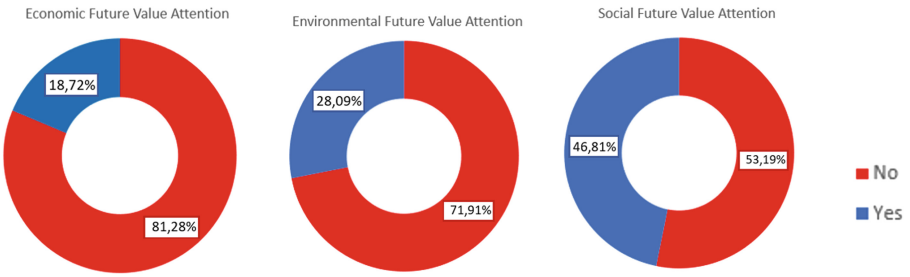

Fig. 4. Implementation of practice to create future value.

Economic future value is the least to be pursued in employee work practices. This result emphasizes that businesses seem to do not perceive the economic sphere as a fundamental pillar to sustain the ability for the future of enterprises. Additionally, employees do not seem to know environmentally friendly practices, highlighting the lack of attention that enterprises give to the environment. Furthermore, by comparing the social value in practice with practices to create future social value from the employee's point of view, we can highlight a discrepancy between them. Most of the employees stated that they feel underappreciated and treated as easily replaceable even if they are not, as their experience suggests that their knowledge and competencies are not widely shared or appreciated in the business or work situation.

4 Discussion and Conclusions

From the sociotechnical perspective, if a company develop corporate responsibility (CS) under social, environmental, technical, and economic aspects, it is more likely to develop a good, motivating and creative working environment. A good environment supports and motivates stakeholders to develop work practices and go out of their way to support their business for the better. However, results from our empirical study suggest that not even the essential aspects of the classical TBL approach are implemented in organisational

practices. Hence, the attention to sustain and preserve the ability for the future generation following sustainable development is not perceived as essential for the businesses. Some studies emphasise the systemic nature of CS, highlighting the importance of the inter-organisational network in the context of business operations [26]. In this context, relations with stakeholders and their interactions seem to be the focal point for achieving business goals. The relevant stakeholder's integration in the work system would be a valuable albeit intangible resource for the enterprise as it allows the creation of shared value and cooperative advantage triggered by the knowledge process. From an organisational perspective, it is important to promote as an intangible asset for the company that creates shared value and cooperative advantage through knowledge. In our findings, however, it is obvious that the interaction between stakeholders in the dominant theory in organisational practices takes a back seat since the latter are perceived and acted upon. Furthermore, the dominant stakeholder theory suggests that workers are something to 'manage' and 'control', ignoring the importance of their interactions [26]. These aspects are evident also in the analysis previously carried out.

Multiple perspective context analysis highlights that stakeholder are still perceived as a resource to be managed as there is no communication and integration between them thought the whole business. This lack of integration between the main stakeholders within the business could lead to poor collaboration, which hinders sustainable development.

Collaboration is a crucial point of sustainable development as a stakeholder in context can urge/drive each other to work in a more CS-oriented way as it enables to combine and share knowledge which is "a key success factor to develop the firm's resources and legitimacy in sustainable development" [26]. Learn and act changes build on the level of interaction between business actors. So even world leaders have agreed on the importance of interactions, especially when it comes to promoting them as an essential aspect of sustainable implementation as they "are likely to have a profound influence on efforts to achieve the goals" as the latter all interconnected [27]. The United Nations' 2030 Agenda for sustainable development support this concept highlighting the crucial aspect of positive interaction. "Understanding possible trade-offs, as well as synergistic relations between the different goals, is crucial for achieving long-lasting, sustainable development outcomes" [28]. In this context, transform negative to positive interaction could trigger sustainable innovations as they result from constructive interaction of corporate, political, and social leaders in multi-partite stakeholder cooperation efforts [29]. Innovation is a complex process that depends on constant organisational and technological changes requiring feedback and interactive relations [30]. Therefore, the innovation process cannot be developed in isolation; instead, they need to include multiple stakeholders and businesses focusing on their interaction to achieve goals. The improvement process of interaction is not linear and fixed as it is dependent on different aspects such as governance, technology, and context, which are in constant evolution [28].

The interdependencies and interactions seem to increase their importance to deal with complexity in the context of Sustainable Development Agenda 2030 [31]. Lawler suggests a need to create and integrate a new model to achieve organisational effectiveness as no single model seems to give appropriate guidance [32]. He sustains the necessity to focus on multi-stakeholders relationships, underpinning the "responsible

progress" [32]. Hence, it seems fundamental to pursue an approach more inclusive than the classical TBL, which perceives the business as an integrated whole involving all its parts focusing on integration and interaction. Therefore, it could be essential to accelerate cultural change by encouraging a systemic vision to maximise the sustainable development progress in practice [31, 33]. Following the systemic perspective, to deal with the complexity of problematical social situations, the main concerns are interactions between the whole [11]. This concept is also supported by the Socio-Technical Systems approach, which leads to holistic optimisation giving attention to interaction to develop a value-creation process [34]. We all must learn from each other; therefore, enterprises should perceive their organisation as an "integrated whole" also focus on the organisational design, which should evolve in parallel with its context following STS [35].

Interactions between work systems on multiple stakeholder' levels contribute to having a broader view of an enterprise contributing to their success. System interactions directly affect enterprise development as they could be essential in coordinating work systems being cohesive, maximising their goals and being obstacles as observed in the rich picture (see Fig. 2). Alter supports this thesis pointing out that "system interactions are essential for the operation of any enterprise, organisation, or IT-reliant system" [36]. Furthermore, interactions seem to be an essential characteristic of systems' innovation approach, which sustains that the inclusions of innovations in system context are determined both from their elements and their relations [30]. In this context, it seems necessary to change the leadership approach to face multiple sustainable systemic challenges stated out. The World Economic Forum highlights system leadership as a pillar of an institutional strategy focusing on multi-stakeholder leadership for tackling critical global challenges [37]. System leadership aims to understand the system in depth, engage stakeholders more meaningfully and take new initiative" [37]. "Together, these interactions create new forms of collaboration and impact within the system, generating a wide-reaching multiplier effect" [37:13].

As a result of this analysis, authors individuated specific questions to understand and evaluate sustainability interactions and systemic relationships in employees' work practices. The following table is the sustainability interaction/systemic relationships section added in the sustainability questionnaire of STT 2020 [2]. In future research, a new sustainability questionnaire aims to uncover the problems in the sustainability areas overlapping and systemic relationships highlighted through interactions (Table 5).

Overall, interactions seem to be a crucial concern to achieve sustainable development under a systemic and sociotechnical perspective in practice. Multiple perspective context analysis highlights that negative interaction hind sustainability in practice. Instead, positive interactions can trigger innovation in the enterprise and integrate them into practices, as suggested from stakeholder analysis. Additionally, interactions seem to be the core of knowledge sharing and value creation, leading the enterprise to sustain the ability for the future. The authors suggest perceiving the different parts of the enterprise and their goals as an integrated whole and broader the approaches and views integrating systemic perspective. In this context, aiming to maximise results in all areas is a utopian aim but finding a balance point could lie in the interactions of the sustainability

Table 5. Sustainability interactions/Systemic relationships questionnaire

Questions
Do economic work-practices and decisions seem to respect the following? a. All stakeholders? lf yes - how? /lf not - why? b. Environment? lf yes - how? /lf not - why? c. Technology updated which best fit the job? lf yes - how? /lf not - why?
Do environment-imposed work-practices and decisions seem to respect the following? a. All stakeholders? lf yes - how? /lf not - why? b. Your professionalism and effective work practices? lf yes - how? /lf not - why? c. Your work without causing delays and obstacles and at the same time support enterprise growthlf yes - how? /lf not - why? d.Technology updates? lf yes - how? /lf not - why?
Do social work-practices and decisions seem to respect the following? a. Support to enterprise growth? lf yes - how? /lf not - why? b. Environment? lf yes - how? /lf not - why? c. Use of technology without work delays? lf yes - how? /lf not - why?
Do technology-imposed work-practices and decisions seem to respect the following? a. Support enterprise growth? lf yes - how? /lf not - why? b. Support your professional growth? lf yes - how? /lf not - why? c. Environment? lf yes - how? /lf not - why? d. All stakeholders' interfaces and work in practice? lf yes - how? /lf not - why?

areas. Each single sustainability area's goal could potentially be in contrast with the others. For instance, economic goals are in contrast with environmental or technological could potentially affect the social or environmental sphere in some contests. Hence, pursuing a balance point between those areas in work practice could not reach the maximum goals of each sustainability area however could lead to positive interactions which could improve the enterprise sustainability level in practice. The systemic sustainability model [7], which highlights the importance of a systemic perspective integrated with a sociotechnical approach focusing on technology, environment, economic, and social sphere, develops further integrate interactions. Interactions seem to be positioned in the center (see Fig. 5) of sustainable development as they connect and concern the relations between internal/external stakeholders and business and the multiple inter-related sustainable development goals that are all interconnected. Furthermore, the increment of positive interactions could lead enterprises to include all stakeholders, particularly employees, and give proper attention to employee work practices where sustainable goals realise.

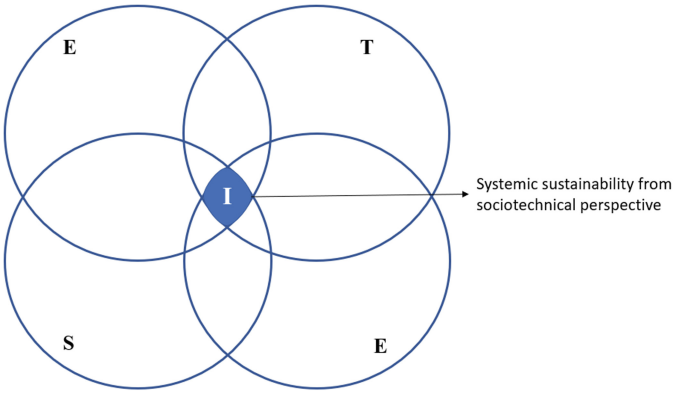

Fig. 5. Systemic sustainability model.

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Gender, Age, and Generational Differences in the Use Intention of Mobile Payments and Its Antecedents

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Abstract. Although mobile payments have gained considerable attention in academic research, there still are major gaps in our more in-depth understanding of the antecedents of their acceptance and use. In this study, we aim to address these gaps by examining the potential gender and age differences in the use intention of mobile payments and its antecedents in terms of the effects of the antecedent factors on use intention as well as the antecedent factors and use intention themselves while also considering the critical prerequisite of measurement invariance. Moreover, through a careful selection of the compared age groups, we extend the examination to cover also the potential generational differences between digital natives and digital immigrants. As the data for the study, we use the responses to an online survey that were collected from Finnish consumers in May 2020 and are analysed by using structural equation modelling (SEM). In terms of gender, we find no differences in the effects of the antecedent factors on use intention but find women to perceive the use of mobile payments as both less easy and less secure than men. In turn, in terms of age and generation, we find the effect of social influence on use intention to be stronger for younger users representing digital natives, whereas older users representing digital immigrants were found to perceive the use of mobile payments as less easy. Finally, we discuss these findings in more detail from both theoretical and practical perspectives.

Keywords: Mobile payments · Use intention · Antecedents · Gender differences · Age differences · Generational differences · Digital natives · Digital immigrants

1 Introduction

The adoption of mobile payments is progressing very rapidly. For example, whereas the global market of mobile payments was valued at about US$ 1,450 billion in 2020, its value has been forecasted to reach about US$ 5,400 billion by 2026 [1]. Thus, it is not surprising that mobile payments have gained considerable attention also in academic research (cf. [2–7]). However, despite this attention, there are still major gaps in our

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more in-depth understanding of the acceptance and use of mobile payments, such as the potential gender, age, and generational differences in its antecedents between different user segments. For example, although the potential gender and age differences have already been examined in some prior studies (e.g., [8–15]), these studies have typically suffered from two main methodological shortcomings. First, they have focused either only on the gender and age differences in the effects of various antecedent factors on use intention or only on the gender and age differences in the antecedent factors and use intention themselves, whereas none have examined them both simultaneously under the same study. Second, few of them have focused on establishing an adequate level of measurement invariance between the compared gender or age groups, which has been highlighted as a critical prerequisite for ensuring the meaningfulness of the conducted comparisons in both general [16] and information systems (IS) specific [17] research literature. Thus, our understanding of these differences has remained limited. In contrast, the potential generational differences have been examined only in one prior study that we are aware of [18] and by using a relatively simplistic research model that focused on the effects of perceived usefulness, perceived ease of use, and perceived security on the attitude toward using mobile payment systems instead of use or use intention itself. Thus, more research on also these differences is urgently needed.

In this study, our objective is to address these gaps by examining the potential gender and age differences in the use intention of mobile payments and its antecedents in terms of the effects of the antecedent factors on use intention as well as the antecedent factors and use intention themselves while also considering the critical prerequisite of measurement invariance. Moreover, through a careful selection of the compared age groups, we extend the examination to cover also the potential generational differences between two generations of users that were originally coined by Prensky [19, 20] and have since been commonly used IS research (e.g., [18, 21, 22]): digital natives and digital immigrants. Of them, *digital natives* (DN) refer to younger users who have grown up using digital technologies, whereas *digital immigrants* (DI) refer to older users who have come to use digital technologies at some later stage of their adult lives. Because of this, these two generations are typically assumed to differ considerably in terms of both their general relationship with (e.g., [19–21]) and their more specific use of (e.g., [23]) these technologies. As the data for the aforementioned examination, we use the responses to an online survey that were collected from Finnish consumers in May 2020 and are analysed by using structural equation modelling (SEM).

After this introduction, we review the prior research on mobile payments and present our research model in Sect. 2. This is followed by the reporting of the research methodology in Sect. 3 and the research results in Sect. 4. The research results are discussed in more detail in Sect. 5 before concluding the paper with a brief discussion of the limitations of the study and some potential paths for future research in Sect. 6.

2 Research Model

Throughout the years, various research models for explaining the acceptance and use of mobile payments have been proposed (cf. [2–7]). Most of these models have been based on either IS specific or more general theories for explaining user or human behaviour,

such as the technology acceptance model (TAM) [24], the unified theory of acceptance and use of technology (UTAUT) [25], UTAUT2 [26], the theory of reasoned action (TRA) [27, 28], and the theory of planned behaviour (TPB) [29, 30]. In the models, the use intention or use behaviour of mobile payments has been explained by using numerous different antecedents, of which the six most commonly used antecedents have been (1) perceived ease of use originating from TAM (analogous with effort expectancy originating from UTAUT), (2) perceived usefulness originating from TAM (analogous with performance expectancy originating from UTAUT), (3) social influence originating from UTAUT (analogous with subjective norm originating from TRA and TPB), (4) perceived trust, (5) perceived risk, and (6) perceived security [7]. In addition to the antecedents themselves, there is also considerable variance between the models in terms of how these different antecedents are hypothesised to affect the use intention or use behaviour of mobile payments, with some models hypothesising direct effects and other models hypothesising indirect effects via other antecedents. For example, whereas the study by Khalilzadeh et al. [31] hypothesises perceived security to affect use intention both directly and indirectly via attitude, the study by Liébana-Cabanillas et al. [32] hypothesises only a direct effect, whereas the study by Matemba and Li [33] hypothesises only an indirect effect via privacy concerns. Similar examples for the other aforementioned antecedents are also available.

In this study, we obviously cannot cover all the different antecedents that have been proposed in prior studies or all the different ways in which they have been hypothesised to affect the use intention or use behaviour of mobile payments. Therefore, in order to promote compatibility with prior research as well as to optimise the impact of our study in terms of its findings concerning the potential gender, age, and generational differences being as broadly applicable as possible, our approach is not to aim at any theoretical novelty in our research model but rather the opposite. In other words, we aim our research model to be a parsimonious synthesis of the findings of prior studies in terms of both its constructs and the hypothesised effects between them. We aim to achieve this in three different ways. First, we base the antecedents of the research model on the aforementioned six most commonly used antecedents in prior studies (i.e., perceived usefulness, perceived ease of use, social influence, perceived trust, perceived risk, and perceived security), with the exception that, of the latter three antecedents, we include only perceived security and exclude perceived trust and perceived risk. This avoids the potential conceptual overlaps between these three antecedents and can also be seen to result in a more parsimonious research model because the perceived trust toward mobile payment systems and the perceived risk of using them are typically determined mainly by their perceived security. Second, in terms of the outcome construct of the research model, we focus on use intention instead of actual use behaviour because this construct has more commonly been used as the outcome construct in prior studies [7]. Third, in terms of the hypothesised effects of the antecedents on use intention, we focus only on the most parsimonious alternative, which are the direct effects of the antecedents on use intention. Thus, in our research model, which is illustrated in Fig. 1, we hypothesise the use intention (UI) of mobile payments to be affected directly by four antecedent factors: perceived usefulness (PU), perceived ease of use (PEOU), social influence (SI), and perceived security (PS).

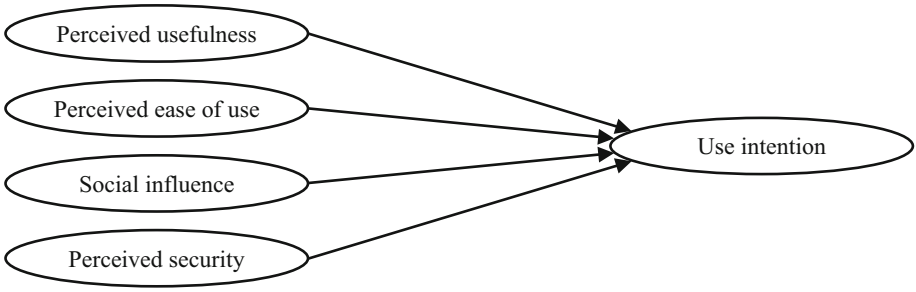

Fig. 1. Research model of the study

In terms of gender and age differences, although gender and age have been hypothesised to moderate the effects of various antecedent factors on the acceptance and use of technology in theories like UTAUT and UTAUT2, relatively few prior studies have examined these differences in the context of mobile payments. The most notable exceptions to this are the studies by Liébana-Cabanillas et al. [8–10], which have focused on the gender and age differences in the effects of the antecedent factors on use intention. In addition, the gender differences in the effects of the antecedent factors on use intention have also been examined in the studies by Jaradat and Faqih [11], Lwoga and Lwoga [12], as well as Lee et al. [13]. In turn, only two studies have focused on the gender and age differences in the antecedent factors and use intention themselves, with the study by Hamza and Shah [14] focusing on them only in the case of gender and the study by Acheampong et al. [15] focusing on them in the case of both gender and age. Finally, generational differences in the context of mobile payments have been previously examined only in the study by Fischer et al. [18]. We will discuss the findings of these studies in more detail in Sect. 5 when reflecting them against those of our study.

3 Methodology

The data for this study was collected in an online survey targeted at Finnish consumers in May 2020. The survey respondents were recruited by sharing the survey link actively via various communication channels, such as the electronic mailing lists of our university and social media. The survey questionnaire was in Finnish and was tested in a pilot study before the actual study. It contained multiple items related to the demographics of the respondents and their use of mobile payments. Of them, the 15 items reported in Table 1 (translated from Finnish to English) were used to measure the constructs of our research model. Each of the five constructs was measured reflectively by three items. The items measuring perceived usefulness and perceived ease of use were adapted from [24], whereas the items measuring social influence were adapted from [25] and [34]. In turn, the items measuring perceived security were adapted from [35] and [36], whereas the items measuring use intention were adapted from [25] and [37]. The standard five-point Likert scale (1 = strongly disagree … 5 = strongly agree) was used as the measurement scale. In order to avoid forced responses, the respondents also had the option not to respond to a particular item, which resulted in a missing value.

Table 1. Item wordings

Item	Wording
PU1	Using mobile payments would enable me to pay more quickly
PU2	Using mobile payments would enable me to pay more efficiently
PU3	Using mobile payments would enable me to pay more easily
PEOU1	Learning to use mobile payments is easy
PEOU2	Using mobile payments is clear and understandable
PEOU3	I find using mobile payments easy
SI1	People who are important to me think that I should use mobile payments
SI2	People who are important to me expect that I use mobile payments
SI3	People who are important to me have recommended that I use mobile payments
PS1	I would feel secure sending sensitive information across mobile payment systems
PS2	Mobile payment systems are a secure means through which to send sensitive information
PS3	Mobile payment systems have sufficient technical capacity to protect my sensitive information
UI1	I intend to use mobile payments in the near future
UI2	I am likely to use mobile payments in the near future
UI3	I am willing to use mobile payments in the near future

The collected data was analysed with covariance-based structural equation modelling (CB-SEM), which was conducted by using the Mplus version 7.11 software [38] and by following the recommended guidelines for SEM in administrative and social science research [39]. As the model estimator, we used the MLR option of Mplus, which stands for maximum likelihood estimator robust to non-normal data. The potential missing values were handled by using the FIML option of Mplus, which stands for full information maximum likelihood and uses all the available data in model estimation.

The potential gender, age, and generational differences were examined by using multiple group analysis (MGA) and by following the procedure formalised in [40] for establishing measurement invariance. In it, increasingly strict constraints on parameter equality are added across the groups and the fit of the resulting constrained model is compared to the fit of the unconstrained model. In the first step, configural invariance is tested by estimating the model separately for each group while constraining only the simple structure of the model as equal across the groups. If the fit of this model remains approximately as good as the fit of the model without the group separation, then the hypothesis of configural invariance is supported. In the second and third steps, metric and scalar invariance are tested by additionally constraining the indicator loadings

and intercepts as equal across the groups. If these additional constraints result in no statistically significant deterioration in model fit, then the hypotheses on metric and scalar invariance are supported. After this, the differences in the effects between the constructs can be tested by constraining the estimated effect sizes as equal across the groups one by one and examining whether this results in a statistically significant deterioration in model fit. If it does, then that particular effect can be considered to differ across the groups. In turn, the differences in the constructs themselves can be tested by examining their estimated mean scores in each group. In order to make the estimated model identifiable, one of the groups typically has to be specified as a reference group in which the construct mean scores are fixed to zero, meaning that the construct mean scores of the other groups indicate the size and statistical significance of the differences in comparison to that particular group. As a statistical test for examining the potential deteriorations in model fit, we used the χ^2 test of difference, in which the value of the test statistic was corrected with the Satorra-Bentler [41] scaling correction factor (SCF) due to the use of the MLR estimator. However, because the χ^2 test of difference is known to suffer from a similar sensitivity to sample size as the χ^2 test of model fit, we also considered the potential changes in the model fit indices as suggested in [40].

4 Results

We received a total of 323 responses to the online survey, of which 11 responses had to be dropped due to missing or invalid data. Thus, the sample size used in this study was 312 responses. The descriptive statistics of this sample in terms of gender, age, education, and prior experience in using mobile payments as well as the reference gender and age distributions of the Finnish adult population in 2020 [42] are reported in Table 2. As can be seen, the sample was quite well-balanced in terms of gender but tilted toward younger respondents aged under 45 years who had either a bachelor's or master's degree. Most of the respondents also already had some previous experience in using mobile payments and relatively many had used them for more than two years. In the following four subsections, we first estimate the model for all the respondents, evaluate it in terms of its reliability and validity at both indicator and construct levels, as well as report its estimates and goodness of fit with the data. Finally, we examine the potential gender, age, and generational differences.

Table 2. Sample statistics (N = 312)

	Sample (N)	Sample (%)	Finland (%)
Gender			
Man	172	55.1	49.0
Woman	140	44.9	51.0
Age			
18–24 years	46	14.7	9.5
25–34 years	130	41.7	15.8
35–44 years	94	30.1	15.9
45–54 years	25	8.0	14.8
55–64 years	14	4.5	16.1
65 years or over	3	1.0	28.0
Education			
Basic qualification	2	0.6	
Vocational qualification	30	9.6	
Matriculation examination	51	16.3	
Bachelor's degree	135	43.3	
Master's degree	85	27.2	
Doctoral degree	8	2.6	
No response	1	0.3	
Experience in using mobile payments			
Has never used	52	16.7	
Has used for less than one year	52	16.7	
Has used for one or two years	74	23.7	
Has used for more than two years	128	41.0	
No response	6	2.0	

4.1 Indicator Reliability and Validity

Indicator reliabilities and validities were evaluated by using the standardised loadings of the indicators, which are reported in Table 3 together with the mean and standard deviation (SD) of each indicator as well as the percentage of missing values. In the typical case where each indicator loads on only one construct, it is commonly expected that the standardised loading of each indicator is statistically significant and greater than or equal to 0.707 [43]. This is equivalent to the standardised residual of each indicator being less than or equal to 0.5, meaning that at least half of the variance in each indicator is explained by the construct on which it loads. The only indicator that did not meet this criterion was SI3, which is why we decided to drop it from the model. After dropping it, as shown in the final column of Table 3, all the indicators met the aforementioned criterion.

Table 3. Indicator statistics (*** = $p < 0.001$)

Item	Mean	SD	Missing	Loading before dropping SI3	Loading after dropping SI3
PU1	3.936	1.321	0.3%	0.927***	0.928***
PU2	3.888	1.277	0.0%	0.858***	0.858***
PU3	4.166	1.058	3.5%	0.836***	0.835***
PEOU1	3.939	1.288	0.0%	0.829***	0.829***
PEOU2	3.974	1.211	0.0%	0.888***	0.888***
PEOU3	4.147	1.244	0.0%	0.899***	0.899***
SI1	3.157	1.253	14.4%	0.917***	0.847***
SI2	3.084	1.348	8.3%	0.815***	0.880***
SI3	3.385	1.408	4.2%	0.582***	Dropped
PS1	3.240	1.287	0.0%	0.814***	0.813***
PS2	3.385	1.091	10.9%	0.834***	0.834***
PS3	3.324	1.313	0.0%	0.861***	0.861***
UI1	4.391	1.041	2.6%	0.869***	0.869***
UI2	4.416	0.955	2.9%	0.943***	0.944***
UI3	4.389	0.948	3.5%	0.949***	0.948***

4.2 Construct Reliability and Validity

Construct reliabilities were evaluated by using the composite reliabilities (CR) of the constructs [43], which are commonly expected to be greater than or equal to 0.7 [44]. The CR of each construct is reported in the first column of Table 4. As the reported values show, all the constructs met this criterion. In turn, construct validities were evaluated by examining the convergent and discriminant validities of the constructs by using the two criteria proposed in [43]. They both are based on the average variance extracted (AVE) of the constructs, which refers to the average proportion of variance that a construct explains in its indicators. In order to exhibit satisfactory convergent validity, the first criterion expects that each construct should have an AVE of at least 0.5. This means that, on average, each construct should explain at least half of the variance in its indicators. The AVE of each construct is reported in the second column of Table 4, showing that all the constructs met this criterion. In order to exhibit satisfactory discriminant validity, the second criterion expects that each construct should have a square root of AVE greater than or equal to its absolute correlation with the other constructs in the model. This means that, on average, each construct should share at least an equal proportion of variance with its indicators than it shares with these other constructs. The square root of AVE of each construct (on-diagonal cells) and the correlations between the constructs (off-diagonal cells) are reported in the remaining columns of Table 4, showing that this final criterion was also met by all the constructs.

Table 4. Construct statistics

	CR	AVE	PU	PEOU	SI	PS	UI
PU	0.907	0.765	0.875				
PEOU	0.905	0.761	0.819	0.873			
SI	0.854	0.746	0.563	0.475	0.864		
PS	0.875	0.699	0.551	0.510	0.384	0.836	
UI	0.944	0.848	0.783	0.682	0.560	0.584	0.921

4.3 Model Estimates and Model Fit

The results of model estimation for all the respondents in terms of the standardised effect sizes and their statistical significance, the proportion of explained variance (R^2) in use intention, as well as model fit are reported in the first column of Tables 5 and 6. Model fit was evaluated by using the χ^2 test of model fit and four alternative model fit indices recommended in recent methodological literature [45]: the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardised root mean square residual (SRMR). Of them, the χ^2 test of model fit rejected the null hypothesis of the model fitting the data ($\chi^2(67) = 152.147$, $p < 0.001$), which is common in the case of large samples [46]. In contrast, the values of the four model fit indices (CFI = 0.964, TLI = 0.952, RMSEA = 0.064, and SRMR = 0.036) all clearly met the cut-off criteria (CFI $\geq$ 0.95, TLI $\geq$ 0.95, RMSEA $\leq$ 0.06, and SRMR $\leq$ 0.08) recommended in [45]. Thus, we consider the overall fit of the model as satisfactory. Of the four antecedent factors, perceived usefulness, perceived security, and social influence were each found to have a positive and statistically significant effect on use intention, whereas the effect of perceived ease of use on use intention was found to be statistically not significant. Together, the antecedent factors were found to explain about 66.4% of the variance in use intention.

Table 5. Model estimates (* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$)

	All	Men	Women	Younger/DN	Older/DI
Effects					
PU → UI	0.523***	0.503***	0.522**	0.330*	0.699***
PEOU → UI	0.083	0.030	0.152	0.177	−0.006
SI → UI	0.151*	0.111	0.202**	0.284**	0.014
PS → UI	0.195***	0.269**	0.130	0.163*	0.230*
R^2					
UI	0.664***	0.626***	0.728***	0.600***	0.767***

Table 6. Model fit

	All	Men	Women	Younger/DN	Older/DI
Fit test					
χ^2	152.147	112.086	141.445	122.344	126.982
df	67	67	67	67	67
p	<0.001	<0.001	<0.001	<0.001	<0.001
Fit indices					
CFI	0.964	0.966	0.934	0.958	0.948
TLI	0.952	0.954	0.910	0.943	0.929
RMSEA	0.064	0.063	0.089	0.069	0.081
SRMR	0.036	0.042	0.040	0.044	0.041

4.4 Gender, Age, and Generational Differences

For examining the potential gender, age, and generational differences, the sample was split into two mutually exclusive and collectively exhaustive groups that were compared against each other: men (N = 172) vs. women (N = 140) and younger users aged under 35 years (N = 176) vs. older users aged 35 years or over (N = 136). Of them, when taking into account that the data was collected in mid-2020, the younger and older users can also be alternatively labelled as DN and DI because they represent users who were born after and before 1985 (1985 has been used as the cut-off year for separating DN from DI in several prior studies (e.g., [47–49]), although some prior studies have also used 1980 (e.g., [18, 22]) or 1983 (e.g., [23]) as the cut-off year). The results of model estimation for these four groups in terms of the standardised effect sizes and their statistical significance, the proportion of explained variance (R^2) in use intention, as well as model fit are reported in the remaining columns of Tables 5 and 6.

The results of the measurement invariance tests for the gender, age, and generational differences are reported in the first three rows of Tables 7 and 8. As can be seen, in the case of the gender as well as age and generational differences, the fit of the configural invariance model deteriorated slightly in comparison to the model without the group separation (cf. Table 6) but still remained satisfactory in terms of three of the four model fit indices (i.e., CFI, RMSEA, and SRMR). Thus, the hypothesis on configural invariance was supported. Similarly, the results of the subsequent model comparisons supported the hypotheses on metric and scalar invariance, as the χ^2 tests of difference suggested no statistically significant deterioration in model fit ($p \geq 0.05$), and most of the model fit indices suggested improvement rather than deterioration in model fit.

Table 7. Invariance tests for the gender differences

Invariance	χ^2	df	SCF	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	Δdf	p
Configural	253.446	134	1.0771	0.952	0.934	0.076	0.041			
Metric	250.787	143	1.0974	0.956	0.944	0.070	0.043	1.591	9	0.996
Scalar	257.951	152	1.0905	0.957	0.949	0.067	0.044	6.201	9	0.720
PU → UI	256.868	153	1.0952	0.958	0.950	0.066	0.044	0.015	1	0.903
PEOU → UI	256.759	153	1.0969	0.958	0.950	0.066	0.044	0.166	1	0.684
SI → UI	258.220	153	1.0920	0.957	0.949	0.066	0.044	0.516	1	0.473
PS → UI	258.945	153	1.0940	0.957	0.949	0.067	0.045	1.224	1	0.269

Table 8. Invariance tests for the age and generational differences

Invariance	χ^2	df	SCF	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	Δdf	p
Configural	249.177	134	1.0599	0.953	0.937	0.074	0.043			
Metric	252.627	143	1.0793	0.956	0.944	0.070	0.051	6.255	9	0.714
Scalar	260.258	152	1.0726	0.956	0.948	0.068	0.052	6.720	9	0.666
PU → UI	261.872	153	1.0754	0.956	0.948	0.068	0.052	1.642	1	0.200
PEOU → UI	259.886	153	1.0789	0.957	0.949	0.067	0.052	0.608	1	0.436
SI → UI	266.242	153	1.0712	0.954	0.945	0.069	0.054	7.043	1	0.008
PS → UI	260.675	153	1.0740	0.956	0.948	0.067	0.053	0.631	1	0.427

The results of the remaining model comparisons, which were used to examine the gender, age, and generational differences in the effects of the antecedent factors on use intention, are reported in the last four rows of Tables 7 and 8. As can be seen, a statistically significant ($\Delta\chi^2(1) = 7.043$, $p = 0.008$) difference was found only in the effect of social influence on use intention in the case of the age and generational differences, which was found to be stronger for younger users (i.e., DN) than older users (i.e., DI). In turn, the standardised construct mean scores, which were used to examine the gender, age, and generational differences in the antecedent factors and use intention themselves, are reported in Table 9. Here, men and younger users (i.e., DN) act as reference groups in which the construct mean scores are fixed to zero and against which the construct mean scores of women and older users (i.e., DI) are compared. As can be seen, statistically significant gender differences were found in the construct mean scores of perceived ease of use and perceived security, which were found to be lower for women than men. In contrast, statistically significant age and generational differences were found only in the construct mean score of perceived ease of use, which was found to be lower for older users (i.e., DI) than younger users (i.e., DN).

Table 9. Differences in construct mean scores ([a] = fixed to 0, * = $p < 0.05$, *** = $p < 0.001$)

Construct	Men	Women	Younger/DN	Older/DI
PU	0.000[a]	−0.134	0.000[a]	−0.179
PEOU	0.000[a]	−0.211*	0.000[a]	−0.349***
SI	0.000[a]	−0.182	0.000[a]	−0.231
PS	0.000[a]	−0.272*	0.000[a]	0.073
UI	0.000[a]	−0.081	0.000[a]	−0.152

5 Discussion and Conclusions

In this study, we examined the potential gender and age differences in the use intention of mobile payments and its antecedents in terms of the effects of the antecedent factors on use intention as well as the antecedent factors and use intention themselves while also considering the critical prerequisite of measurement invariance. Moreover, through a careful selection of the compared age groups, we extended the examination to cover also the potential generational differences between DN and DI. The examination was based on a research model in which the use intention of mobile payments was hypothesised to be explained by perceived usefulness, perceived ease of use, social influence, and perceived security. Overall, we found this model to perform very well in explaining the intention to use mobile payments and to have a good fit with the data as well as satisfactory reliability and validity at both indicator and construct levels.

In terms of the gender differences in the effects of the antecedent factors on use intention, we found no differences. When reflecting this finding against prior research, it supports the findings by Jaradat and Faqih [11], Lwoga and Lwoga [12], as well as Lee et al. [13], who also found no differences in the effects of perceived usefulness or performance expectancy, perceived ease of use or effort expectancy, and social influence or subjective norm on use intention. The only exception to this was the finding by Lwoga and Lwoga [12] that the effect of perceived ease of use on use intention is stronger for men than women, which is not supported by our findings. In addition, our findings also do not support the findings by Liébana-Cabanillas et al. [8, 10] that the effect of perceived usefulness on use intention is stronger for men than women.

In terms of the gender differences in the antecedent factors and use intention themselves, we found women to have lower scores of perceived ease of use and perceived security than men, meaning that they perceived the use of mobile payments as less easy and less secure. One likely explanation for this is that women have typically been found to have lower technology readiness (e.g., [50]), lower self-efficacy toward technology use (e.g., [51]), as well as lower trust perceptions (e.g., [52]) and higher risk perceptions (e.g., [53]) toward online shopping, which may influence also their perceptions concerning the use of mobile payments. When reflecting this finding against prior research, it supports the findings by Hamza and Shah [14] as well as Acheampong et al. [15] that men have higher scores of perceived ease of use or effort expectancy than women. In contrast, our findings do not support the prior findings by Hamza and Shah [14] as well

as Acheampong et al. [15] that women have higher scores of subjective norm or social influence than men. In addition, while our findings also support the findings by Hamza and Shah [14] that there are no differences in the scores of perceived usefulness and use intention between men and women, they do not support the finding by Acheampong et al. [15] that men have higher scores of performance expectancy than women.

In terms of the age and generational differences in the effects of the antecedent factors on use intention, we found the effect of social influence on use intention to be stronger for younger than older users, meaning that their motivation to use or not to use mobile payments is more strongly influenced by the perceived opinions of other people. This finding is not surprising when considering that the younger and older users in our study were equivalent to DN and DI of whom the daily lives of DN are typically assumed to be more intertwined with the use of digital technologies in comparison to DI, also in terms of social aspects [21]. Thus, they are likely to be more susceptible to social influences when it comes to the use of these technologies. When reflecting this finding against prior research on age differences, it does not support the finding by Liébana-Cabanillas [10] that there is no difference in the effect of external influences on use intention. However, our findings support the findings by Liébana-Cabanillas [9, 10] that there is no difference in the effect of perceived usefulness on use intention.

Finally, in terms of the age and generational differences in the antecedent factors and use intention themselves, we found older users to have lower scores of perceived ease of use than younger users, meaning that they perceived the use of mobile payments as less easy. Like the previous finding, this finding is scarcely surprising when once again considering that the younger and older users in our study were equivalent to DN and DI of whom DN are typically assumed to be more technologically savvy in comparison to DI [19–22], thus likely influencing also their perceptions concerning the use of mobile payments. When reflecting the finding against prior research on age differences, it supports the finding by Acheampong et al. [15] that younger users have higher scores of effort expectancy than older users. However, the findings by Acheampong et al. [15] also suggest that younger users have higher scores of performance expectancy but lower scores of social influence, which is not supported by our findings.

From a theoretical perspective, the findings of the study promote the understanding of the potential gender, age, and generational differences in the antecedents of the acceptance and use of mobile payments by addressing some of the methodological issues of the prior studies on gender and age differences as well as by being the first study to examine generational differences in the effects of the antecedent factors on use intention as well as in the antecedent factors and use intention themselves. For example, the prior study by Fischer et al. [18] examined the generational differences only in the effects of the antecedent factors on the attitude towards use, not on use intention itself. In turn, from a practical perspective, the providers of mobile payment systems can potentially use the findings to further promote the adoption of their systems via more positive user perceptions. For example, as women and older users representing DI were found to perceive the use of mobile payments as less easy and less secure, the providers should highlight mobile payments as an easy and secure payment option in the case of these user segments. In addition, as social influence was found to have stronger effects on use intention among younger users representing DN, this user segment may be particularly susceptible to more socially oriented marketing campaigns.

6 Limitations and Future Research

We consider this study to have three main limitations. First, the study focused only on Finnish consumers, which is why the generalisability of its findings to other countries calls for confirmation. Second, in terms of the antecedents of the intention to use mobile payments, the study focused only on perceived security instead of perceived trust and perceived risk, which have also commonly been hypothesised to act as antecedents of use intention in prior studies. Third, the study did not focus on the potential interactions between gender and age, such as whether there are differences in the effects of the antecedent factors on use intention or in the antecedent factors and use intention themselves between younger men, older men, younger women, and older women. Future studies should address these limitations by replicating the study in other countries, testing alternative research models, and focusing on the aforementioned interactions. In addition, future studies should examine more thoroughly the explanations for the gender, age, and generational differences that we found in this study. Instead of the positivist paradigm and statistical generalisations that were used in this study, these studies may benefit from the use of also other types of research paradigms and generalisations, such as the interpretive paradigm and analytical generalisations (cf. [54–56]).

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Will They Like It? – Understanding Customer Adoption of Connected Car Services within Automotive Aftersales

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Abstract. Connected IT services are considered a key offering for the future differentiation of car manufacturers in automotive aftersales. Enabled by ICT, the additional value and customer experience offered can make the difference on the market. However, the customers' perception and thus their intention to use such services has rarely been studied in the literature so far. Since their actual adoption is crucial to achieve a competitive advantage, this paper presents criteria that influence the usage intention. They have been analyzed by an exploratory quantitative study using the Unified Theory of Acceptance and Use of Technology and PLS-SEM. Results of the survey (n = 260) indicate that the intention to use connected services strongly depends on their overall risk aversity regarding online activities in general. It shows the necessity for car manufacturers to put more focus on offering the right services to their target groups.

Keywords: Connected services · Automotive aftersales · Adoption

1 Introduction

In recent years, automotive Original Equipment Manufacturers (OEM) have put significant effort in building up a digital aftersales business, providing technology-based services to their customers based on the vehicle communicating with its environment [24]. Due to the direct customer contact and its potential to ensure competitive advantage due to differentiation, downstream sectors such as aftersales became even more important [14,15]. Among other terms, the transformation from manufacturers to service providers has been described primarily as servitization in literature [6,7,19,30,52,69].

Such connected services enable OEMs to enhance the customer experience and to build new revenue streams [29,62].

However, by promoting connected services OEMs also risk opening the market for external parties causing an increasing competition around the car as a platform [5,16,39,49].

Even though a better understanding of the potential adoption of connected services by customers would help OEMs in their differentiation on the market

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[14,15], this has only been studied scarcely in the automotive context [63]. Since connected car services will potentially become a highly competitive market [5, 16,39,49], it is crucial to understand adoption criteria to ensure their usage and thereby create additional value for customers [28].

Therefore, this paper presents criteria influencing the adoption of connected services by private customers in the context of automotive aftersales. The results have been obtained by adapting the Unified Theory of Acceptance and Use of Technology (UTAUT) to the context of connected car services. The exploratory quantitative study conducted provides a deeper understanding of technology adoption for such services and delivers implications for further research.

The rest of this paper is organized as follows: In Sect. 2, the relevant literature is discussed, and the research gap and question are stated. Section 3 describes the research methodology and model and illustrates the study design and data collection process. In Sect. 4, the quantitative evaluation of the model is presented and in Sect. 5 the obtained results are discussed. We conclude with the limitations and a summary of our findings.

2 Literature Review

The increasing spread of ICT throughout industries and aspects of life is changing companies even in areas that were previously dependent on physical materiality [5,17,23,26,28,40,49,57,59,74]. Technological achievements changed the relevance and nature of mobility for providers and consumers [36]. Different from the past, it is now essential to know how the vehicle is used [42], which can be accomplished due to the integration of ICT in the vehicle [50]. Automotive companies react to these developments by re-designing existing services and by introducing new technology-based service offerings [20,21]. Depending on the communication objects involved, many examples for such services have been discussed in the literature so far: vehicle-to-vehicle (V2V), vehicle-to-road (V2R), vehicle-to-infrastructure (V2I), vehicle-to-pedestrian (V2P), or vehicle-to-everything (V2X) [4,21,24,34]. Besides these inter-vehicle communication models, the intra-vehicle communication implying vehicle-to-sensor (V2S), or vehicle-to-device (V2D) interaction has also been presented [4].

Since ICT is also becoming increasingly widespread in vehicles, one can already speak of vehicle or in-vehicle information systems [33,71]. General, the service offerings of OEMs can be divided into technical and non-technical services, where technical services ensure the vehicles' mobility and non-technical services aim to add additional value beside the mere mobility [28]. Among the technical services, the driver support systems are predominantely [48,61] in order to increase the divers' safety [21].

Consequently, it enables OEMs to enhance the customer experience and enables them to build new revenue streams [62]. Due to ICT, the car itself can now serve as a platform for services [5,16,39]. Thus, a so-called digital aftersales could be introduced, basically dependent on the vehicle communicating with its environment [24].

Therefore, the vehicle is no longer an isolated good but rather involves and integrates different devices, functions, data, and stakeholders [29,62]. Subsequently, this development opened the market for new actors such as tech-companies that are well-positioned in offering services [5,16,36,49], increasing the competition around the platform car and the corresponding services [5,16,39,49,59].

By providing services, it also changes the way how car manufacturers create value, as customers can now be involved in the value creation process [21,56]. Accordingly,the role of customers is evolving from that of mere consumers to that of co-actors in value creation [55].

Thus,the focus for the development of such services is the customer [24, 31,70]. The user adoption of new technologies is crucial for successful service offerings that are based on ICT [68].

For along time, Information System (IS) research has extensively studied individuals' adoption of new information and communication technology [3,8, 10,12,13,18,41,58,64,65,72]. In academic literature several models have been introduced that aim to predict the adoption of technology by humans [3,11–13,18,41,64,72]. By comparing and combining eight models, [72] has derived the Unified Theory of Acceptance and Use of Technology (UTAUT) (see Fig. 1).

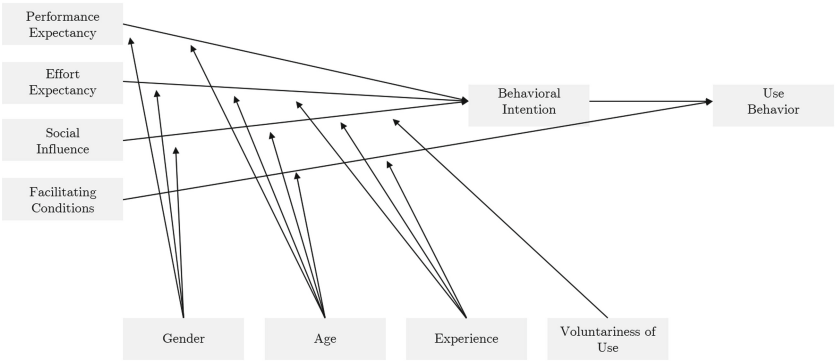

Fig. 1. Unified Theory of Acceptance and Use of Technology (UTAUT) (own illustration based on [72]).

Within this model, performance expectancy (PE) has been defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" and has been indicated to be moderated by the factors gender and age [72].

Characterized as "the degree of ease associated with the use of the system" has been the construct of effort expectancy (EE) [72]. Moreover, the influence of gender, age, and experience have been outlined with respect to the effort expectancy [72]. The construct social influence (SI) deals with "the degree to which an individual perceives that important others believe he or she should

use the new system" [72]. Meaning that the behavior is influenced by how the individual believes others will see him as a result of having used the technology [72].

The belief of a person about the degree of technical and organizational infrastructure provided in order to support the system usage has been categorized as the construct of facilitating conditions (FC). Besides the core constructs, it also has been paid attention to the following moderating factors: experience, voluntariness, gender, age [72].

The automotive industry has been of great interest for the research field of technology adoption [1,35,37,38,47,51,53,53]. With regard to the automotive industry, different aspects have been considered by technology adoption research such as autonomous driving [2,32,43,46,60,73], electric vehicles [63], driver support systems [37,51,53,54,60], and connected vehicles [45,59,63]. Although the adoption of IT in the connected car context has been studied [45], the research is quite general by investigating "in-car technology" and not specific services [59].

Table 1 summarizes the current research streams regarding these topics found in the literature. Subsequently, although literature has considered the adoption of ICT within the automotive context [45,59,63], there is just few research about connected services [63].

Table 1. Summary of the relevant research streams found in the literature.

Vehicle communication channels	[4,21,24,34]
Characterizations of connected car services	[28]
Models regarding technology adoption by humans	[3,11–13,18,41,64,72]
Technology adoption research in the automotive industry	[1,35,37,38,47,51,53,53]
Technology adoption regarding autonomous driving	[2,32,43,46,60,73]
Technology adoption regarding electric vehicles	[63]
Technology adoption regarding driver support systems	[2,32,43,46,60,73]
Technology adoption regarding connected vehicles	[45,59,63]
Technology adoption regarding connected services	[63]

In order to address this gap, this paper aims to give insights about criteria that influence the adoption of connected services for passenger vehicles by addressing the following research question:

Which criteria influence the user adoption of connected aftersales services for private customers?

Within the scope of this paper, only passenger cars are considered. Moreover, by naming connected aftersales services, it can be referred to the ability of the car to communicate with its environment in order to enable non-technical services that go beyond the earlier offerings targeting maintenance and repairs [24,28,66]. Such services have been called to be use- and result-oriented, e.g. by offering personalized comfort or intelligent mobility [25].

3 Research Methodology and Data Collection

In this paper, the UTAUT is adapted to the context of connected services for vehicles to investigate their adoption by users. Two exemplary use cases, which have been derived from a previous workshop with industry experts, served as the basis for the survey. As a result, criteria influencing the user adoption of connected car services are presented.

The workshop has been conducted on January 14th, 2019 with a duration of 2.5 h and five participants (P1–P5) as well as one moderator.

The first use case deals with a parking assistant (PA) that suggests free parking spots based on the users requirements regarding costs, location and arrival time. The second addresses the automatic accident handling (AA) of rear-end collisions by recording and passing on relevant information to all involved parties.

But since the survey was not based on already existing systems, the actual UB could not be measured. In addition, the construct of voluntariness has been excluded from the measurement, because the connected services offered for passenger vehicles are used on a voluntary basis anyway. There has also been conducted a pretest with seven participants, which revealed that the construct of EE needs to be excluded from the investigation as well. The construct EE refers to the "degree of ease associated with the use of the system" [72], which has been hard to grasp for the test group since it discussed a hypothetical connected service.

Moderating factors have been collected jointly for both use cases. Besides the moderators that have been derived from literature (age, gender, experience), the experts suggested further moderators (internet usage in frequency and purpose, attitude towards new technologies in general, frequency of car usage, car ownership and concerns).

The survey has been conducted from March 18th, 2019 until March 29th, 2019. The questionnaire has been provided online as well as paper-based. Each item has been measured with a 5-point Likert scale, ranging from 1 (strongly agree) to 5 (strongly disagree).

The collected questionnaires have been reviewed in terms of completeness and suspicious response patterns such as straight or diagonal lining [22, p.58]. After removing those that at least showed one of the criteria, a sample size of $n = 260$ of the original 327 collected questionnaires (online: 286; paper-based: 41) was left, which equals a dropout rate of 20.49%. The data has been gathered from 125 females (48.08%) and 135 males (51.92%) within an age ranging from 17 to over 75 years.

4 Results

For the evaluation, the SEM has been fitted using the PLS-SEM approach, as the sample size was comparably small, theory testing was not the main objective, and PLS provides faster convergence in this case [67].

The results for the model fitted with the collected data by means of PLS-SEM algorithm for the two use cases are presented in Figs. 2 and 3, respectively. It can be seen that for both use cases the constructs Performance Expectancy (PE) as well as Social Influence (SI) in general have a significant impact on the Behavioral Intention (BI) to use the services.

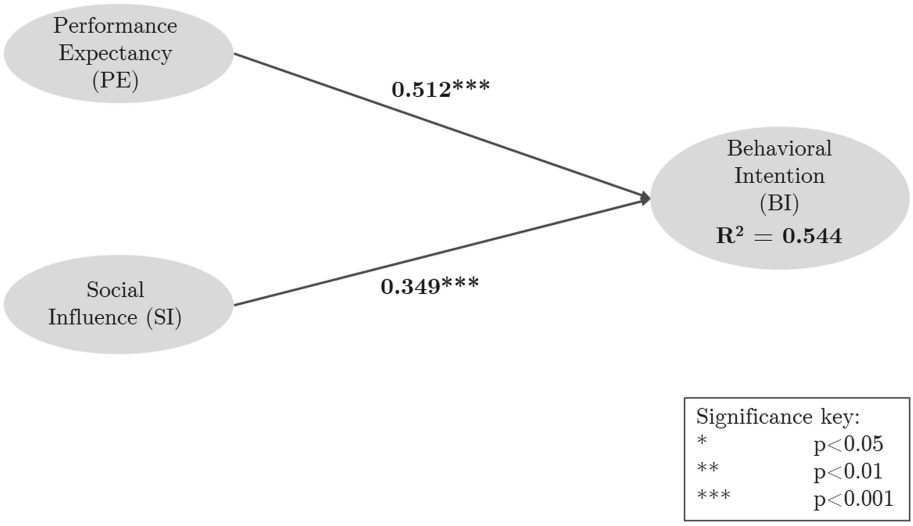

Fig. 2. Results of SEM for use case AA

Table 2 illustrates the results the path coefficients obtained in the analysis, including their significance.

Table 2. Significance of path coefficients

	Original Sample (O)	Sample Mean (M)	p Value	95% BCa Confidence Interval	Significance ($p < 0.1$)
AA_PE → AA_BI	0.512	0.507	<0.001	[0.435, 0.594]	Yes
AA_SI → AA_BI	0.349	0.360	<0.001	[0.250, 423]	Yes
PA_PE → PA_BI	0.488	0.480	<0.001	[0.407, 0.581]	Yes
PA_SI → PA_BI	0.265	0.287	<0.001	[0.146, 0.340]	Yes

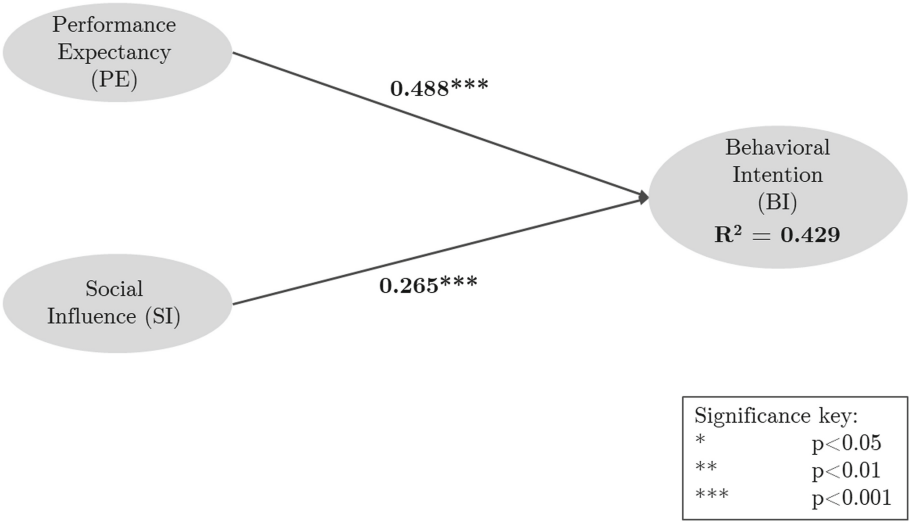

Fig. 3. Results of SEM for use case PA

4.1 Moderators

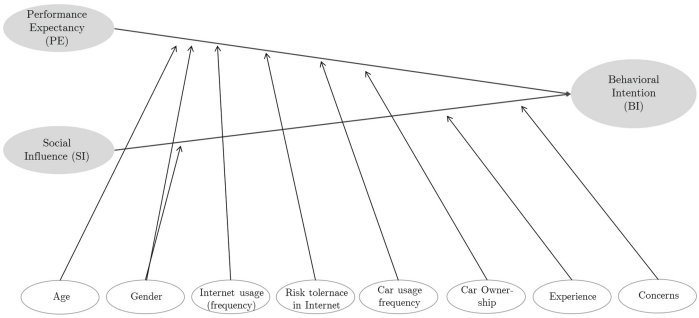

Fig. 4. Overview of moderating criteria for the use case AA

Age seems to influence negatively the path of PE on the dependent variable BI for the use case of AA. This effect has also been found to be significant ($\beta = -0.078$, p = 0.079). Although, age dampened the relation of PA_PE on PA_BI as well, it showed no significance in its effect ($\beta = -0.058$, p = 0.226). Age showed no significant moderating on the path of SI and BI for both use cases AA ($\beta = 0.057$, p = 0.277) and PA ($\beta = 0.067$, p = 0.305) (Figs. 4 and 5).

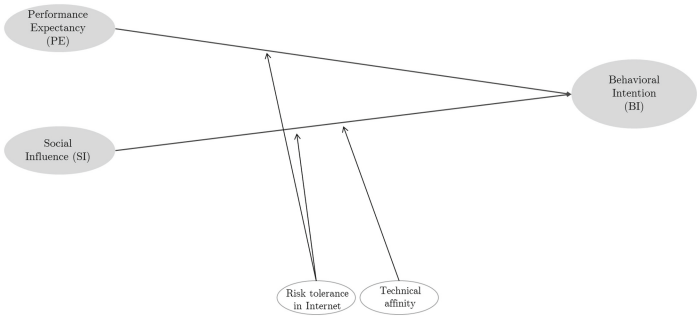

Fig. 5. Overview of moderating criteria for the use case PA

Gender. For the automated accident handling, gender had a significant moderating effect on both, the relation of PE ($\beta = 0.106$, $p = 0.046$) and SI ($\beta = -0.106$, $p = 0.044$) on the behavioral intention. Nevertheless, the moderating effect of gender has been non-significant for the other use case investigated (Performance expectancy on BI: $\beta = 0.024$, $p = 0.655$; Social influence on BI: $\beta = -0.002$, $p = 0.972$).

Experience as a moderator strengthens the positive relation between SI and BI ($\beta = 0.105$, $p = 0.038$) for the automated accident handling. However, the moderating effect on the path of performance expectancy on BI has been non-significant for the use case AA ($\beta = -0.077$, $p = 0.150$). For the PA use case, there has not been a significant effect of experience on the relation of PE ($\beta = -0.068$, $p = 0.252$) and SI ($\beta = 0.063$, $p = 0.325$) on the behavioral intention as well.

Internet Usage. With regard to the Internet usage, the aspects of usage frequency and activities have been taken into account. The internet usage frequency dampens the positive relationship between performance expectancy and behavioral intention ($\beta = -0.118$, $p = 0.082$).

However, the path of SI and BI in the use case AA has not been moderated significantly by the Internet usage frequency ($\beta = 0.111$, $p = 0.132$). For the parking assistant use case, there has not been found a significant moderating from the Internet usage frequency on the relations of the other constructs PE ($\beta = -0.103$, $p = 0.123$) and SI ($\beta = 0.084$, $p = 0.118$) on BI.

Besides the usage frequency, the risk tolerance for activities on the Internet has been taken into account. In the parking assistant use case, both relations of performance expectancy ($\beta = 0.140$, $p = 0.007$) and social influence ($\beta = -0.148$, $p = 0.006$) on the behavioral intention have indicated to be moderated by the risk tolerance for activities on the Internet.

While the positive relation of SI and BI is dampened by the risk tolerance in Internet activities, the positive relation of PE and BI is strengthened. Also

the path of performance expectancy and behavioral intention in the use case of automated accident handling signified a moderating effect of risk tolerance in Internet activities ($\beta = 0.111$, $p = 0.087$). Again, the positive relation has been strengthened by the moderator.

But for the relation of SI and BI the moderating effect of risk tolerance for activities on the Internet has been of no significance ($\beta = -0.109$, $p = 0.112$).

Car Usage. Regarding the car usage, the frequency rate as well as the ownership have been considered. The frequency of usage has signified to moderate the relation of performance expectancy and behavioral intention ($\beta = 0.535$, $p \leq 0.001$) for the use case of AA, it thereby strengthens the positive relation of the performance expectancy and the behavioral intention. On the contrary, there has not been found a significant moderation of the frequency rate on the relation of either SI (AA: $\beta = -0.035$, $p = 0.422$; PA: $\beta = -0.017$, $p = 0.790$) or PA_PE ($\beta = -0.026$, $p = 0.660$) on the behavioral intention.

Car ownership seems to strengthen the positive relation of performance expectancy and behavioral intention as well. ($\beta = 0.120$, $p = 0.011$). The relation of social influence and BI does not seem to be subject to moderation of car ownership in both use cases AA ($\beta = -0.036$, $p = 0.414$) and PA ($\beta = -0.051$, $p = 0.361$). Moreover, car ownership indicated no significant impact on the path of PE and BI ($\beta = -0.051$, $p = 0.322$) for the use case of the parking assistant.

Technical Affinity has a moderating effect on the relation of social influence on behavioral intention in the parking assistant use case ($\beta = -0.137$, $p = 0.008$). Technical affinity thereby strengthens the positive relation between SI and BI.

In contrast, technical affinity shows no significant moderating on the performance expectancy for both use cases (AA: $\beta = -0.078$, $p = 0.110$; PA: $\beta = -0.085$, $p = 0.116$). In addition, the relation of social influence on the behavioral intention has also not been affected significantly by the moderator technical affinity ($\beta = 0.060$, $p = 0.187$).

5 Discussion

With this exploratory study, we contribute to the identification of criteria influencing the adoption of connected car services.

The results of the structural equation modeling showed quite different results for the two investigated use cases. Probably also caused by the substantial differences in their characteristics and consequences resulting from the use of the respective connected service. Moreover, it should also be noted that the third parties involved in the two use cases are quite different in nature.

As expected, respondents of higher age tend to show a lower intention for using the connected services. This could be due to their general accessibility for information and communication technology. However, age showed its moderating effect just for one relation significantly although literature suggests age to serve as a moderator for all relations on the behavioral intention [72].

The same applies for gender, which showed significance in one use case only but moderates the relations on behavioral intention in general according to literature [72]. Interestingly, neither the degree nor the field of study, categorized in rather analytical and rather creative, have indicated an influencing effect on the usage intention. This could also be caused by the distribution of educational background among the sample size. Although technical affinity seemed to come along with a greater usage intention for higher social influence, it showed a significant influence just in one relation. Still, this influence could be explained by expectations from the external environment of respondents due to their lifestyle with regard to technologies.

In contrast, the risk tolerance for activities on the Internet has appeared to act as the most prevalent moderator indicating to be a promising criterion for the usage intention of connected car services. Activities such as banking, making contracts for e.g., electricity and phones or travel bookings via Internet have been the criteria categorized as rather risky whereas research, messages, and entertainment have been categorized as activities with a lower risk. The risk tolerance indicated a dampening effect on the relation of SI on BI. This could be caused by a greater awareness of risks associated with services based on ICT. On the contrary, the risk tolerance for activities on the Internet seemed to strengthen the relation of performance expectancy and BI, which can be caused by previous experience with ICT-based services. Experience itself also indicated an influencing effect. For one use case, it indicated to strengthen the positive relation of social influence and behavioral intention. A reason for this effect could be the lower threshold for using such services with prior experience.

As a result of the differences shown by the two investigated use cases, it can be concluded that exploratory research in the field of connected services in the automotive context is of high potential for further investigation and insights. For practice, the early consideration of aftersales-related issues as well as customer demands and technical parameters should be considered when creating new services [28]. Some even speak of integrating service and technology strategies in the service development process [28]. Since adoption criteria for connected car services have not been studied extensively so far, OEMs should involve customers and early customer feedback in the development process of such services.

6 Limitations and Conclusion

With respect to the survey conducted, several threats to validity have been recognized. Probably the most far-reaching limitation is that the presented services are hypothetical. Thus, no equal background understanding of the service among the participants is guaranteed.

Further research should examine the study on already existing connected services. This also offers the possibility to take e.g. differences between brands into account. Even broader research for different types of services, also depending on the nature of third parties involved, is required. Furthermore, this research tested additional influencing criteria derived from automotive industry experts.

Taking technology adoption criteria of other industries into consideration may be promising, e.g. insurance in the use case of the automated accident handling.

Moreover, it the responses are self-reported. Therefore, it is not possible to make an evidence-based statement about the usage intention of private customers regarding connected aftersales services.

In general, the sample size has been quite limited. Despite bootstrapping has been used, this methodology is still based on the actual sample, which means that the biases are also included in the extrapolation. The survey has been provided in German language and just been distributed in Southern Germany even though literature pointed out cultural differences in technology adoption [9,27,44], this aspect requires also a more detailed investigation.

In conclusion, in this paper first results on the criteria that influence the user adoption of connected car services have been presented. Since such services seem to enable OEMs to overcome competitive pressure and deal with the changing customer requirements in the field of automotive aftersales [28], the present study provides important findings for practitioners in the field.

The results indicate, that the criteria age, gender, affinity towards technology as well as the internet usage behavior seem to significantly influence the overall adoption by affecting the usage intention.

Although they have been presented in a refined model, further investigation and refinement are necessary, since this work could provide only first insights and is based on an exploratory study.

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Getting the Job Done: Workarounds in Complex Digital Infrastructures

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Abstract. Work today consists of complex arrangements of loosely interrelated digital tools that shape work and form digital infrastructures. These digital infrastructures can either support or hinder the workers in their daily tasks. Working in an environment where some digital tools are designed for work purposes, and others without the proposed end-users in mind creates a need for improvisation. The consequence for workers may include finding various types of workarounds when shifting between digital tools. These workarounds become important for how work is performed. Through a multiple case study, this paper explores how workarounds are manifested in different work settings through four cases in the public sector. We conceptualize workarounds as practices of flexibility, efficiency, and responsibility, and show how workarounds result in new and innovative ways of working, which can be understood as a form of infrastructuring.

Keywords: Workarounds · Digital tools · Digital work · Digital infrastructures · Infrastructuring · Innovation · Public sector

1 Introduction

Work today is characterized by complex arrangements of loosely interrelated digital tools used for work purposes. These digital tools combined form the digital infrastructure, practices, regulations, and routines in which the professionals (hereinafter called 'workers') perform their work [1, 2]. Depending on the way the digital tools included in the digital infrastructure are designed, parts of the digital infrastructure can support work whereas other parts can hinder the workers in performing their daily tasks [3]. This reality creates a situation where the workers constantly need to choose between different digital tools, to support their work during a regular workday. If these digital tools, embedded in a digital infrastructure prevent the workers from performing the tasks at hand, the workers are sometimes forced to improvise and choose alternative ways to perform their tasks. It can include choosing another digital tool to enter into the digital infrastructure, or tweaking the work task to fit the digital tool so that their workday can

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flow seamlessly [4, 5]. Alternative ways to work to smoothly continue with the workday can both be seen as types of alternative practices, and as 'workarounds'. These practices are fueled by creative and highly solution-oriented rationales and involve continuous adjustments to manage work tasks. Workarounds, in layman's terms, point towards the deviations from the routines based on improvisation to minimize the impact of obstacles in the work [6–10]. Workarounds can, as we see it, be socio-technical and involve both a specific digital tool (may it be a specific platform, a wearable device, a specific app, an AI, or other types of technology entered to ease work), and social aspects, (e.g., new practice, new routine, alternative regulation, governance, or management). Understanding the concept of workarounds, therefore, includes unpacking the relationships between a variety of digital tools included in the digital infrastructure of an organization and the enactment needed to complete the work tasks on the agenda. Based on this understanding, workarounds constitute complex relationships that are difficult to manage, and difficult to circumvent. Instead of trying to elude workarounds, this paper offers an understanding of what they may look like, how they can be coped with, and even how they can improve work. The literature on digital infrastructure targets this challenge of understanding interrelatedness between systems [11–13]. Traditionally, a variety of different types of digital tools are implemented over a long period, and they are implemented for different purposes. One digital tool in an organization can therefore be understood and treated in isolation from the rest of the already existing digital infrastructure and the social and organizational context in which it is embedded and used. In that way, every single technology is dependent on an 'installed base' of preexisting socio-technical arrangements [12, 14]. Thus, it is important to have models and methods to understand not only one type of digital tool and its use, but also how a specific technology is part of a larger socio-technical system of practices, routines, and a larger digital infrastructure [15]. In this paper, we conceptualize workarounds as a phenomenon where the digital tool at hand and the intended work task mismatch and force new practices to be created.

Workarounds happen all around us, independent of the task type and digital infrastructure at the workplace. We present four cases where we have studied workarounds within public sector organizations. The four cases include the following workers and workplaces: i) nurses in a cancer rehabilitation clinic, ii) teachers in primary schools; iii) resident physicians at a hospital, and; iv) communicators at a municipality. Workers in the public sector traditionally have a rooted role description, often associated with the classical archetype of strict office hours and a high level of bureaucracy [cf. 16] combined with an altruistic motivation to help others and to do right [17]. In this paper, we illustrate the workarounds of public sector workers and argue that the specific work context influences how they complete their work tasks within the digital infrastructure. In all four cases, the workers manage their workday with different types of digital tools. Some tools are more traditional, for example for internal administration and others are less traditional, like digital tools for monitoring patient-generated health data or communicating with patients or citizens on social media. The digital tools form the digital infrastructure in which the workers operate. The complexity of the work grows with each digital tool that is added and as the digital tools are seldomly interconnected, workarounds become a way of getting the job done. In this paper, we explore the role

of workarounds in work, exemplify them and discuss how they affect the workday. The research question is: *How can workarounds be understood as different types of practices from the perspective of workers?* From that we conceptualize workarounds as practices of flexibility, efficiency, and responsibility and show how workarounds result in new and innovative ways of working, which can be understood as a form of infrastructuring. Furthermore, we problematize how workarounds become a tacit and integrated part of work which in turn leads to incidental learning opportunities.

2 Related Research and Theoretical Framing

In this section, we outline the related research and theoretical underpinning which we rely on for this paper. We draw on the literature on workarounds and digital infrastructure. Within the Information Systems (IS) discipline, there is a longstanding interest in understanding technology use in relation to work. As we set out to understand the effects of the use of a combinatory digital infrastructure, we would like to analyze the use of digital tools. We will first describe the literature on workarounds, followed by the digital infrastructure and infrastructuring i.e., *influencing* the digital infrastructure. We argue that the digital infrastructure present in each of the four cases and the mismatch between the work task at hand trigger various types of workarounds.

2.1 Workarounds

From a historical perspective on technology use, IS research has moved away from the faithful-use bias [18], to a more nuanced understanding of how digital tools can be used. That has been done by emphasizing how workarounds reflect systemic flaws and reveal infrastructural deviations, which can be both good and bad at the same time. For example, following up on an early critique of IS work, redefining characteristics of IS workers and the IS workplace [19], Orlikowski [20], applied structuration theory to the nature and role of technology, or digital tools, in organizations. She argued that there is a need for alternative theories that combine prior traditions to avoid a forced choice between subjective and objective conceptions of the organization and showed how users shape technology and its effects on their work. More specifically, experts create workarounds, and by doing so, they accept "flaws" in a system as 'the new normal'. Thus, instead of fixing the system, they create ways to work around the system [21]. They institutionalize temporary solutions, indicating that digital tools can condition social practice but not determine it [20]. These temporary solutions can even become permanent ones, in terms of permanent workarounds which stay within organizations for years [4].

Another stream of literature discusses the mandatory use of information systems and illustrates the workplace as a setting where workers can be reluctant to complete their tasks, using the system in the way it is designed to be used [22–24] and that can lead to workarounds. However, as we see it, it does not have to be about any type of reluctance to comply, instead, workarounds can also include convenience and failure to understand why it is important to do a work task a certain way. Other scholars focus on understanding the affective response towards specific information systems [25, 26]. This literature examines the feelings that certain information systems trigger, and how

different types of feelings can arise during the use of specific digital tools, both in terms of dark sides and negative responses [26] as well as in terms of bright sides and positive impact of technology use [27]. In line with that, one could argue that various types of workarounds, conducted in specific digital tools, certainly trigger different emotions. Moreover, the nature of workarounds has been argued to be highly situated and emergent [28]. The same authors lift the level of abstraction and provide an outward-inward linkage of workarounds where bypassing rules, systems or digital tools are analyzed. Gerson and Star [29] early define workarounds as a series of: "misfits with the idealized representations of work" [29]. They continue by stating that various workarounds can conflict with one another, and that they can solve problems "locally and temporarily", and that each workaround can trigger other workarounds to arise. They also stress that: "There is no way of guaranteeing that two workarounds, each adequate in its local context, will not recursively prove to be incompatible in a larger context" [29, p. 267]. The early definition explains workarounds with a negative connotation whereas later definitions have a more positive connotation. Alter [6, p. 1044] defines workaround as:

> *A workaround is a goal-driven adaptation, improvisation, or other change to one or more aspects of an existing work system to overcome, bypass, or minimize the impact of obstacles, exceptions, anomalies, mishaps, established practices, management expectations, or structural constraints that are perceived as preventing that work system or its participants from achieving a desired level of efficiency, effectiveness, or other organizational or personal goals.*

Workarounds thereby rely on the notion of work systems, where both actions and actors interact and perform work with digital tools, in a functioning relationship [24]. Additionally, workarounds have been discussed from the perspective of institutionalized behavior as a way of 'establishing equilibrium' within a structure that is partly governed by pressure from outside and practice-based pressure [18]. The notion of workarounds is grounded in human agency and relies on the assumption that humans perform work, and act in a complex world [6, 24]. However, when the work system is not in harmony, due to hindrances related to what the workers want or needs to minimize the impact of obstacles, improvisations come into play [6]. There is a gap in the literature regarding the granularity of how workarounds are performed on an individual level when mixing the use of organizationally and personal information systems to complete work tasks. As Soliman and Rinta-Kahila [23] point out, there is a need to research the connection between the use of workarounds concerning individual and organizational information systems use which is addressed in this paper.

2.2 Digital Infrastructures and Infrastructuring

As discussed above, workarounds give rise to new work dynamics. Digital infrastructure and infrastructuring are two streams of research within IS that have conceptualized the way digital infrastructure impacts work dynamics. Digital infrastructure has been defined as "the basic information technologies and organizational structures, along with the related services and facilities necessary for an enterprise or industry to function." Tilson, et al. [30, p. 748]. Typically, digital infrastructures are related to an already

existing socio-technical relationship that forms an installed base on which new services are reliant [11–13, 31]. This literature emphasizes that digital infrastructures evolve from and are conditioned by what is already in place; the aforementioned installed base. Infrastructural breakdowns are considered particularly useful for analysis as they shed light on both the dependencies among the comprised components and the competence or inventiveness of actors. The theoretical lens of infrastructuring, does not only provide an interesting understanding of the technical configuration of digital infrastructures, but contributes with important insight into the users' ongoing negotiations with the digital infrastructure and how the digital infrastructure evolves over time [32, 33].

Henfridsson and Bygstad [34] summarize the literature on digital infrastructures and suggest four models, based on four different streams of literature. First, *complexity models* consider digital infrastructure in the light of complexity. Due to digitization, physical and digital resources can be separated and recombined with new physical and digital resources that organizational actors can utilize to connect and develop in an extended organization. Second, *network models* imply an underlying assumption that networks of human and technical elements drive digital infrastructure evolution. Multiple human actors translate and inscribe their interests into a technology, creating an evolving network of human and nonhuman actors. Self-reinforcing effects and large networks strengthen the digital infrastructure and drive generativity and scalability. Third, *relational models* argue that digital infrastructure is always about relations; hence, it can never be a thing, and it is nothing that can be put in the background. Digital infrastructure is thereby not a stable entity but rather an ongoing social alignment between contexts. It is an enactment process, constantly in the making, and something that emerges and continuously evolves. Infrastructure is the politics and norms articulated in relationships between humans and technology and becomes infrastructure relative to established practice. Fourth and lastly, *strategic asset models* imply a strategic choice view, in which digital infrastructure is understood as a managerial process. In this stream of literature, political action is stressed as most important when analyzing organizational responses to IT-related changes, such as when aligning new systems and tools with business strategies and the existing IT resources [34].

As infrastructures are continuously being re-negotiated and re-designed over time, as new digital tools are added, it becomes relevant to rely on the lens of infrastructuring. This is to shed light on a process that incorporates the use, design, and maintenance, of everyday digital infrastructures in which both technology developers and technology users take part in [35]. Infrastructuring encompasses a process of "reconceptualizing one's work in the context of existing, potential, or envisioned IT tools"; a process that is a natural part of workers' activities [35 p. 469]. Pipek and Wulf [35] discuss possible 'points of infrastructure' referring to the way infrastructures become visible to users, either upon breakdowns or during moments of innovation, leading to new emerging practices. This aligns with the relational view of digital infrastructure as an ongoing social process, that comprises organizational rules and norms articulated in relationships between humans and technology relative to organized practice [14]. On a similar note, infrastructuring has been used to describe and understand transformations in digital infrastructures and workarounds that bridge or extend knowledge infrastructures, when existing infrastructures prevent users from doing what they want to do [36]. In this

way, infrastructuring occurs as acts of infrastructural alignments and navigations when actors—either individually or collectively—assemble material, mental, social, and cultural resources to adapt seamlessly to new situations [4, 32, 36]. Infrastructuring is often needed due to the complex, messy, and unevenly distributed nature of digital infrastructures which requires that individuals are in continuous negotiation with an existing digital infrastructure [14, 37, 38].

To sum up, infrastructuring can be used as a lens to describe infrastructural transformations and their relation to workarounds, as workarounds bridge or extend the knowledge infrastructure when existing digital infrastructures prevent the users from doing what they set out to do [32, 39]. Based on that, we argue, that when analyzing workarounds, the perspective of infrastructuring has explanation power, particularly when it comes to understanding how novel practices created by workers contradict existing organizational setups.

3 Method

To explore workarounds in the public sector we applied a qualitative approach in our cross-case study [40]. This approach was adopted for two main reasons. *Firstly*, it enables the investigation of a contemporary phenomenon within its natural setting [40]. Since the main objective of this study was to develop a rich, theoretical understanding, an exploratory approach, which enables predicting similar results, seemed particularly useful. *Secondly*, it facilitates the exploration of workarounds within the domain of the public sector, still within different contexts. Thus, whenever there are two or more cases, a cross-case analysis of the findings is likely to be more robust in confirming, challenging, or extending existing theory and knowledge [40]. We have chosen four cases, which include four types of 'workers', namely cancer rehabilitation nurses [41], primary school teachers [42], resident physicians at a hospital [37], and municipal communicators [38]. Our empirical data include observations, interviews, and written materials such as instructions meeting notes, and log data (see Table 1 for an overview).

In all our four cases, the workarounds and the understanding of the practices constituted a natural part of working life. The data analysis was focused on understanding workarounds as practices. That is, to identify when, how, and why workarounds and infrastructural breakdowns arose in the various contexts. In the analysis, we also focused on consequences in terms of infrastructuring for the individual on the one hand, as well as for the organization on the other hand. The empirical data was analyzed using an abductive approach, i.e., where the understanding of the empirical material grows gradually by oscillating between theory and empiricism. That step was followed by identifying the cause of the tension or conflict from sanctioned practice and grouped the material according to three specific types of workarounds: a) the reason behind a workaround; b) which problem(s) the workaround creates or solves, and; c) the effects of the workarounds. The third and last analytical step included a grouping of the previous themes into an understanding of three types of workarounds where each type refers to a specific type of practice which we elaborate on in the results.

Table 1. Data collection for the four cases.

Data type	Cancer rehabilitation nurses	Primary School Teachers	Resident physicians	Municipal communicators
Observations and engagement in practice	Observations of the work of the nurses both concerning patient contact (in consultations, in telephone conversations, and video consultations) and in clinical work. The observation time spanned 20 full workdays	Observations of teaching activities involving teachers planning meetings, classroom teaching, and reflection sessions. An estimation of observed time is 60 h	Observations from longitudinal collaborative research involving both physicians. The engagement included participation in everyday work activities at the hospital, as well as online activities	Observations of municipality communicators' activity on a municipality Facebook page, involving discussing with citizens during one month
Inter-views	6 individual semi-structured interviews with nurses and 5 workshops which included a group of nurses	6 post-project interviews with participating teachers	15 semi-structured interviews with physicians	21 semi-structured interviews with municipality communicators and managers
Other relevant data that informed the analysis	Documents, log data, data on planning, data from the design process, and meeting notes over three years	Documentation of teaching and learning material including teacher instructions/ planning documents, teacher reflection notes over three years	Log data, project documentation, meeting notes, and informal communication over five years	Sentiment analysis of the Facebook posts from the municipalities' Facebook pages over three years

4 Results and Analysis

In this section, we use illustrative examples to demonstrate how workarounds can constitute different practices, based on the cause of the tension or conflict from sanctioned practice. The practices outlined herein should not be seen as exclusive but rather as overlapping and mutually related, however for an analytical reason we present them as three separate entities. The practices we have identifies in the performed workarounds are: i) practice of flexibility; ii) practice of efficiency, and; iii) practice of responsibility (see Fig. 1).

Fig. 1. Workarounds as practices of flexibility, efficiency, and responsibility.

Practice of Flexibility

In the four cases, we have seen that certain workarounds are deployed as a response to actual or perceived inflexibility in established systems and structures. Inertia and bureaucracy, therefore, create a need to think new and differently to achieve a certain goal, often by using additional hardware or software. An example of that can be drawn from the cancer rehabilitation case where the clinical practice wanted to use video consultations in their work. The clinic had some patients who had difficulty transporting themselves to the hospital and the employees desired to run an up-to-date clinical practice that offered possibilities for these patients, via video consultation tools. However, the hospital is a closed heavyweight infrastructure, which does not allow for flexibility or the addition of new digital tools. The consultation tool was not controversial as such, and it was designed and developed to fit the already established infrastructure of the hospital. However, getting the new consultation tool approved, would take administrational effort. To avoid that administrative hurdle, or postpone it, the workaround was to bring in a new computer, that would run on 4G network and operate outside the firewalls of the hospital, as illustrated by the following quote: *"It is just too difficult to try to get the video consultation tool approved, without testing it. We need it to be tested, but to test it, we need to find a way to test it. This is kind of a deadlock"* (from the cancer rehabilitation case with the nurses).

Similarly, another example comes from primary schools, where teachers experience regulations to inhibit innovations and the development of the teaching practice. In an educational context, the discrepancy between teachers' need for flexible and user-friendly

digital tools and the organization's demand for security and economy constitutes a recurring dilemma. For example, restrictions related to the number of programs and services that are sanctioned and that bans the use of cloud services is highlighted as a problem that hampers the work of teachers, as illustrated by: "*We have a vision and a desire to reach a goal, but then there are so many things getting in the way, such as technical devices and applications we are not allowed to use*" (from the primary school case with the teachers). The teachers experience that they are hostages in contradictory demands. On the one hand, policy documents require teachers to digitalize their teaching practice, on the other hand, other (often local) regulations create difficulties in developing their practice. Therefore, teachers rebel against existing digital tools and regulations and choose services that best suit their needs.

Opposite to how the nurses and teachers abandon sanctioned systems to be able to put innovative ideas into practice, communicators in the municipality case, occasionally avoid social media platforms and retreat to more traditional communication channels. The communicators in our case use social media, such as Facebook, Twitter, and Instagram for external communication in the municipality to bring about citizen dialogue and ultimately to meet expectations in a digital society. However, social media platforms are unpredictable. The communicators experience that social media platform algorithms increasingly impact their work and put concepts of transparency and openness in a new light. The following example sheds light on how a communicator, after having posted information about an unpopular political decision, steers over the negative comments from the social media platform to the telephone. We see here how the communicator creates an alternative route to meet the critical audience in a closed environment and change a negative situation into a positive experience for the citizens.: "*Then there were immediately long harangues about how they* [commenters on Facebook] *didn't think this* [the political decision] *was a good idea. But then I just replied that "thanks for your comments, feel free to contact me on the phone", just to get rid of them. And then they became 'wow' we are talking on the phone, and they were very nice so then that issue was gone*" (from the municipality case with the communicators). The examples manifest how the worker, flexibly, shift between social media platforms and more traditional technology to keep control of the dialogue. All three examples illustrate how the technology at hand does not align with the worker's intended work practice and how practices of flexibility serve as workarounds to have the work done responsibly.

Practice of Efficiency

We have also seen examples of how workarounds are used primarily from an efficiency point of view. In the case of the physicians, we see how workers, often due to lack of functionality, use the digital tools in other ways than intended, to make the workday more efficient. One physician describes how nurses tend to enter information into certain fields, that are not meant for that type of information, in the electronic patient record. This leads to the records not being correct because it is entered in an unstandardized way: "*There are so-called gray lines in the calendar, which can be a bit of anything that the nurses enter, either during our administration time or after regular working hours,*" (from the hospital case with the resident physicians). Some scribbles are also left on paper, instead of in the EPR. Further, the physicians highlighted dilemmas arising from using top-down, standardized healthcare systems and more bottom-up, individualized systems and other

types of digital tools in parallel. One physician tells that they have created a private Dropbox folder, to circumvent security, instead of using the established collaboration tool at the department (which has a similar function): *"..the simplest is of course that you have a folder or that you have a Dropbox folder…so that it is available everywhere* [at the hospital computer] *it won't be good, because then it will only be available on that particular computer"* (from the hospital case with the resident physicians).

Similarly, in the case of primary school, teachers are encouraged to collaborate with colleagues outside of the local school. The teachers in our case were part of a Nordic school development project was developed innovative teaching models across local and national borders, using technology. For communication, the recommended technology was Project Groupware, intended for the project. However, due to various factors such as lack of dynamic functions supporting for example co-writing or the fact that the project groupware did not constitute a natural part of teachers' other (professional or private) use of technology made they use other channels such as e-mail, closed Facebook groups, or Google drive to manage their internal communication to make cooperation more efficient. The teachers developed a more flexible repertoire to support their work as illustrated by the project report: *"Teachers were usually not far from ideas and were creative and found solutions to problems… most of the problems were converted to challenges, which were solved in one way or another"* (from the primary school case with the teachers).

Practice of Responsibility

Practices of responsibility relate to workarounds that are based on a kind of consequence ethic where the action that has the best consequences in practice is the most correct, even if it violates current regulation regarding which system to use or principles of, for instance, openness and transparency. One example of this can be derived from the cancer rehabilitation case. The nurses have a calendar system, into which they report patient meetings. The calendar system does however not allow for them to organize the patient rooms, and by being limited in that way, it does simply not take their workday into account. Furthermore, it takes much time to open sometimes, so it is simply not reliable. The system is mandatory to use but the current calendar, where all the actual information needed to run a clinic, is kept in a paper calendar at the office. The paper calendar is the most reliable source of information, but the digital calendar is filled in simply to keep the administration at hospital administration happy. The analog calendar, however, fits the practice seamlessly, the digital one is only seen as a hassle: *"Well, to be honest, everything we need is here [points towards the analog calendar at the nurses' station]. It has everything. See!"* (from the cancer rehabilitation case with the nurses). The calendar is not complicated, but the digital calendar is simply so far from what they need, that they are unable to make it work even though the digital one is connected to the existing digital infrastructure, and the analog one is outside of those boundaries.

Another example derives from the municipality case. In Sweden, the principle of openness is a constitution that strongly permeates the work of authorities. Everything that is judged to be public information must be saved and be accessible. When increasingly more conversations are moved from email to asynchronous chats in social media, doubts tend to arise as to what information falls under the principle of openness and what does not. To bypass these doubts workers, use tools like Snapchat, that do not

automatically save the written conversations. A municipal communicator explains this workaround using an example from fellow municipality workers patrolling the streets at night to ensure security. These workers normally use Facebook, Twitter, and email when communicating to youths in the street and with co-workers but have switched over to Snapchat: *"They* [the patrolling workers] *chose it* [Snapchat] *to feel safe, that conversations are not saved. If they receive an alarm about a conflict somewhere in town, for example, it will not be saved. And that's a conscious choice they have made, to deviate from the classic municipal* [tools/systems]. *I'm not sure if you are allowed to remove history [conversations in a chat]. They saw it as an anonymous tip* (…) *Difficult, you want to reach out all the time but it [how to do it] changes all the time"* (from the municipality case with the communicators). In both examples, the workarounds include making the work increasingly safe, resilient, and reliable for patients and citizens. For the patients, it is about the fact that the system is reliable, and for the citizens, it is about enabling them to dare to report events. Thus, these workarounds can be understood as a practice of responsibility from the worker's perspective.

5 Discussion

Work is becoming increasingly digitalized and the complexity of the digital infrastructures that support work increases with it [43, 44]. Considering that, it is vital to understand infrastructural breakdowns when there is a mismatch between the task at hand and the digital tools. Workarounds have been conceptualized as activities of adapting, improvising, and changing work to minimize the impact of various types of obstacles and thus increase efficiency in everyday work [6]. In this paper, we extend this understanding to also involve the practice of flexibility, efficiency, and responsibility which can all be seen as a form of innovation, that arises through everyday infrastructuring as the workers navigate and switch between different digital tools to perform their work tasks. We further develop the concept of workarounds as a goal-driven adaptation to a situation and a set of new, yet responsible actions that form new, innovative practices. Although workarounds can be seen in that light, the other side of the coin is that workarounds also include a deviation from the rules, regulations and often also include a mismatch between the workers' skillset and the digital tool at hand [22]. However, what we have illustrated in this paper is that workarounds constitute infrastructuring, that pushes new innovative ways of conducting work, and that workarounds emphasize responsibility and altruistic behavior in our cases.

By drawing on the literature on digital infrastructures [30, 34] and infrastructuring [14, 35] we argue that workarounds are distinctive, yet mutually interrelated practices of flexibility, efficiency, and responsibility that together form practices of innovation. First, workarounds emerge as a response to the need for *flexibility*, which includes new hardware, new digital tools, and new types of processes to innovate established practice, bypassing management expectations [6]. We show how that can be realized with help of certain digital tools (e.g., by using cloud-based services, or by bypassing a firewall by bringing in a new computer). However, when workers use tools that would help them conduct their work tasks, they are met by structural constraints [6] concerning what digital tools are and are not a part of the already existing digital infrastructure.

Our empirical cases provide examples of workarounds related to perceived inflexibilities around digital technologies and policies [45]. Secondly, the desire for *efficiency* is realized through establishing workarounds as an integrated part of the work, for the work to flow seamlessly for the workers [4]. This is in line with Alter's [5] definition of workaround as a means to achieve the desired level of efficiency and where the alternative of not using workarounds is seen as more time-consuming and inefficient compared to the workaround. Thirdly, workarounds occur as acts of *responsibility*. It constitutes pragmatic stans where the action that has the best consequences in practice is considered the most 'correct', even if it violates current regulation regarding which digital tools to use or even contradicts principles of openness and transparency. All of our cases reflect accountability, responsibility, and loyalty towards the patients, students, and citizens [1, 17]. Workarounds in the line of work where accountability is high towards others become a balancing act between staying within the rules or performing workarounds to get the work task done; a judgment call, depending on the work task at hand [5]. Viewing contradictions between the existing digital infrastructure and intended activities with roots in innovation could change the negative connotation of workarounds to positive ones. Based on that, we would like to forward workarounds as a form of infrastructuring which can lead to incidental learning and can be seen as an innovative part of 'getting the job done'.

6 Conclusion

In this paper, we explore the role of workarounds as a part of work. We provide examples of different types of workarounds and discuss how they affect work. We conceptualize workarounds as practices of flexibility, efficiency, and responsibility, and show how workarounds become a tacit and integrated part of work which result in incremental learning opportunities and ultimately lead to new and innovative ways of working. Hence, workarounds can be understood as innovation, which means, flexibility in actions, to perform work efficiently and responsibly. We further argue that the way the workers innovate can be seen as a form of infrastructuring. In that sense, workarounds entail going against the sanctioned systems and structures, by being innovative yet responsible for one's actions. A future area of research could be to validate these workarounds in other contexts and to study workarounds in an organization over an extended period to see how workarounds as a form of infrastructuring are embedded (or not) within the existing digital infrastructure. Another future avenue would be to develop a framework of workarounds that others can use to illustrate infrastructural changes, new ways of working, and innovation in practice.

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Does Social Innovation Matter for Government? An Exploratory Study

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Abstract. Social innovation scholars and sociologists regard shocks and crises that impact heavily on social systems as opportunities for self-reflection and as windows of opportunity for the emergence of new ideas and possibilities. In this sense, the social systems recovery in the new normal post-Covid19 era can open new opportunities for the spreading of the transformational impact of social innovation. This will concern also public administration organizations since social innovation can also be seen as a particular perspective on how the public sector should be reformed. Hence, social innovation should be a topic of particular interest for public administration scholars. The aim of this exploratory study is to investigate whether and how social innovation has been considered in the top academic public administration journals. The study confirms that the topic is still underexplored in this literature and highlights some possible research directions that can contribute to bridge this gap.

Keywords: Social innovation · Public administration · Literature survey · Collaborative governance · Coproduction

1 Introduction

In the current fast-changing world, more than in any previous period, socio-economic and environmental problems are acting as a brake on sustainable economic growth, leading to inequality and instability in society, and impinging upon the general well-being of people and communities. Addressing economic and environmental sustainability, social exclusion, discrimination, and various forms of inequalities is today a crucial challenge for social systems, one that requires new ideas and innovative approaches. Social innovation is a response to these challenges that offers new solutions, new methodologies and new conceptual frameworks [1].

According to [2], "social innovation relates to new responses to pressing social demands by means which affect the process of social interactions. It is aimed at improving well-being. It covers wide fields which range from new models of childcare to web-based social networks, from the provision of domestic healthcare to new ways of encouraging people to exchange cars for bicycles in cities, and the development of global fair-trade chain" (p. 6). Such and extensive definition of social innovation helps understanding the continuously growing popularity of the concept. As observed in [3], this depends

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also on the fact that the concept of social innovation can be considered as a 'magic concept', i.e. a key term that, like 'governance', 'accountability' and 'networks', seems to be pervasive among both academics and practitioners [4].

Inspiring as it could be, the concept is still weakly conceptualized, also due to the predominance of grey, policy-oriented literature [5]. However, especially from a public sector reform perspective, the promise of social innovation is too compelling to be ignored. As pointed out by [6], social innovation is "a particular perspective on how the public sector should be reformed. Reforms should be done via 'social innovation'" (p. 61). Social innovation is a 'game changer' for government, it requires government to redefine its role within social systems. Hence, understanding the role of institutions on multiple levels for the creation of social innovations is a crucial question, also to avoid using the existence of social innovation in the private and third sectors as a justification to reduce public sector efforts to support social innovation and large-scale social change [7].

Given the central role of social innovation for the public sector, it is relevant to investigate whether and how social innovation has been considered in the academic public administration literature. This is the objective of this exploratory study that aims to investigate how social innovation has been discussed in papers published in top public administration academic journals during the period 2000–2020.

The remainder of the paper is organized as follows: in the next section, the transformational impact of social innovation on social systems is discussed and the need is highlighted for an academic reflection on how such an impact can also have consequences for the public sector. In the third section the objective of the paper is stated and the methodology for the exploratory study is described. In section four, the selected literature is analyzed and the main topics emerging in it are highlighted. Section 5 critically discusses the results of the exploratory study and identifies some relevant research directions for the public administration academic domain. The final section drives some conclusions and highlights some limitations of the study.

2 Social Innovation as a 'Game Changer'

According to the United Nations Industrial Development Organization (UNIDO) social innovation "refers to a novel solution to a social problem that is more effective, efficient, sustainable, or just than current solutions. The value of social innovations accrues primarily to society rather than to individuals" [8, p. 13]. Hence, the fundamental goal of social innovation initiatives is not only to identify and satisfy traditional social needs (e.g., poverty, marginalization and exclusion) but also to cope with new and emerging social themes, like sustainability and the quality of life and work [9]. Engagement of citizens and organizations in innovation, criticism of dominant business models and narrow economic outlooks on development, extensive declines in public spending, and the needs to develop economies where innovation is not about cutting-edge technology but about solving social problems are among the major trends behind the growing interest in social innovation [7].

Mulgan, Ali, Halkett and Sanders define social innovation as "the development and implementation of new ideas (products, services and models) to meet social needs"

[10, p. 13] that are predominantly developed and diffused through organizations whose purposes are social [11]. According to [12] social innovation amounts to a "complex process of introducing new products, processes or programs that profoundly change the basic routines, resource and authority flows, or beliefs of the social system in which the innovation occurs" (p. 2). [13] describes it as "the attempts to transform the way societies address social problems and produce public goods and services (…) in order to improve social outcomes and creating public value" (p. 4).

In more general terms, [14] defines social innovation as innovation in social relations based on values of solidarity, reciprocity and association and ethical practice for meeting needs, transforming social relations, and collectively empowering communities to shape the future. Hence, social innovation entails new organizing modalities based on the development of collaborative relationships involving those who design and implement innovative products and services, but also the beneficiaries of those products and services. In other words, innovation becomes social innovation when it activates the engagement and participation of a multiplicity of subjects, first of all the beneficiaries of the innovation [9]. From this point of view, social innovation is intended to both enable and foster social transformations in the ecosystem in which it takes place by improving the system efficiency in promoting social development, increasing welfare and reducing inequalities [15]. As such, social innovation should be understood as a process of dynamic change involving the reconfiguring of co-operating groups [16], the political transformation of society and the restructuring of power relations [17].

To achieve a transformational effect on social systems, social innovation requires the collaborative efforts of a multiplicity of social agents, first of all government organizations, social enterprises and other third sector organizations. As pointed out in [18], this is reflected in the policy emphasis emerging in the United States and within the European Commission on social enterprises and non-profits as creators and diffusers of social innovation (p. 647).

Although the two concepts are often treated as almost equivalent, social innovation should not be confused with social entrepreneurship. According to [8], social entrepreneurs are social actors who pursue social objectives through their "ability to realize new ideas and concepts on how to produce and deliver products and services that have not been sufficiently provided by the public or traditional for-profit private sector but are socially desirable, and to earn income through creativity, innovation, risk taking, ability to plan and manage projects and solve problems" (p. 13). Social entrepreneurship "encompasses the activities and processes undertaken to discover, define, and exploit opportunities in order to enhance social wealth by creating new ventures or managing existing organizations in an innovative manner" [19].

Social innovation and social entrepreneurship can be distinguished based on their different strategic visions. Social entrepreneurs aim at creating new ideas or products to satisfy unmet needs through a scaling-out process [20, p. 254] to reproduce and disseminate programs, products and ideas in order to reach more and more subjects and to cover wider geographic areas. Instead, social innovation "not only introduce innovation, but also manage the broader context, in such a way that the innovation has a chance to flourish, widening the circle of its impact" (ibidem). Social innovation involves a scaling-up process that entails "identifying opportunities and barriers at broad

institutional scales, with the goal of changing the system that created the social problem in the first place" (p. 237).

Social innovation programs are both social in their ends and in their means [21]. As observed above, this can have implications for existing institutional arrangements and settings [22]. Different from social entrepreneurship, social innovation entails (at least tendentially) far reaching consequences and impacts on the structure, relationships and interaction patterns within the social system as a whole: it tries to act as a 'game changer', breaking through 'institutional path dependencies' [3, p. 228]. This 'transformational' aspect of social innovation that relates it to new social relations and mobilization-participation within a changing macro socioeconomic environment, and resulting social impact is now somewhat of a common ground for sociologists, economists and management researchers, and urban and regional specialists [7, p. 1925].

Social innovation refers to breaking up the monopoly in producing new ideas and approaches that are 'good' for society [6], it entails the allocation and/or re-allocation of public values that are to be achieved, which can challenge the privileged role of government within social systems. Social innovation does not take place in an institutional void and implies that roles of actors and rules of the game need to change as well. This does not imply that the role of government is obsolete, but little is still known about how social innovation can effectively and legitimately develop in interaction with existing political and governmental institutions [3].

The paper intends to contribute to bridge this gap by exploring how social innovation has been discussed within the Public Administration academic literature and whether and how the transformational impact of social innovation on government has been considered in it.

3 Objectives of the Paper and Research Methodology

As observed, much of the literature on social innovation amounts to grey policy-oriented literature, whereas in the academic literature the concept has been investigated mainly in the areas of sociology, urban and environmental studies, business management and in journals related to the social and solidarity economy [17, 18]. The topic has been much less discussed in the Public Administration academic journals. For this reason, in the paper a systematic (although still limited in coverage) survey of this literature has been performed with the aim of investigating how social innovation has been discussed in the top Public Administration academic journals.

From a methodological point of view, the paper adopts an exploratory survey methodology [23, 24] with the aim of laying the basis for further in-depth investigations on the conceptualization of social innovation from the point of view of its potential transformational impact on public administration.

The study is based on the results of a search performed on *Scopus* on January 2021. The search has been limited to the journals tagged with Public Administration in the subject area field. The search has been further restricted by considering only journals ranked in the top 10%. This gave the list of the 28 journals reported in Table 1. A full text search has then been performed on those journals using "social innovation" as the search term. The search found 150 papers (step 1). All the 150 papers have been considered by

analyzing the abstract and, when needed, the whole paper to exclude papers in which the term "social innovation" is only mentioned, including papers in which the term occurs only in the references (step 2). At the end of the refinement process, a set of 35 papers has been identified as relevant for the exploratory study. The selected papers are listed in the Annex (in what follows the papers are identified by their numbering in the Annex).

Table 1 summarizes the results of the search and the refinement process:

Table 1. The results of the search on Scopus

Top 10% journals in the "Public Administration" subject area on Scopus	Papers found in step 1	Papers excluded in step 2	Selected papers
Administrative Science Quarterly	6	6	0
Journal of European Public Policy	1	1	0
Public Administration Review	13	13	0
Policy Studies Journal	4	4	0
Journal of Public Administration Research and Theory	6	6	0
Administratie si Management Public	0	0	0
Public Management Review	25	18	7
Criminology and Public Policy	2	2	0
Policy Sciences	8	5	3
Review of Public Personnel Administration	2	2	0
Governance	4	2	2
International Review of Administrative Sciences	7	3	4
Journal of Policy Analysis and Management	3	2	1
Regulation and Governance	1	1	0
Educational Administration Quarterly	0	0	0
Information Technology for Development	5	3	2
Journal of Public Relations Research	0	0	0
Journal of Information Technology and Politics	3	3	0
Public Administration	5	4	1
Policy and Politics	3	0	3
Environment and Planning C: Politics and Space	23	20	3

(*continued*)

Table 1. (*continued*)

Top 10% journals in the "Public Administration" subject area on Scopus	Papers found in step 1	Papers excluded in step 2	Selected papers
Policy and Internet	0	0	0
Area Development and Policy	2	2	0
Government and Opposition	0	0	0
Policy and Society	8	3	5
American Review of Public Administration	9	7	2
Administration and Society	8	6	2
Globalizations	2	2	0

Due to the exploratory nature of the research, no iteration of the search through backward or forward snowball has been performed. This means that neither the references of the selected papers, nor works citing them have been considered for possible relevance. For the same reason, the results of the search do not include papers in which the key-terms occur only within the references.

4 Exploratory Analysis of the Sample

The first and most evident element emerging from the survey is the quite reduced reference to social innovation within the selected literature, which confirms what has been observed in [5]. A full text search on Google Scholar performed on April 17, 2021, gives about 212.000 results for the term "social innovation"; about 76.000 results for the combination "social innovation" & government; 31.000 for the combination "social innovation" & "public sector"; and 20.000 for the combination "social innovation" & "public administration". Compared to these results, the 150 papers found in the selected literature represents a quite poor result.

The survey also confirms that "social innovation" is widely used as a 'magic', weakly conceptualized and 'umbrella' concept. Actually, most of the 115 papers that have been excluded from the sample during the refinement step, only mention episodically "social innovation" with reference to the most varied of topics. Some of the papers in the selected sample explicitly and critically refer to social innovation as a magic concept (A2, A27, A33), a buzzword (A4, A13, A15, A24, A28) and a vague concept that lacks clarity (A9, A13, A24). Moreover, in 12 of the selected papers, the concept is only mentioned quite pretextually. Social innovation is mentioned as an effect of co-production/co-creation initiatives (A7, A8); as a general aim for public policies and their design (A3, A8, A12, A14); and as a result of the activities of social entrepreneurs and social enterprises (A11, A6, A21). In a case (A25) the term is mentioned in the keywords and no more referred to in the paper.

That the concept has not been extensively studied yet in the Public Administration academic literature is also confirmed by the fact that only in two papers in the selected sample the concept is discussed based on a review of the literature (A2, A29). However, in both cases social innovation is not the specific object of the survey, but it is considered in relation to concepts it can be somehow related: namely, innovation networks (A29) and co-production (A2).

Co-production and co-creation are among the concepts most often discussed with social innovation within the papers in the sample (A2, A6, A7, A10, A11, A20, A21, A31, A33). In (A2) a systematic survey of 122 articles and books on cocreation/co-production with citizens in public innovation is conducted, and the conclusion is reached that co-creation/co-production can be considered as a cornerstone for social innovation in the public sector. This mainly depends on the active involvement of citizens in the design, implementation, and evaluation of public services (A6, A7), which can require government to change its mode of operation and its relationship with citizens. This point is stressed in almost all the papers that relate social innovation to co-production/co-creation, since co-production/co-creation imply shifting public service design, implementation, delivery, and evaluation away from an expert-driven process towards enabling users as active and equal idea contributors (A7) and as entrepreneurs (A6).

However, also due to a lack of clarity in both the concepts, the relationship between social innovation and co-production/co-creation is not completely clear in the selected papers. (A2) considers co-production/co-creation as a cornerstone of social innovation, implying that co-production/co-creation is a fundamental ingredient for social innovation. (A11) defines co-production/co-creation as a source of social innovation, whereas for (A20) co-production/co-creation represents a particular kind of social innovation. For (A33) co-production/co-creation can go hand-in-hand with social innovation, although the reach of social innovation is wider. The actors of social innovation can be citizens, companies or societal organizations and the hybridization of the social and economic dimensions can generate meaningful returns for groups, communities, or segments of society, and for society as a whole. (A31) follows a different strand arguing for a distinction between co-creation and similar ideas like co-production, collaborative governance and social innovation. According to the authors, social innovation can be seen as the attempt of civil society to correct and supplement the public sector that usually does not play an active role in social innovation, except for its occasional role as a sponsor for social enterprises or local initiatives.

This particular role of public sector organizations to support social innovation (without being themselves actors of social innovation) is considered in some of the papers in the sample (A1, A5, A11, A12, A21, A23). These papers discuss the funding of social enterprises and third sector organizations (A1, A5, A11, A12) and the creation of an appropriate legal environment (A21, A23) to stimulate social innovation.

Another topic widely discussed in the selected papers concerns collaborative and networked governance. Most of the papers point to the creation of networks involving public and private actors as one of the conditions for social innovation (A2, A3, A4, A5, A7, A8, A13, A16, A19, A22, A24, A29, A32, A33, A34, A35). Generally speaking, all the papers that relate social innovation to co-production/co-creation also consider collaborative governance as an important piece of the picture. By discussing the

relation between co-creation, on the one hand, and collaborative governance and social innovation, on the other hand, (A31) stresses a difference between social innovation and collaborative governance. According to the authors, while collaborative governance clearly recognizes the importance of multi-actors collaboration, it fails to bring out the potential link between collaboration and innovation. On the other hand, the notion of social innovation very well captures the innovative dimension of the attempts of social entrepreneurs to involve local citizens in creative problem-solving.

The relation between social innovation, social entrepreneurship and social enterprise (as the tool to exercise social entrepreneurship) has been discussed quite widely in the grey literature. This topic is discussed, although at different levels of detail, also in the selected papers. In (A5) the authors argue that public administration and policy scholars should study research questions related to individual social entrepreneurs, individual and collective social entrepreneurship, government impact on social enterprise through diverse forms of support, social enterprise as an organization and the dynamic interaction among these factors. (A11) observes that a myriad of terms is used in the literature, including social ventures, social purpose enterprises, and social entrepreneurship. This lack of a single and clear definition creates some confusion for policymakers who wish to support social enterprises.

(A1, A11, A19, A21) report a growing interest toward social entrepreneurship and social enterprises mainly due to the need of tackling pressing social issues (A11) and the failure to attenuate them through government interventions (A21). (A1) observes a government enthusiasm for social innovation and social entrepreneurship especially in the Anglo-Saxon countries. This led to the creation of substantial social innovation funds to support social enterprises. The public and private funding of social enterprises is critically discussed in (A12, A19). On the one hand, with a specific focus on nonprofit organizations, (A19) discusses the pressure for accountability and improved performance for their expenditure of public funds. On the other hand, (A12) observes the emerging of forms of 'philanthrocapitalism' – donations of big money by single philanthropists to specific causes with a preference for the use of social entrepreneurship methods – that may force governments to revisit their eligibility criteria for tax receipting privileges.

5 Discussion

From the exploratory survey some interesting elements emerge that represent possible research topics for public administration scholars.

As already observed, the exploratory study confirms that social innovation is still an underexplored topic within the top public administration journals. This could be due to the vagueness and elusiveness of a concept that still needs clarification, both at the level of definition and at the level of operationalization. This is a topic of primary interest for scholars interested in exploring whether and how public sector reforms could be done via social innovation.

In general terms, social innovation can be approached from two different theoretical points of view [21]. On the one hand, given the multiplicity of the domains for social innovation, there is the tendency to favor keeping a variety of approaches on the basis that "there are no reasons for believing that a single theory could explain phenomena

as diverse as family life, urban communities, the evolution of workplaces, identity and conflict, crime and violence, exploitation and cooperation" (p. 24). On the other hand, it can be argued that the ongoing big social changes are systemic and "policy-makers would benefit from a general theory of social innovation to respond to major structural adjustment challenges of the current historical paradigm shift" (ibidem).

At the moment, as it is also confirmed by the exploratory study, it seems that the first approach is the one dominant in the public administration academic literature. Actually, besides those included in the sample selected for the study, numerous papers can be found in the top public administration journals that discuss topics and cases that would be appropriate to label as social innovation, although the concept is not mentioned in them (this is why they have not been included in the selected sample).

However, it should be noted that no general theory of social innovation will be possible without an unequivocal definition of the concept, a clear delimitation of the domain of social innovation and a precise identification of what differentiates the concept of social innovation from (partially) similar concepts. These critical aspects of social innovation have so far received only a limited attention within the considered literature. This has consequences also on the appreciation of what social innovation could mean for government and what role public sector organizations can play to foster social innovation.

There is a strong tendency in the selected papers to discuss social innovation with reference to citizens' involvement in co-production/co-creation exercises. Co-production and co-creation entail the active involvement of citizens in the implementation of new, and possibly innovative, solutions to meet social needs. This seems to make social innovation and co-production/co-creation quite similar concepts. However, with co-production/co-creation exercises there is always the risk that they could mask exploitation behind the rhetoric of engagement and participation. This could happen because the primary objective of co-production/co-creation is to answer social needs (in this sense they seem more similar to social entrepreneurship than to social innovation), whereas the impact on the process of social interactions [2] and the production of social outcomes [13] appear to be only possible (maybe desired) derivative benefits. Social innovation initiatives do not amount 'simply' to initiatives that are both social in their ends and in their means; rather, social innovation involves changing the system that created the social problem in the first place [20]. In this sense, social innovation aims at exercising a transformative impact on the social system, which is not usually intended in the co-production/co-creation initiatives. How such a transformative impact can be achieved and what it can amount to are both topics of relevant interest for public administration scholars.

Since social innovation can have implications for existing institutional arrangements and settings [22], government should play an active role in it. In the exploratory study the role of government has been described as related to the creation of the appropriate legislative environment for social enterprises and social entrepreneurship; the funding of third sector organizations; and the involvement of citizens in co-production/co-creation exercises. Are there further tools government can use to steer social innovation?

Assuming that social innovation represents a particular perspective on how the public sector should be reformed [6], what does a social innovation inspired reform program amount to from the perspective of public governance and public management? On the

one hand, as highlighted in some of the selected papers, social innovation seems to imply a reductionist view of the role of the state, as a continuum of the neoliberal ideology typical of the New Public Management approach. On the other hand, the central role of collaborative and networked governance for social innovation characterizes it as strictly related to the post-NPM reform approaches. How social innovation inspired reform programs can be related to the 'classical' theories of public administration is another topic that deserve attention from public administration scholars.

6 Conclusions and Limitations of the Study

Many scholars from different disciplines have claimed that the Covid19 pandemic is going to act as a game changer with deep impacts on many aspects of social systems. The pandemic hit marginalized communities, entrenched societal inequities, affected every aspect of life around the globe, from individual relationships to institutional operations to international collaborations. Despite this, the pandemic also opened a window of opportunity for the emergence of new ideas and new opportunities to build back a better, more inclusive, resilient, and sustainable society. This can open new possibilities for spreading the transformational power of social innovation. In this sense, further research is needed to better understand not only the role that civil society can play in social innovation, but also how government can play an active role in sustaining processes aimed at transforming existing institutional arrangements and settings, changing the structure, relationships and interaction patterns within the social system as a whole, and redefining new social relations and mobilization-participation within a changing macro socioeconomic environment.

Public administration scholars can contribute to those objectives by providing policymakers and public managers with a clear and unequivocal operationalization of the concept to turn it from a 'magic concept' into a concept that can support the design, implementation and evaluation of public policies; a clear delimitation of the domains of social innovation; and a precise identification of what differentiates the concept of social innovation from similar but not equivalent concepts.

By surveying a significant sample of the extant public administration literature, the study found that all these elements are still underexplored in it, thus confirming the existence of a theoretical gap within the public administration literature on social innovation. This, as well as the highlighting of some possible research directions that can contribute to bridge that gap can be considered as the main contributions of the paper.

The study presents some limitations as well, especially in the way in which the papers in the sample have been selected. First, the search has been limited to papers indexed on Scopus, this means that other important sources have not been considered (first of all, the Web of Science database). Second, only journals in the Public Administration subject area have been considered, which led to exclude from the survey journals like Government Information Quarterly (indexed in the Social Sciences subject area) that published papers discussing social innovation. Third, in the search only the keyword 'social innovation' has been used, which means that other related concepts (namely, social entrepreneur and social entrepreneurship) have not been considered. Fourth, in the selection phase no iteration of the search through backward or forward snowball

has been performed. These, and the limitation of the search to top journals only, could have affected the completeness of the sample considered and limit the relevance of the conclusions of the study.

However, despite these limitations, which are in part inherent in its exploratory nature, the study raises some important questions that need to be addressed if social innovation has to be one of the pillars of the social systems recovery in the new normal post-Covid19 era.

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Annex

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Change Through the Lenses of Institutional Logics: A Systematic Literature Network Analysis

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Abstract. The aim of this paper is to trace the development of the literature in an objective manner by applying the Systematic Literature Network Analysis (SLNA). It contributes to the literature by building a solid map for future research avenues in the stream of institutional logic and change. Our findings illustrate the time-based introduction in the literature of change mechanisms, such as theorization, rhetoric, representation, and a recent focus on professional role identity, especially in the healthcare context. Recent trends emerge: (i) contributions on emerging global trends, with the application of hybrid organization in sustainable transitions and social enterprises; (ii) increasing body of research applying Institutional Logics and Institutional work in the analysis of organizational change; (iii) increasing interest from scholars of different disciplines in applying the institutional logics perspective; and (iv) the need to further develop the underlying theoretical assumptions of Institutional Logics. Finally, some limitations: (i) selected time frame of analysis; (ii) only author keywords were considered; (iii) overlooking other valuable scientific contributions due to "Matthew effect".

Keywords: Systematic literature network analysis · Institutional logics · Institutional change

1 Introduction

The concept of Institutional Logics started to emerge at the beginning of the 90s with the chapter by Friedland and Alford published in "The New Institutionalism in Organizational Analysis" [1]. The chapter criticized the 'new intuitionalism' and the focus it has on organizational fields, as it lacks an appropriate theorization of institutional dynamics which could be explained only by an interinstitutional conceptualization of society. The 'new institutionalism' arose in the 1970s as part of institutional analysis, where the seminal papers by Meyer and Rowan [2] and Zucker [3] were the first to highlight the relevance of culture and cognition by stating how organizations need to comply with the external environment (i.e., socially validated understandings) to gain legitimacy, thus positing cultural persistence as a measure for institutionalism. The question of isomorphism was further developed by focusing on the organizational fields rather

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than the societal level [4] where actors conditioned by culture tended towards isomorphic conformity in reproducing the "status quo" [5]. Thus, the term "new institutionalism" embodied the rejection of rationality in explaining the organizational structure and focused on legitimacy in explaining the organization's survival rather than efficiency. Friedland and Alford (p. 284) [1] formally introduced Institutional Logics to depict the contrasting "practices and beliefs embedded in the institutions of the modern western societies" which account for the "interrelationships between individuals, organisations, and society". This led to numerous conceptualizations within the literature, the most common of which is that of Thornton and Occasion (p. 804) [6] which states that Institutional Logics are "the socially constructed, historical pattern of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality". The definition by Thornton and colleagues underlines the relationship between agency and socially constructed institutional practices and structures. In fact, this systematic theoretical framework of Institutional Logics [7, 8] includes the ideal-typical logics that are associated with their respective institutional order and which differ in their sources of legitimacy and authority and types of norms and control mechanisms. Therefore, some logics provide a basis for action (i.e., shared view of what occurs in the field) [8], while others provide competing cognitive frames for subsets of participants [9]. In other words, there is a distinction between logics, but also across the different logics of the same type, which explains the persistent heterogeneity across and within contexts. This alternative rationalized model, even though it takes up the idea of cultural rules and cognitive structure in shaping organizations [10], is differentiated from the new institutional approach of Meyer and colleagues by rejecting individualistic rational choices and macro perspectives (i.e., rationalization of power of cultural schemes at the societal level). As isomorphism is no longer central, the focus shifts to the effects that Institutional Logics have on organizations in a variety of contexts. The development of the Institutional Logics approach has addressed the limitations and tensions studied by institutional theory scholars by positing Institutional Logics as modelling institutions' content and meaning.

In the last few years, the Institutional Logics approach has received increased interest from many scholars [11] becoming one of the key theoretical perspectives in organizational institutionalism expanding its application beyond sociology and management disciplines [12, 13]. The perspective has been applied empirically in numerous contexts and to different topics, including human resource management [14], corporate governance [15, 16], corporate social responsibility [17–19], sustainability [20–22], and technology innovation [23–26].

Leveraging the recent literature, we discuss the importance of the Institutional Logics perspective in explaining institutional change by reviewing a substantial number of documents – through the Systematic Literature Network Analysis (SLNA) [27] – that have analysed how institutions are created and modified, highlighting the different change mechanisms. Based on our analysis, we discuss current and new scholarly directions that improve understanding of benefits and downsides of approaching change in different contexts through the Institutional Logics perspective. The results of this methodology enrich the already existing literature reviews [28] by providing a complementary view

of the "dynamic development of the field" and allowing us to build a solid map for future research avenues in the stream of institutional logic and change.

The paper is structured as follows: Sect. 2 explains the adopted methodology and the materials collected to conduct the SLNA; Sect. 3 reports the results of the analysis, while Sect. 4 discusses the results and provides future research directions; the last section presents the conclusions and limitations of the review.

2 Materials and Methods

For the purpose of this work, data is collected from Scopus, since it is the most frequently used citation database for field outlining [29, 30] and it has 60% more coverage than Web of Science (WoS) [31]. The chosen methodology (i.e., SLNA) includes two phases: Systematic Literature Review (SLR) and Bibliographic Network Analysis and Visualization. The SLR aims to define the scope of the study through the scope of analysis by framing the appropriate literature using the CIMO approach [32]; subsequently, studies are located through keywords and timeframe; and finally, the bibliographic network analysis and visualization are performed on the resulting database. For the last step, Pajek [33] and VOS viewer [34] are the two packages used to conduct the analysis. Pajek is a software used to analyse and visualize large networks allowing the manipulation – such as partitioning – on graph sets, while VOS (Visualization of Similarities) is a complementary viewer that also creates, visualizes, and explores bibliometric networks of science in wider formats of layouts.

2.1 Locating Studies

The main topic of interest is the concept of Institutional Logic and its contribution to explaining change. We opted to use the connector "OR" rather than the symbol asterisk (*) as a wildcard to avoid also capturing words such as 'logical'. The search was refined in terms of document type considering only articles, conference papers, books, and book chapters and only written in English. There has been no discrimination in terms of the research area, as the theoretical perspective of Institutional Logics is applied in numerous disciplines. Our intent is to see the development of the literature up to date in an objective manner; thus, the year 2021 was excluded from the analysis as it is yet to become relevant. Furthermore, the first year considered (i.e., 1985) is based on the year when the concept of institutional logics was first mentioned in the Power of theory [35]. The identified string was used in Scopus on February 1st, 2021, in the "Title-Key-Abs" field which led to obtaining 474 works as an outcome.

2.2 Bibliographic Network Analysis and Visualization

SNLA has already been applied successfully by other authors [36] and has enabled them to identify trends and key issues that depict the development of knowledge within a field in an objective way. The advantage of the network analysis approach is the simplistic yet effective visualization of documents (i.e., nodes) (see Appendix 1). On the one hand, some papers are connected to other nodes by linking arrows that track in chronological

order the citation networks. This depiction enables us to understand the "influence of past research on subsequent studies". On the other hand, there are the non-connected nodes that can represent either non-cited or non-citing papers, which by definition of CNA are omitted from the analysis since this approach builds on citations [37].

The CNA analysis is based on three techniques: (i) Community Analysis which allows identification of the study's sub-areas by clustering documents based on how citations connect them; (ii) Vector Analysis to analyse specific properties of clusters (i.e., most cited); and (iii) "Main Path" generated by the Key Route technique [38], which reflects the unfolding of knowledge over the years by highlighting the pivotal articles within the knowledge field. The remaining analysis considers not only the papers in the connected component but also the non-connected ones.

The Global Citation Score (GCS) indicates the paper's cumulated citations obtained in the database, which can identify the seminal and/or influential papers, whereas the normalized GCS (i.e., the ratio between most recent GCS and the total number of years since its publishing) [37] makes it possible to identify promising papers [39]. The Keywords Co-Occurrence Networks creates a network that highlights the keywords that co-occur together and assigns them to a cluster.

3 Reporting Results

3.1 Citation Network Analysis (CNA)

The "Community Analysis" obtained 24 different clusters containing documents published between 1997 and 2020. However, one cluster was eliminated as it contained only two papers by the same author. For the process of identifying the clusters' research topics, only the content of papers with the most citations are considered, as this shows how the various communities approached the institutional logics perspective.

Topic 3 focuses on the structure of professionalism, where the responsibility of managers is expected to maintain the legitimacy in the field of their profession and the hybridity of logics by performing intentional institutional work [40]. However, the intended outcomes of innovation sustaining legitimacy rarely emerge when entrenched in already existing logics of professionalism [41] since this poses threats to the professional logic that dominates the field [42]. In fact, for the professional role identity to change, intentional identity work by the group of actors and the leadership of managers are required to facilitate the reinterpretation of the new logics (i.e., overcoming the resistance to change) [43]. Similarly, Topic 14 focuses on the role of identity in the process of institutionalization where nonentrepreneurial actors reproduce and translate new institutional logics through institutional work [44] based on individual cognition and interpretive subjectivity [45]. In other words, it connects changes in the institutional field to the rhetoric and corresponding logics put forward by actors [46], who construct social identities [47], and it shows "how streams of communication enable the reproduction and change of the underlying principles that constitute institutional logics" through different mechanisms such as theorizing, sense giving [48] and "representation of change through exemplars" [49]. Furthermore, Topic 4 also focuses on change explaining how existing institutional logics and role identities are replaced by new ones through rhetorical strategies, such as theorization of new roles [50], and social movements [51], thus demonstrating how

organizations that operate within the same institutional field respond differently [52], as, for example, universities [53]. Moreover, Topic 20 puts forward institutional work as an explanatory variable of changes in supply chain logic [54] and sustainability and climate policies [55, 56].

Topics 15, 21, and 24 highlight how institutional change has an increasing adherence from scholars in many disciplines [28], such as accounting, by studying (i) the introduction of budgeting practices in contexts of competing logics [57]; (ii) how accounting firms deal with changes that have resulted from a shift in the professional identity or organizational structure [58]; and (iii) how institutional pressures influence decisions to adopt IFRS voluntarily [59].

Topics 11 and 13 deal with managing the conflicting logics in pluralistic organizations, such as universities [60, 61], for further institutional change [62] deriving from external political pressure [63]. Similarly, Topics 16, 17 and 19 deal with how to manage the co-existence of competing logics in organizational fields [64] by putting forward studies on pluralism logics and their cooperation in academia and healthcare [61, 65, 66].

Topics 2 and 10 deal with defining the concept of hybrid organizations and their efforts to combine the contrasting multiple logics to generate innovation while dealing with the consequences of the complexity of their field [67]. Examples include social enterprises, that have a dual mission to achieve both financial sustainability and social purpose [68]; public and non-profit organizations that face a plurality of normative frames [69]; the concept of the sharing economy where organizations face pluralistic logics [70]; and the challenges posed by global climate change [71].

Topic 6 community explores the role of entrepreneurs and the institutional pressures that explain the actions of actors, where environmental jolts result in an increased entrepreneurial opportunity to re-evaluate the current logics (i.e., opportunity for organizational change) [72, 73]. For example, some authors focus on the fashion market to explain how consumers can introduce new consumer-focused institutional logics, by still supporting and promoting the prevailing logics [74, 75].

Topics 5 and 7 address more peripherical topics in applying institutional logics perspective in transforming sports unions, such as the rugby union [76] and soccer multi-club [77], due to exogenous factors [78]; whereas, Topics 1 and 9 serve as a milestone for the institutional logics literature [79] setting the foundation on how changes in the institutional environment logics impact individual rationalities and organizational structure [80, 81].

More recent communities (i.e., Topic 23) have focused on better understanding the institutional logics approach and its qualitative analysis by explaining the ontological assumptions and methodological techniques [82]. Furthermore, the concept of socio-technical regimes (i.e., paradigm core of a sector from which co-innovation of institutions and technologies come) is approached from an institutional perspective to explain the tensions created by the contrasting institutional logics of a field [83]. Incorporating the institutional logics in the concept of socio-technical regimes challenges the prevalent logics of the field that hinder innovation (i.e., opportunity for change) and thus supports the ‘structural system for innovation’ [84].

Finally, some topics have lacked attention from the communities in recent years, such as Topic 22 which focuses exclusively on revising the Human Resource age-related practices using the Institutional Logics perspective [85, 86]; Topic 8 that deals with institutional bricolage to comprehend institutional change from the introduction of new environmental governance, such as PES schemes [87–89].

3.2 Main Path

The MP (see Appendix 2) starts with the seminal contribution by Havemann and Rao [80] which studies the coevolution of organizations and institutions in the thrift industry where the societal level logics are impacted by the formation of distinct organizational forms. From this point on, the MP develops into two branches. The right side of the MP, still focusing on tensions between multiple logics, develops different mechanisms of change, such as identity, legitimacy, and theorization [50] related to social movements. [90] study the organizational structures in the accounting context to show how institutional entrepreneurs use the mechanism of rhetoric to reinterpret the prevailing practices and symbols and "discredit the dominant logic which defined the legitimacy". Moreover, [64] theorize a model based on the key role of institutional logics to understand change subsequent to a radical structural change due to healthcare reform. In fact, according to Nigam and Ocasio [49], "new institutional logics emerge through a process of environmental sensemaking which are triggered by attention to events that are relevant to institutional actors in an organizational field". These two papers serve as a foundation for the works by [65] and [43] that focus on professions and the multiple logics present in medical education, in exploring the change of the professional identity role through the process of reinterpreting the multiple logics that exist and their relationships; the analysis is drawn on the comparison of the strength each logic has to the "ideal logic type" as a constant [82]. Building further on the topic, unlike previous authors, [91] introduce the mechanism of co-optation to explain the co-existence of multiple logics, which also explains the reason why shifting logics shape the identity motives and identity work of senior professionals in the healthcare sector [92].

The second branch expands further with studies relating to the healthcare system, in particular [41] deals with the logic of managers' professionalism in maintaining organizational legitimacy during the US academic health centre mergers; [89] focus on the re-composition of an organizational field where the radical change process in medical professionalism is impacted by competing institutional logics (i.e., dominant logic is subdued rather than eliminated); [93] study the planning of healthcare reforms aimed at improving the quality for patients; and [66] conceptualize the professional work as guided by a constellation of logics derived from society. The latest contributions to the Institutional Logics perspective are applied to investigate change with the introduction of new information technology [94]; in the incentive and accountability structure [95]; in work practices [96]; in facilitating organizational sustainability initiatives [97]; leading to shifts in the legal profession [98]; and where opportunities of professional logics offer a new way to foresee and deal with challenges in implementing new organizational models [99]; as well as understanding how the coexistence of multiple Institutional Logics enables managers to adopt multinational corporate values that challenge local value [100] (i.e., opportunity for organizational change). Finally, the last node [101]

highlights the importance of the change agents' interest in the context of coexisting logics.

3.3 Global Citation Score

Only two out of ten papers are part of the MP, and they are both by the same author [43, 82]. Another intriguing aspect of this analysis is that the remaining ones are part of the biggest connected component. The most recent papers [102, 103] focus on the tensions and risks of scaling strategies in social entrepreneurship and how social enterprises, when internationalized, become hybrid organizations responding to the host country's logic. Other recent developments include papers by (i) [104] addressing the challenge of climate change and the efficiency of efforts of public and private actors in promoting the voluntary certification standards for sustainable products and services; and (ii) [105] focusing on regenerative change through the re-emergence of previous dominant logics in organizational fields.

The authors of the most promising paper [69] position themselves in the non-profit sector explaining the concept of hybridity and demonstrating how hybrid organizations arise from the existence and interaction of plural logics with actor identity mediated through professional structures.

The remaining works deal with the concept of the sharing economy and the fashion market. The first work [70] states how the sharing economy sees the role of organizations as infrastructure providers and thus assesses the plural forms (i.e., institutional complexity) and practices (i.e., institutional work) in these organizations. Finally, the last paper [75] applies the institutional logics perspective in the fashion market to investigate the participation of consumers in producing unintended market-level changes by creating new logics, which are consumer-focused, while still supporting and promoting pre-existing logics through institutional work.

3.4 Keywords Co-occurrence

The selected Scopus database includes a section entitled "Author Keywords" used to perform the keyword co-occurrence analysis. The parameter setting regarding the minimum number of occurrences of a keyword is set so that the keywords occur together in a minimum of 5 papers. The process generated seven clusters (see Appendix 3) that represent different research focuses. Keywords were normalized for plural (i.e., Institutional Logics and institutional logic), and the spelling was normalized into standard English (i.e., organizational change and organisational change).

Topic 1 focuses on the efficient implementation and integration of governance changes and policies in pluralistic organizations - universities [106] and hospitals [93] - through the system of accountability [107]. For example, some authors [108] study the processes and practices enacted by institutional actors during the implementation of an IT system in healthcare; and (ii) explore the impact that a reform policy has on universities in accentuating the controversies which lead to a change brought about by professionals [109].

Topic 2 explores the reciprocal relationship between institutions and fields and how the interaction at the field level shapes institutions to understand the sources of constraint

for organizational adaptation [110]. Examples include [111], who analyses the emergence and development due to exogenous factors and endogenous interactions of news media entities through an institutional logic perspective. Another example is [112], who analyse how institutional entrepreneurs play a key role in the adoption of International Public Sector Accounting Standards. Moreover, [113] focus on how leaders respond to external pressure for change through institutional work and are able to transform the organizational practices.

Topic 3 relies on the processes of sensemaking and framing to explain institutional change, in particular [49] illustrate how the process of sensemaking leads to the emergence and adoption of new logics in organizational fields (i.e., healthcare), whereas [114] use the framing process to unpack professional norms and logics which shape the organizational field, while the sensemaking process is used to understand how industry actors legitimize their status archetype perceptions in the industry. Moreover, [89] focus on "the re-composition of an organizational field where competing institutional logics" drive the radical change process in medical professionalism. Finally, [115] focus on the implications of value creation for organizations and governance strategies, which are achieved through contrasting logics (i.e., institutional complexity).

Topic 4 emphasizes the importance of hybrid organizations as a frame for business model innovation for sustainability in social entrepreneurship [116]. [20] and [117] explore the concept of sustainability through the lenses of institutional logics to comprehended how sustainability can be observed and practised through socially constructed actions and intentions. Furthermore, [118] and [119] study how the emergence of hybrid organizations in highly institutionalized industries can successfully combine elements of the dominant logic with innovation to facilitate radical change.

Topic 5 addresses the issue of climate change, such as reduction of greenhouse gas [120, 121], and explores the role and implications of institutional entrepreneur as a "climate broker" to deliver a shift in the climate change logics [122].

Topic 6 explores the contrasting logics that arise from the introduction of changes impacting an organization's corporate governance, such as the logics introduced by the International Financial Reporting Standards (IFRS) [123] and the role of the internal audit function in mediating the existing logics with those introduced by the ERP systems [124, 125].

4 Discussion of Results

4.1 Existing Themes

The first mention of the concept of institutional logics goes back to 1985 with the seminal work by Alford and Friedland. Even after its introduction with a proper definition in 1991, authors seemed to shy away from this perspective in approaching change until more recently when the number of published documents containing institutional logics as keywords started to increase. The CNA shows how out of the 474 papers only 146 documents of the dataset are part of the unconnected cluster. The result suggests that even though the topic of institutional logics is not yet completely explored, scholars' interest in further developing the perspective seems to be increasing. Both the community author (i.e., CNA) and the keywords co-occurrence analysis show how the institutional logics

perspective has been applied in several research domains, implying that the perspective of institutional logics has been gaining increased attention from various scholars in different disciplines in explaining change.

The main path analysis, author community and keywords co-occurrence analysis show how early works focused on change mechanisms employed by actors to change underlying institutional logics, such as theorization [49, 50], rhetoric [90] collaborations, separate identities, event attention and representation [49]. Likewise, some communities of scholars focused on studying the contrasting institutional logics between the already existing logics and the logics arising from the introduction of changes affecting the corporate governance of an organization as well as tackling the problem of climate and environmental change through the underlying incompatibility of logics dominating the field (i.e., Topic 5 and 6 keywords). Some other scholars were able to define and analyse the reciprocal relationship between institutions and fields by emphasizing how the interactions of the logics at the field level would shape institutions and bring about change (i.e., Topic 2 keywords). Subsequently, more academics seemed to take an interest in the perspective of institutional logics (i.e., Topic 1) making contributions to change management, such as changes in roles and work practices [66, 96], and introduction of a new incentives structure [95]. Such contributions further enhanced the interest that organizational scholars had in explaining the changes in highly institutionalized and pluralistic (i.e., coexistence of more than one dominant logic) organizations i.e., hospitals, universities, and banks (Topic 11 and 13 CNA).

The GCS analysis shows how all papers are part of the most connected component. This means that recent trends are in fact connected to the already existing community of authors, suggesting that the institutional logics perspective literature is on a path towards consolidation. In addition, it underlines the interest of scholars in applying the perspective of institutional logics to social enterprises and climate change, as well as focusing on the conceptualizations of hybrid organizations, institutional work, and institutional complexity (Topic 2, 10, and 3 CNA) to try to tackle the analysis of organizations dominated by plural logics (Topic 1 keywords). These results confirm that recent trends focus on the coexistence of contrasting logics that arise (i) to explain the rationale behind the existence of hybrid organizations and how they promote innovation for sustainability (i.e., Topic 2–10 CNA; Topic 4 keywords); (ii) to foster successful initiatives for change within organizations helping managers understand how to respond to the shift in logics [93, 99, 100]; (iii) to manage the impact of institutional complexity on the organization (i.e., Topic 3 keywords). This focus indicates that the approach of Institutional Logics in explaining change is not limited only to organizational studies but has been gaining increased attention from various scholars of different disciplines (Topic 15, 21, and 24 CNA; Topic 6 keywords).

4.2 Emerging Research Trends

Based on our results (see Table 1), the following section presents the emerging research trends that serve as a map for new scholarly directions in the stream of institutional logic and change. Some topics (i.e., Topics CNA 5, 7, 8, 18, and 22) have not been considered as they are peripheral topics or no longer of interest for the community since the topics have not been considered in the recent literature. The RTs are related to each other, and

they focus on the institutional complex which derives from a pluralism of logics that is affecting the way organizations operate.

Table 1. Future research directions based on the systematic literature network analysis

Research trends	Topics CNA	Topics keyword co-occurrence
RT1: Managing institutional complexity to achieve sustainable change	Topic 1, 2, 3, 8, 9, 10 and 12	Topic 1
RT2: Pluralistic organizations and institutional complexity	Topic 11, 13, 16, 17 and 19	Topic 3
RT3: The role of hybrid organizations in institutional complexity	Topic 2, 3, 15, 21 and 24	Topic 4
RT4: The role of institutional entrepreneur and social movements in achieving sustainable climate change through digital innovation	Topic 4, 6, 14, 20 and 23	Topic 2 and 5
RT2: Pluralistic organizations and institutional complexity	Topic 11, 13, 16, 17 and 19	Topic 3

RT1: Managing Institutional Complexity to Achieve Sustainable Change. We suggest literature should further investigate the reasons why studying how to manage institutional complexity is relevant to avoid organizational risk, and thus, presumably achieve sustainable change. Furthermore, we suggest focusing on new types of filters (i.e., field position, governance, structure) that organizations use to elaborate a response to institutional complexity. Understanding how organizational actors can manage institutional complexity and the contrasting logics within the field can help cope with organizational risk. Institutional complexity can lead to different types of risks for organizations, from reputational to financial, and even human risk. For example, in hospitals, which are driven both by the "medical profession logic" and "business logic" [64], when one of the two logics becomes dominant, it can undermine the other logic leading to potential ethical implications and impact on financial objectives. In other words, when the business logic is undermined, it may be hard to achieve more operational objectives, whereas when it is pursued it might make it difficult for professionals to make decisions regarding patient treatment. Therefore, to understand complexity at organizational level, the field level should be taken into account [66] since its mechanisms are key to framing, filtering and enforcing logics. Pressure that arises from institutional complexity affects each organization differently, thus, each institutional logic that passes through organizational fields is then filtered by the attributes of the organizations (i.e., governance, structure, ownership, and field position) [126]. Therefore, we put forward the consideration of culture as an additional organizational filter through which institutional complexity at

the organizational level can be managed and can shape the responses that the organization has to it. For example, Schein's culture model states that basic assumptions shape values, values shape practices and behaviour, where the latter is what the organization displays to the external world. We could therefore consider organizational culture as a filter for institutional complexity and in turn, organizational culture as a filter to shape organizations responses for sustainable change.

RT2: Pluralistic Organizations and Institutional Complexity. We propose a focus on universities since they are organizations playing a role in numerous fields with a certain set of logics (i.e., pluralism), thus, highlighting the need to explore how stakeholders and organizations deal with the tensions created by the plural logics (i.e., institutional complexity) through change or adaptation [61]. In particular, higher education is torn between two conflicting logics - professionalism logic and corporate logic - which has led to consequences such as "increasing managerial control, quantification of faculty performance using commensurable metrics, and the university's financial climate, where generating revenue is perceived to take priority over educational mission" [53]. These consequences also have a spill-over effect on the research evaluation process since promoting the use of metrics to measure performance, ultimately means that the quality of the research output is also being evaluated. The corporate logic of using bibliometric measures in the evaluation of research is in contrast with that of professionalism, where the underlying principle is that research output should serve society through development and dissemination of knowledge across disciplines, rather than targeting efficient and effective performance goals, which are more related to the corporate logic. Therefore, we encourage further studies to explore and analyse the effects that institutional complexity has on pluralistic organizations (i.e., universities, hospitals, medical research centres) through study cases (see PRIN)[1].

RT3: The Role of Hybrid Organizations in Institutional Complexity. Hybrid organizations can combine institutional logics to try to generate innovation in complex issues that they face due to institutional complexity. In fact, hybrid organizations emerge in highly institutionalized industries as they successfully combine elements of the dominant logic with innovation to facilitate radical change. Such organizations have been studied in the context of social enterprises [68]; public and non-profit organizations [69]; sharing economy [70]; and the challenges posed by global climate change (see RT4) [71]. We think that the concept of hybrid organization deserves to be explored further, especially its theoretical underpinnings and how it deals with the conflicting logics deriving from institutional complexity to achieve sustainable innovation. For this reason, we suggest further studies on hybrid organizations and their ability to successfully combine the logics deriving from institutional complexity, in particular, in the light of digital innovation and accounting practices.

RT4: The Role of Institutional Entrepreneur and Social Movements in Achieving Sustainable Climate Change through Digital Innovation. Social movements similarly to institutional entrepreneurs strive towards similar goals, such as that of tackling the inevitable global warming. Social movements [104] and the role of institutional

[1] http://prinvalutazione.ircres.cnr.it/.

entrepreneur [127] have already been used to discuss sustainability topics to tackle climate change issues. To add to the discussion, it would be relevant to study how social movements and institutional entrepreneurs make use of digital technologies to reinforce their user/followers' adherence, reach more users, and ultimately achieve their goals in a broader spectrum to tackle the challenge of climate change.

5 Conclusions

In this paper, we overviewed a substantial part of the literature associated with the institutional logics perspective, using the SNLA approach, to highlight new research directions that we believe could be promising. Institutional logics approach in management studies has been criticised as it has mostly shown a static perspective. On the one hand, institutional logics are conceived as 'substantive', thus identifying an endogenous dynamism residing in the logics themselves, implying that changes are the result of competing logics and their 'hybridity'. On the other hand, institutional logics can be also considered 'procedural' which provide the opportunity to understand why they are pursued [128]. While there have been numerous papers published, most of the recent work has used institutional logics merely to analyse the impact they have rather than further developing the concept itself and providing explanation and clear connections among the concepts which are associated with institutional logics. For this reason, we propose a map for future research focusing on institutional complexity and how organizations manage the impact of it. The aim of the agenda is to stimulate conversations on institutional logics across many disciplines. In fact, even though it emerged over 30 years ago, the field has yet to reach its maturity level, which leaves the opportunity for further studies, both empirical and theoretical.

In concluding, the limitations of the research must be mentioned. First, the time frame was derived from the first paper in the Scopus database that mentioned 'institutional logics' (i.e., 1989) and the last relevant year (i.e., 2020). Limiting the time frame to the most recent years could be beneficial to unveil more detailed analysis of the current research trends. Second, only author keywords were considered, and not all papers (i.e., only 18%) have the column of 'Author Keywords' filled, thus excluding possible relevant studies. One may want to analyse the indexed keywords (i.e., only 20%) for complete analysis as these represent synonyms, various spellings, and plurals, or keywords reviewed by a subject specialist to define the appropriate term. Finally, due to the "Matthew effect", authors tend to cite seminal papers (i.e., with high citations), which may overlook other valuable scientific contributions.

Appendix 1

Figure 1.

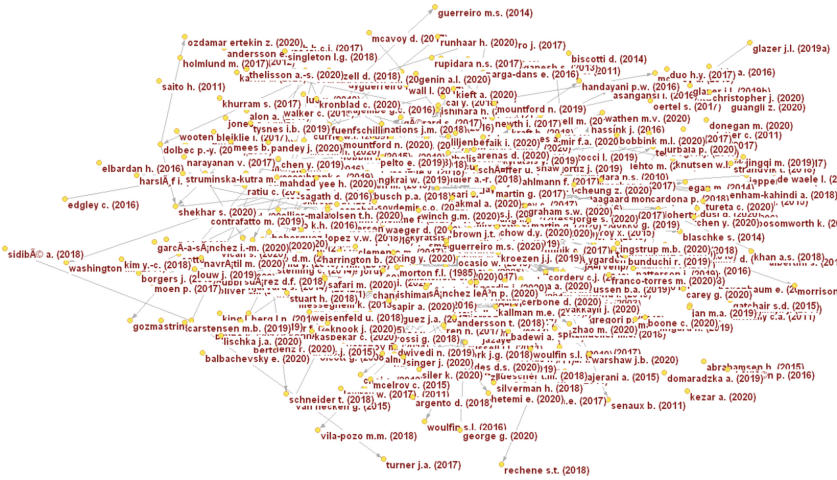

Fig. 1. Network of papers

Appendix 2

Figure 2

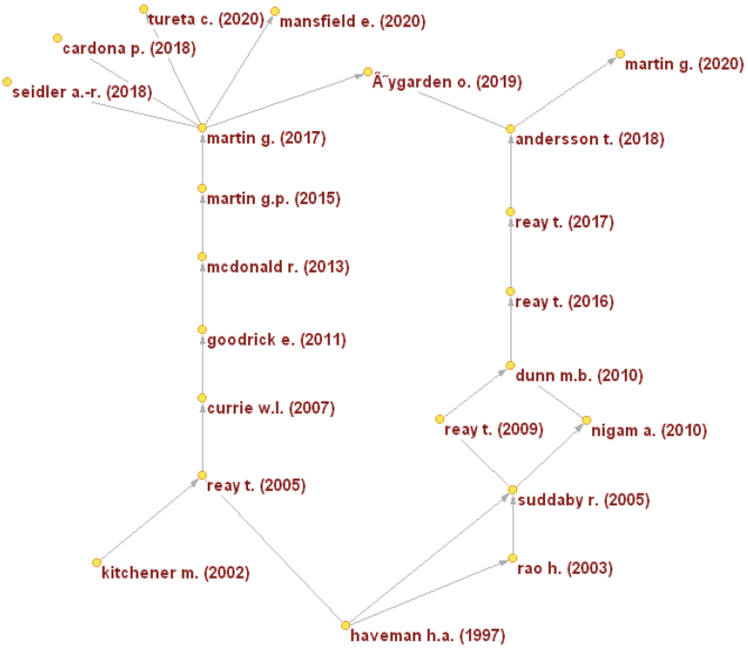

Fig. 2. Main path – chronological knowledge building

Appendix 3

Figure 3

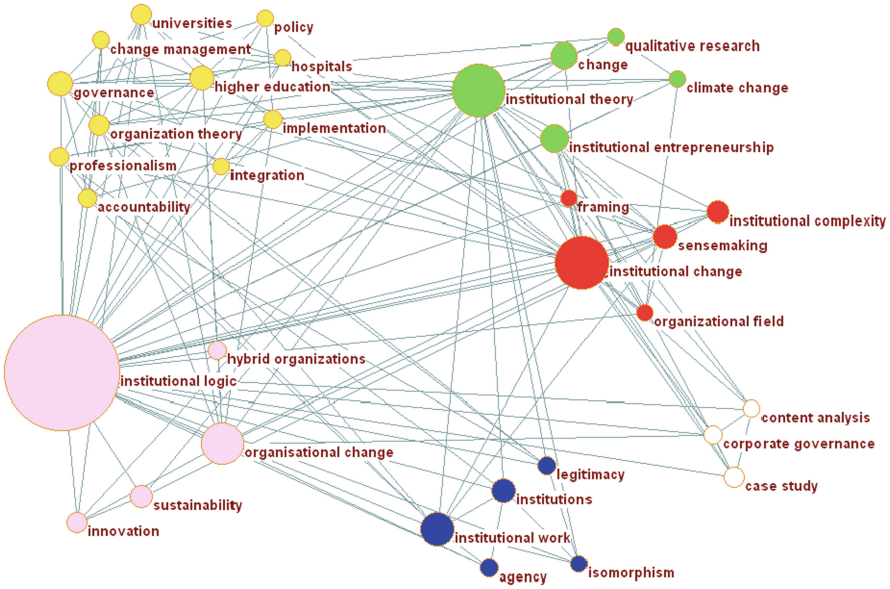

Fig. 3. Keywords cluster

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Exploring Collaboration and Productivity in the Higher Education Scientific Community

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Abstract. In this study, we analyze research collaborations and their characteristics in the higher education (HE) scientific community in recent years. Specifically, we focus on the most influential journals in the field according to the Academic Journal Guide 2021— the Academy of Management Learning & Education, the British Educational Research Journal, Management Learning, and Studies in Higher Education—to create our dataset composed of 1,322 articles. Using a bibliometric analysis technique, we design a comprehensive map of scientific production and impact in recent years (2016–2021). We study authorship and co-authorship in the HE field, highlighting the most productive authors and countries and the collaborations that emerge through network analysis. We also perform a citation analysis to examine the impact of the field. Finally, we conclude our discussion with a call for an in-depth study of the most debated and emerging topics in the field.

Keywords: Higher education · Bibliometric analysis · Scientific community · Most productive authors · Citations per country · Topic trend

1 Introduction

Higher education (HE) has always been considered a "major institution of modern society" [2, p. 3]. It is a multidisciplinary field, so achieving a comprehensive picture of its structure is a complex challenge. Nevertheless, the scientific community around HE is increasing, and interest in the field should be monitored to better understand future research opportunities and trends.

Attempts to describe the general situation of HE have been made over the last years by independent institutions, such as the EDUCAUSE Horizon Report in its Teaching and Learning Edition [10], which highlights the developments in the social, technological, economic, and political trends related to HE. In particular, it underlines the critical changes in trends related to HE, such as increased student diversity, the need for changing degree pathways to accommodate new perceptions of employability, and opportunities related to online education. All these dynamic elements have brought about fundamental changes in HE research and, consequently, in the research community.

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Scientific literature made remarkable attempts to map the field of HE education research. In their recent work, Daenekindt and Huisman [8] analyzed 17,000 articles published between 1991 and 2018 to extract all relevant topics discussed in the field. Their article, based on 28 journals focused on HE, showed 31 different topics, highlighting the fragmentation of the field and the constant struggles among topics and themes. Moreover, they found relative stability of the cluster structure and a decreasing level of topic diversity.

In 2015, Kuzhabekova et al. [18] mapped the international higher education research. In particular, they used bibliometric and social network analysis for mapping the publications on the topic from 2002 to 2011. The articles showed that international collaboration among the authors of the fields was still rare. In particular, the research showed that international collaborations were more common in developing countries, which were becoming more relevant in the HE debate (e.g., China and South Africa).

Other publications tried to map the HE research in specific world zones. For example, Zavale and Schneijderberg [29] studied the case of African HE research, considering a significant period, i.e., 1980–2019. They recognized that the discussion on this specific field is quite new and emerging in the Continent. Other research considered specific aspects of HE research, such as international students [15], territory [23], graduate employability, and career development [11].

HE research has grown exponentially in the last two decades, and this trend continues. A quick check in the SCOPUS database shows an increasing number of studies dealing with HE and related subjects. Therefore, the need for a better comprehension of HE research and the related scientific community needs to be considered a relevant issue.

This study aims to examine the most recent developments in the scientific community around HE by considering the most productive authors, the impacts of their articles, the most productive countries, and the collaborations between countries. After a description of the methodology, this article presents the results of our analysis, which focuses on the years between 2016 and 2021. Finally, we call for an in-depth examination of the most relevant and emerging topics identified.

2 Methodology

Given that our objective was to understand the evolution of the HE scientific community in recent years, we used bibliometric methods to extract and analyze data. In particular, we utilized Scopus to extract articles concerning HE and related discourses. We used the Bibliometrix package of R to complete the data analysis [1]. Our research followed three main steps: (1) extraction of publications, (2) refining of the dataset (e.g., selection of relevant publications and keyword refinement), and (3) descriptive analysis of several aspects related to the publications [28].

First, we selected the four most influential academic journals for HE from Academic Journal Guide (AJG) 2021. We focused on the following journals for our research: the Academy of Management Learning & Education (AMLE), the British Educational Research Journal (BERJ), Management Learning (ML), and Studies in Higher Education (SHE).

Second, we used SCOPUS to gather the contributions and create the initial dataset. We utilized the keyword (higher AND education) and other related concepts, such as

universit*, academ*, and degree*. Given that we aimed to understand the most recent changes in the HE scientific community, we limited our results to the last five years (from 2016 to the first two months of 2021). After that, we limited our results to the four mentioned journals. We eliminated false positives using the methodology suggested by Keupp et al. [16] and Denyer and Neely [9]. At the end of this phase, a total of 1,322 articles were considered relevant for the analysis.

Finally, we extracted those keywords with more than one occurrence, and we homogenized all concepts that had the same meaning. In this process, we worked on 840 keywords, obtaining and refining them and then reducing the sample to around 750. The table with the conversion results is available upon request. Finally, the dataset was ready for analysis.

3 Dataset Analysis

Table 1 shows the primary information of the dataset we analyzed. The extraction resulted in 1,322 articles from four journals. The time span of the articles was from 2016 to the first two months of 2021. The average number of years since publication was 2.52, and the documents had an average number of citations of 7.6. The average number of citations per year per document was 1.838.

Table 1. Main information of the dataset

Data	Value
Time span	2016–2021
Journals	AMLE; BERJ; ML; SHE
Number of papers	1,322
Average number of years since publication	2.52
Average number of citations per document	7.6
Average number of citations per year per document	1.838
References	67,692
Author's keywords	3,787
Authors	3,186
Author appearances	3,567
Authors of single-authored documents	269
Authors of multi-authored documents	2,917
Single-authored documents	290
Documents per author	0.415
Authors per document	2.41
Co-authors per document	2.7
Collaboration index	2.83

The articles had more than 67,000 references, 3,787 keywords, and 3,186 authors. In particular, there were 269 authors of single-authored documents, 290 single-authored documents and 2,917 authors of multi-authored documents.

The average number of documents per author was 0.415, and the average number of authors per document was 2.41. The average number of co-authors per document was 2.7, and the collaboration index (i.e., the ratio between the number of authors of multi-authored documents and the number of multi-authored documents) was 2.83.

In the following sub-sections, we analyze publication activities in terms of author and then country. Next, we describe the impact of the contributions based on the citation analysis.

3.1 Most Productive Authors

The total number of authors was 3,185. All authors contributed to HE research, with one to seven publications for each author. In particular, one author published seven contributions, three authors published six contributions, four authors published five contributions, 14 authors published four contributions, 41 authors published three contributions, 221 authors published two contributions, and 2,901 authors published one contribution. In Fig. 1, we show the most prolific authors for the field during the period studied.

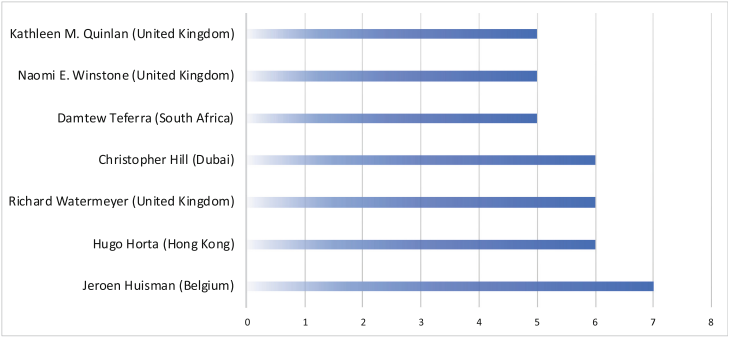

Fig. 1. Most prolific authors in the HE field (2016–2021)

Jeroen Huisman, from Belgium, is the most prolific author. He published seven multi-authored contributions during the period examined. Specifically, he contributed three studies in 2016 and four studies in 2019. The most cited paper among the first group of publications had 31 citations and focused on international branch campuses in Malaysia and Singapore [21]. The most cited paper in the second group of publications had 15 citations and focused on issues related to performance management and burnout [3], as well as on UK universities' mission statements [20].

Three authors published six contributions. Hugo Horta, from Hong Kong, published one multi-authored article per year except for 2019, when he published two multi-authored contributions. He studied the HE community by exploring research agendas [14], career performance [13], and collaborations outside academia [4]. His most cited

paper was Kim et al. [17], which focused on cohesion and integration in the HE research community in Hong Kong, Japan, China, and Malaysia, with a total of 17 citations.

Richard Watermeyer, from the UK, published six contributions in SHE, two single authored and four multi-authored. His research interests are marketization [7], evaluation of research (e.g., [24]), and new public management (e.g., [26]). Watermeyer [25] was his most cited paper, with 75 citations.

Christopher Hill, from Dubai, also published his six multi-authored contributions in SHE. His research interests are employability (e.g., [6]) and internationalization [12]. His most cited paper was Cheong et al. [5], which focused on the employability of Malaysian graduates, with 23 citations.

Finally, three authors published five contributions during the period analyzed. Damtew Teferra, from South Africa, published two single-authored and three multi-authored contributions. His research area was the study of early academic careers. His most cited paper was Teferra [22], with six citations, which focused on the teaching praxis of early academics in Africa. Naomi E. Winstone, from the UK, contributed to the field with five multi-authored documents. Her main area of study is assessment and feedback seeking, as well as recipience. One of her articles that focused on these themes had 89 citations [27]. Kathleen M. Quinlan, from the UK, published two single-authored and three multi-authored documents. Her most cited paper focused on developing student character through disciplinary curricula, with 11 citations [19].

In the next section, we explore scientific production at the country level.

3.2 Most Productive Countries

Figure 2 shows the most productive countries, arranged according to the number of papers they published during the period considered. In particular, the graph depicts the countries that contribute to the field with at least 20 publications. The graph shows, in blue, the number of contributions in which all authors share the same affiliation (single country paper [SCP]), and, in red, the number of papers in which the corresponding author's affiliation is the country considered, whereas the affiliation of the other authors is a different country (multiple country paper [MCP]).

The UK was the most productive country, with 319 papers divided into 265 SCPs and 54 MCPs. Australia followed the UK, with 125 papers divided into 108 SCPs and 17 MCPs. Therefore, the difference between the first and second countries in the dataset was 194 papers—157 SCPs, and 37 MCPs. The UK overcame Australia by 155.52%.

The US published 72 SCPs and 15 MCPs for a total of 87 contributions. Spain published 34 SCPs and 7 MCPs, for a total of 41 publications. Finland published 24 SCPs but no MCP. China published 24 SCPs and 20 MCPs. South Africa published 22 SCPs and 2 MCPs. Sweden and Germany contributed 21 SCPs each, but Sweden published 4 MCPs, and Germany published 9 MCPs. The Netherlands published 23 papers divided into 18 SCPs and 5 MCPs. Portugal contributed 22 publications—12 SCPs and 10 MCPs. Canada and Italy published 21 papers each. In particular, Italy contributed 16 SCPs and 5 MCPs, whereas Canada contributed 20 SCPs and 1 MCP. Finally, Ireland and Hong Kong published 20 contributions each. Ireland contributed 12 SCPs and 8 MCPs, whereas Hong Kong contributed 15 SCPs and 5 MCPs.

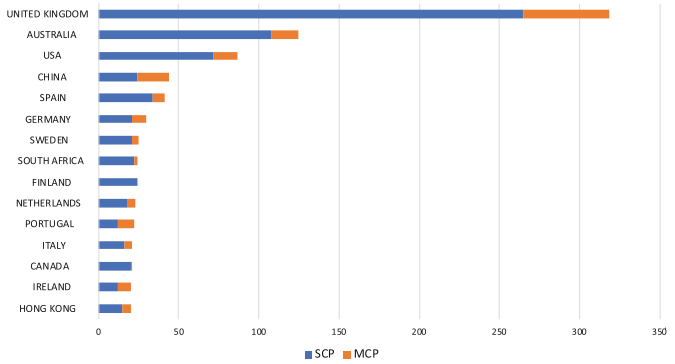

Fig. 2. Most productive countries. SCP: single country paper. MCP: multiple country paper.

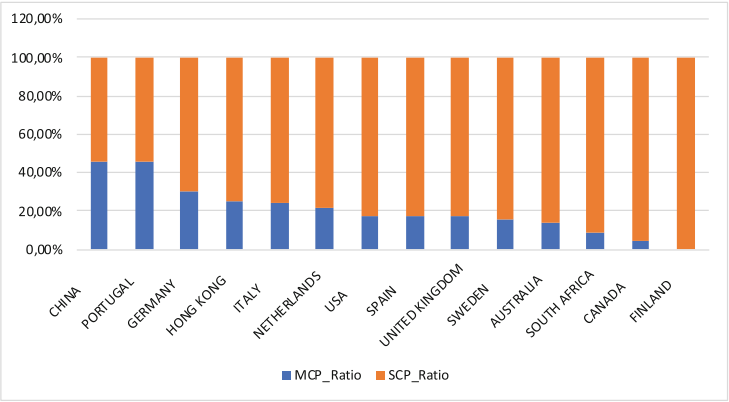

Fig. 3. Most collaborative countries. MCP_Ratio: multiple country papers divided by the sum of papers published by the country. SCP_Ratio: single country papers divided by the sum of papers published by the country.

Figure 3 shows the most productive countries arranged by the MCP ratio, which is the sum of MCPs divided by the sum of papers published by the country. The most collaborative countries were China and Portugal, with a 45.45% MCP ratio. Germany followed at 30%. Hong Kong, Italy, and the Netherlands all had ratios greater than 20% (i.e., 25%, 23.81%, and 21.74%, respectively). Between 10% and 20%, we find the US (17.24%), Spain (17.07%), the UK (16.93%), Sweden (16%), and Australia (13.60%). Finally, South Africa registered a ratio of 8.33%, while Canada registered 4.76%. Finland did not show any collaboration.

Figure 4 shows the country collaboration map built through the connections between the countries of affiliation of the papers' corresponding authors. The map shows that Anglo-Saxon countries guided scientific production in HE. In particular, the most significant number of collaborations was between the UK's corresponding authors and those in Australia (23), followed by the UK's corresponding authors and those in other countries. In particular, we identified 10 connections between the UK and the US and eight

connections between the UK and France, Germany, Ireland, Italy, and Spain. Moreover, the UK's corresponding authors showed seven collaborations with those in China, six with Norway, and five with the Netherlands, New Zealand, and Sweden. Finally, the UK's authors collaborated with those in 33 other countries. Australian corresponding authors collaborated with those in the US (7), Germany and New Zealand (3), Denmark, France, and Turkey (2), and nine other countries. The most significant number of US collaborations was with France (6), followed by collaborations with Germany and New Zealand (4), Chile and Korea (2), and 16 other countries.

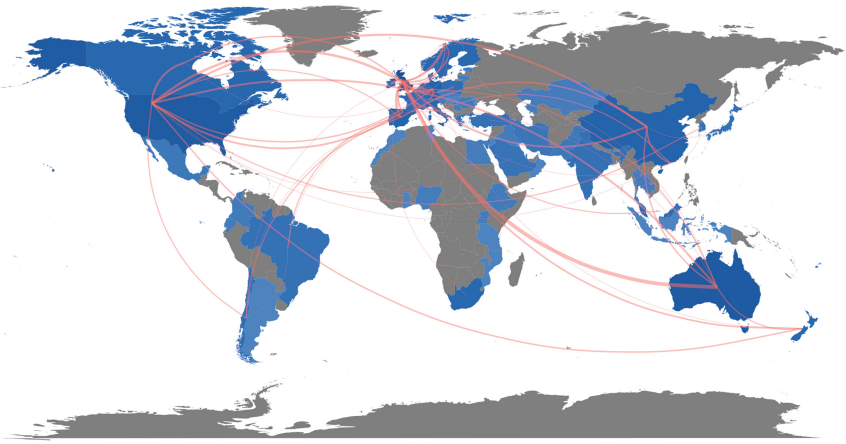

Fig. 4. Country collaboration map

We also identified other relevant collaborations of China, the Netherlands, Spain, Canada, and Germany. China's corresponding authors showed collaborations with those in the US (8), Hong Kong and Spain (5), Australia (4), Japan (2), and 10 other countries. Dutch corresponding authors collaborated mainly with those from Germany (8), followed by those from Belgium (5), Norway (3), and four other countries. Spanish corresponding authors had collaborations with those in Portugal (4), Chile and the US (3), Brazil (2), and seven other countries. Canadian corresponding authors had collaborations with US authors (8), German authors (2), and authors from five other countries. Finally, German corresponding authors collaborated with those from Belgian, Irish, New Zealand, and Norway (2), as well as with authors from seven other countries.

In the following section, we explore the impact of HE scientific production in terms of the total and average number of citations.

3.3 Citation Analysis

In Table 2, we show the total number of articles per year and the average total number of citations per article and per year. The most productive year was 2020, with 390 articles. In 2019, there were 308 contributions. In previous years, the number of publications was less than 200 per year. Articles published in 2017 had the highest average total number of

citations per article and per year at 15.53 and 3.88, respectively. The year 2016 followed, with an average total number of citations per article of 15.01, followed by the year 2018 at 3.34.

Table 2. Total number of citations per article and per year

Year	Number of articles	Average total number of citations per article	Average total number of citations per year
2016	189	15.01	3.00
2017	198	15.53	3.88
2018	196	10.03	3.34
2019	308	4.83	2.42
2020	390	1.68	1.68
2021	41	0.68	–

The trend of article publication per year was relatively stable in 2016, 2017, and 2018, during which the data registered the values of 189, 198, and 196, respectively. After that, the number of published articles increased over time. In 2019 and 2020, 308 and 390 articles, respectively, were published in the HE field, which is in line with our initial discussion of the increased productivity and interest in HE scientific research. Observing the publication trends in the following years will be interesting to understand the future of the field.

The average number of citations per article decreased over time. This trend was due to the increase in the number of years that passed from publication to the time of data extraction. Nevertheless, the trend was stable in 2017 and 2018. This observation led us to conclude that observing the number of citations per article in the following years could be beneficial in understanding the future impact of the field. While the number of articles may be increasing, the stability of citations can be an indicator of the stability of the general impact of the field. An increasing number of authors interested in the field does not necessarily mean an increase in scientific communities' interest in HE.

The average total number of citations per year did not show a stable trend. In particular, it started at 3.00 in 2016, registered a peak in 2017 (3.88), and then decreased over time. Nevertheless, the total number of articles in the dataset was 1,322. Therefore, a difference of 0.88 between 2016 and 2017 seemed particularly significant. In this sense, observing the trend of these data in the following years should lead to stronger conclusions about the general impact of scientific research in the field of HE.

The UK, which had the most significant number of published papers, had the greatest total number of citations (Fig. 5). This finding was not unexpected, given the difference in the total number of published articles between the UK and the other countries. Nevertheless, there was a considerable difference between the second country, Australia, and the following countries in terms of the total number of citations (e.g., US, Portugal, and Spain).

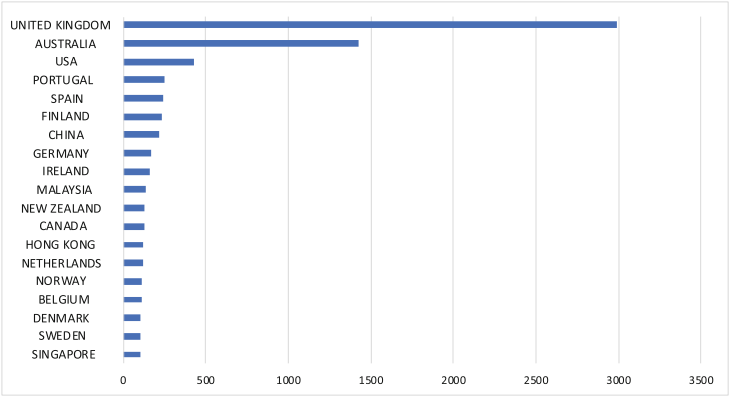

Fig. 5. Total number of citations per country

Comparing the total number of published articles and the total number of citations per country was interesting. The UK, Australia, and the US were in the top ranks in terms of the number of published articles and citations. China was ranked third in the number of published articles, but it was ranked seventh in citations per country. Portugal had a peculiar condition. It ranked 11th in the total number of published papers, but it ranked fourth in the number of citations per country. Therefore, Portugal's impact on HE should be observed in the following years. Finland had a similar condition. It was ranked ninth in the number of publications, but it was at the same time ranked sixth in the number of citations.

There were different situations for other countries, such as Sweden and Italy. Sweden was ranked seventh in the number of publications, but it was ranked 18th in the number of citations. Italy was ranked 12th in the number of publications, but it was not on the list of countries with more than 100 citations. A similar condition was observed for South Africa and Hong Kong.

Figure 6 shows the countries' average number of article citations. The graph displays a consistent picture of the average number of citations in the HE field. Singapore had the most significant average number of article citations (25.75), but it had only 103 total number of citations. Malaysia and Denmark had similar conditions. Malaysia had 136 total number of citations, while it ranked second in the average number of article citations at 12.36. Denmark had 108 total number of citations, while it ranked third in the average number of article citations at 12.00. Portugal had a high impact, with 249 total number of citations and an average at 11.32. Moreover, Portugal had the same average number of article citations as Australia, one of the most productive countries in the HE field.

4 Discussion and Implications for Future Research

In this article, we used bibliometric analysis to understand developments in the HE research community in recent years (2016–2021). In particular, we analyzed the scientific papers published in the most influential journals of education listed in AJG 2021. We

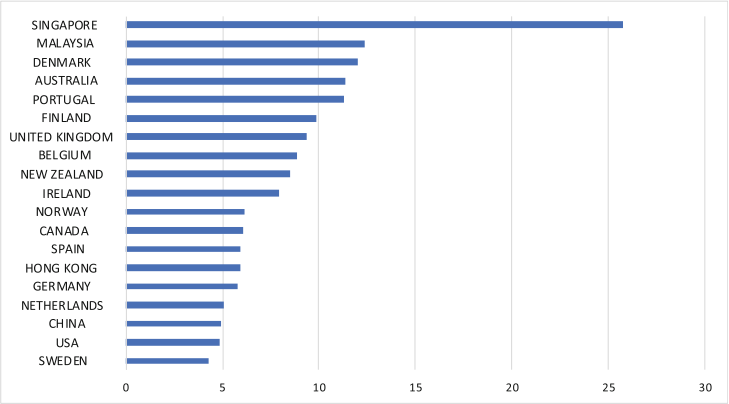

Fig. 6. Average number of article citations

performed an analysis of the most productive authors and countries. Furthermore, we analyzed the impact of HE research through citation analysis.

The most productive authors have common research interests. Their papers focus on academic careers, performance management in academia, research evaluation, new public management, and internationalization. Moreover, interest in students' employability has increased over time. The most productive countries in terms of publications are the UK, Australia, and the US, but they are not the most collaborative countries. China, Portugal, and Germany top the list in terms of collaboration.

Citation analysis shows a stable interest in the field. Considering an in-depth analysis of the indicators of citation in the future is an excellent opportunity to improve research on HE status.

Figure 7 shows the trend of significant topics, which was computed using the most recurrent keywords in the database. From 2016 to 2018, we observed a stable interest in academic achievement, both in terms of results and collaboration. From 2017 to 2019, the data show an increasing interest in internationalization, both in general terms and among international students. From 2018 to 2020, the graph shows a stable interest in management education and related content, such as business schools and entrepreneurship education. Finally, topics such as socioeconomic status, identity, gender differences, and cultural capital also consistently drew attention.

A relevant implication of our work is underlining how collaboration plays a critical role in defining the dynamics of the scientific community. There is an apparent discrepancy between the exponential growth in the number of articles in the field and their impact on citations, which seems relatively stable. Collaboration could provide an incentive for the development of HE impacts. For this reason, this study highlights the need to guarantee a more significant number of collaborations between different countries in order to increase the scientific impact of the discipline.

Furthermore, the highly multidisciplinary nature of HE implies the need to integrate a focus on article content. Although many attempts were developed to map the field from the side of topics and themes development (e.g., [8]), more space should be devoted to the recent evolution of the scientific debate. Therefore, we recommend that future

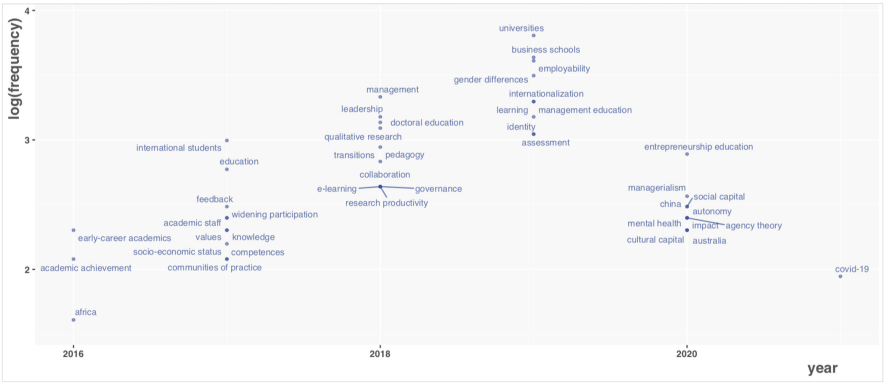

Fig. 7. Trend of major topics

research be performed using mixed methods, enriching the quantitative aspects of the conclusions.

The HE research community reveals increasing dynamism over time. Its multidisciplinary characteristics have led the field to attract an increasing number of researchers. Moreover, the numerous topics debated have allowed the field to achieve an in-depth exploration of a wide range of subjects. The changing external environment contributes to the field's development, but researchers' essential topics do not seem to follow major external trends, such as technology. The replication of our study could guarantee an increasingly clear view of the status of HE research. Finally, further in-depth analyses of emerging or declining themes in the field could integrate our research.

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The Evolution of Hybrid Organisations' Research: A Bibliometric Analysis

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Abstract. Hybrid organisations have become important due to their growing popularity based on their different and flexible forms and suitability for all the stakeholders. We investigate the evolutionary trend of the research on hybrid organisations discourse. For this purpose, we analyse a dataset composed of 471 papers selected from the Scopus platform. Adopting a bibliometric analysis approach, we perform descriptive and topic analyses. The results of the descriptive analysis show the growing interest of researchers on this specific topic, specifically in recent years. The topic analysis presents the main topics studied by the authors in our dataset. We find that hybrid organisations topic has been linked with different themes and issues, including social enterprises, institutional logics, social entrepreneurship, governance, sustainability, non-profit organisations and benefit corporation.

Keywords: Hybrid organisations · Social entrepreneurship · Bibliometric analysis · Topic mapping

1 Introduction

In the current era, firms are breaking stereotypes by focusing on a single aspect because it has become essential for them to stay alive in the market. Therefore, there has been a blurring of boundaries for both for-profit and non-profit firms in recent times between financial and social goals [1–3]. This phenomenon fosters the hybridisation of those organisations. Hybrid organisations are based on different elements, processes, logics, and forms of two or more categories such as public, private, or non-profit [4–6] and are characterised as an organisation with a variety of values. It is argued that hybrid organisations combine the public sector with the private sector, third sector or both [7]. For instance, examples of hybrid organisations are partnerships between private and public firms and contracting out [4, 8].

Unlike only for-profit organisations that focus on values concerned with the efficient and profitable production of goods or services, hybrid organisations provide also care to the community by breaking the traditional focus of profit generation only [9]. Based on

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the literature, a hybrid organisation can be defined as a type of organisation that is based on at least two distinct sectors (public, private or non-profit), logics (social, market or business) and value systems (social impact or profit generation) [4, 10].

The trend of hybrid organisations is increasing probably due to the growing and evolving expectations of different stakeholders related to different values. In a way to address these growing expectations, companies are called to deal with multiple values. Examples could be the need for companies to adopt sustainable behaviour and the necessity to meet UN SDGs (United Nations Sustainable Development Goals).

In the earlier literature, social enterprises, discussed mainly in organisation studies [11], are the most studied and representative category of hybrid organisations [1, 4, 12]. Moreover, non-profit organisations could be seen as a hybrid organisation when they become business-like, studied mainly in management and organisation studies [13].

So far, scholars from critical accounting and interdisciplinary fields have scantly focused on the relationships about how the goals of hybrid organisations are affected by the different actors and their individual values and what role they play in developing management accounting practices [14]. Nonetheless, in the literature, there is limited research on the role of different actors in hybrid organisations in designing and implementing accounting and accountability practices [15, 16]. Hence, future studies can be conducted inside the hybrid organisations [17] to seek further thorough insights about internal operational and accounting practices (e.g. [18–20]) instead to perform external examinations or interpreting some official documents [21].

So in a way to better address the investigation about the drivers, hurdles, and pressures in diverse hybrid organisations for creating value and the accounting implications, as well as to explore the role of different actors and accounting practices for measuring and disclosing multiple values created by hybrid organisations [13], we believe that a detailed picture of all the studies already done through a systematic literature review is necessarily preparatory.

In past and recent literature, researchers have performed systematic literature reviews (SLRs) on hybrid organisations such as non-profit organisations becoming business-like [13] and the role of performance measurement systems in social enterprises to manage multiple logics [22]. Similarly, in the recent literature, the SLR is conducted on the relationship between multinational corporations and the concept of corporate social innovation to investigate how the concept of corporate social innovation has evolved [23]. Further, the SLR is performed on social entrepreneurship organisations [24] and social entrepreneurship and social innovation in the third sector [25].

The earlier SLRs conducted are based on specific phenomena. They do not provide the evolutionary trend on hybrid organisations as a general, even though an SLR [13] is based on the time period from 1972 to 2014. However, their focus was to confront the challenges in studying the field of non-profit organisations becoming business-like. Therefore, the earlier literature lacks the examination of the emergence of hybrid organisations topic. Nevertheless, the topic of hybrid organisations has recently received much attention from researchers due to the growing trend of hybrid organisations. There has been a tremendous increase in studies on hybrid organisations in recent years. Specifically, we have the majority of the studies on hybrid organisations in the last decade. Therefore, a thorough examination of previous studies on hybrid organisations topic is

necessary to highlight the most prevailing and significant topics that have been studied concerning hybrid organisations topic. Mainly, it is essential to assess the trend of studies on hybrid organisations from the start to the present. Therefore, based on these research gaps, we aim to conduct a bibliometric analysis on the topic of hybrid organisations and to explore its evolutionary trend. According to our best of knowledge, this is the first study that performs bibliometric analysis to examine the emergence of hybrid organisations. Further, we aim to describe the main phenomena in this field of study to provide a fruitful research agenda.

The results based on descriptive analysis show the growing interest of researchers on the hybrid organisations topic, and interestingly the trend is further increasing in the present. The topic analysis is based on the trend of the top 34 used keywords and co-occurrences of the authors' keywords. This analysis presents that hybrid organisations topic has been linked with different themes and related challenges. Specifically, the main studied topics are social enterprises, institutional logics, social entrepreneurship, governance, sustainability, non-profit organisations and benefit corporation.

The remainder of the paper is structured as follows. Section 2 discusses the research method and Sect. 3 presents the descriptive bibliometric analysis. Section 4 discusses the main topics investigated in the dataset. Lastly, Sect. 5 presents the conclusion.

2 Research Method

We applied a bibliometric method to examine the evolutionary research trend of hybrid organisations topic [26, 27]. The bibliometric analysis describes, evaluates and monitors published research using the quantitative approach. This technique is potential enough to introduce a systematic, transparent, and reproducible review process and, therefore, improves the review quality [28, 29]. This method is advantageous as it has no subjective bias and provides aid in reviewing literature even before the formal analysis by indicating the influential studies and mapping the research field [30, 31]. The bibliometric method has two primary uses, including performance analysis and science mapping [32]. Performance analysis examines the performance for research and publication of both institutions and individuals while science mapping uncovers the structures and dynamics of the investigated scientific field [30].

In bibliometric research studies, it is essential to ensure both validity and consistency, and for this reason, the selection of the literature is considered a crucial factor. For this purpose, we adopt a procedure of three-step for selecting the literature and analysing the results as presented in Fig. 1. First, we select the database containing bibliometric data and then filter the set of core documents. In the second step, after completing the procedure of dataset identification, we refine the data where we cleaned and standardised the content of selected fields in the dataset. In the last step, we perform the data analysis, which comprises two analyses:

1. descriptive analysis, where we highlight the indicators of the descriptive performance of the dataset; and
2. topic analysis, where we provide the conceptual structure of the dataset and explore major themes based on social network analysis tools.

We use the R and Bibliometrix package to perform bibliometric analysis [27, 33].

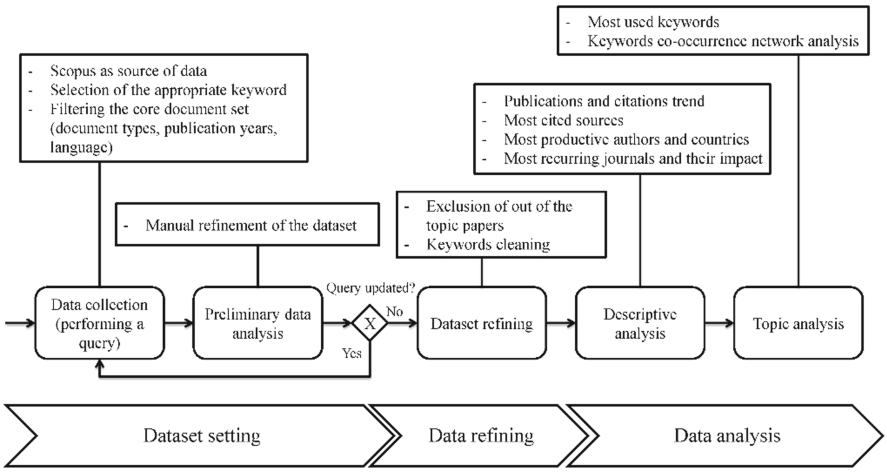

Fig. 1. Research protocol (adapted from [34])

2.1 Data Collection and Refinement

We select the Scopus database to extract the data as this database extensively provides coverage for peer-reviewed journals [35]. This database is considered one of the most reliable databases for a similar kind of study, and also it offers data that is valuable and has a high impact [35]. We collect the data by performing a research query on the database.

The research query process is established based on the key papers related to hybrid organisations [36]. We perform a number of iterations to define a research query to get all the relevant manuscripts related to the research field. The final query we ran was: ("hybrid organisations"). We run the query on the selected keywords in titles, abstracts and keywords, and we get a total of 632 contributions.

In the next step, we restrict the search and consider only journal articles published in English for the time span from 1985 to 2021. We made this choice for quality control due to the process of peer-review. This filtration resulted in a sample of 494 articles.

We next move toward cleaning the dataset as necessary for data analysis. In the cleaning phase, first, we went through all the articles to make sure if there is any paper not related to the topic of hybrid organisations. This step resulted in the exclusion of 23 articles that were out of the topic. Therefore, our final sample is based on 471 articles. Further, in cleaning the dataset, we also homogenised the keywords appearing in the research papers by replacing terms indicating a similar concept with a unique word. For instance, we replaced "Benefit Corporation" and "Benefit Corporations" as "Benefit Corporation"; "Hybrid Organising" and "Hybrid Organizing" as "Hybrid Organising"; and "Hybrid Organisation", "Hybrid Organisations", "Hybrid Organization",

"Hybrid Organisations", "Hybridorganization", "Hybridorganizational Type" and "Organizaciones híbridas" as "Hybrid Organisations". At the end of this step, we reduce the initial number of authors' keywords from 1331 to 1238.

3 Descriptive Bibliometric Analysis

3.1 Publication by Year

Figure 2 shows that the research on hybrid organisations dates back to 1985. According to Fig. 2, the trend of research publications can be divided into three phases over the years. The first phase ranges from 1985 to 2000, the second phase from 2001 to 2011, and the third phase from 2012 until 2021. The first phase remains consistent as in the entire period, only 1 or 2 papers were published each year, and we have 0 publications for 5 years. It represents that the topic was really new and remained unpopular even though the time period was extensive. In the second phase, we see a slight increment in the publications as in this phase, the minimum and maximum number of publications were 1 and 9 for 2003 and 2006, respectively. In this phase, we further identify both increasing and decreasing trends. Overall, the topic became popular among the researchers in this phase. The third phase, the most significant one among all phases, shows a remarkable trend. There was a huge increment in the number of publications where a minimum of 13 articles were published in 2012 while a maximum of 85 articles were published in the year 2020. It depicts that the topic has received much popularity from 2012, and

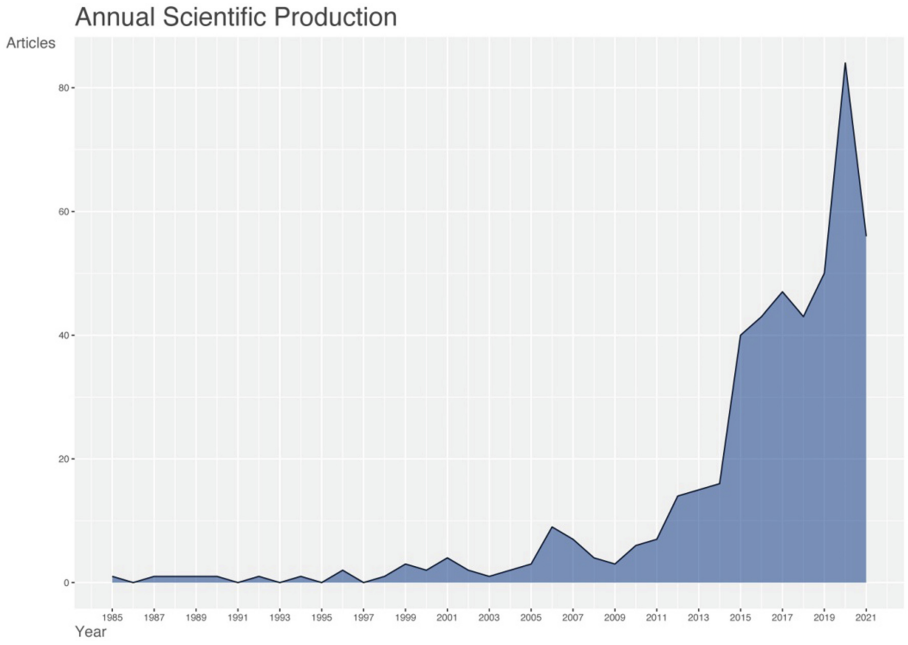

Fig. 2. Number of publications year-wise since 1985

there was unprecedented growth in this phase both in the research publications and the topic importance. Overall, we can identify an increasing trend in this phase. It implies that the topic of hybrid organisations has become important for organisations and their stakeholders worldwide due to its growing trend.

3.2 Citations by Year and Most Cited Papers

In the scientific community, the popularity of any publication and its influence in a specific field can be identified considering the number of citations it has received, thus indicating the accurate picture of any published document [37, 38]. In our corpus, the paper with the most citations is [39] with 1127 citations, followed by [1, 4, 17] and [40] with 804, 622, 548 and 489 citations. Interestingly, these five papers with the most citations follow the same order regarding the impact based on the average total citations per year. It represents that these papers received the most citations, and their impact is also remarkable.

By examining the papers with the most citations in our dataset, we can identify that the focus of these studies was based on different themes and challenges related to hybrid organisations. Some researchers explored how the hybrid nature can be developed and maintained new forms of hybrid organisations, combining institutional logic in an unknown way, without the presence of a "ready-to-wear" model that is necessary to handle the troubles in combining logics process [39]. The authors explored how competing institutional logics are internally managed by the hybrid organisations [17] and provided a selective coupling strategy to manage competing institutional logics.

The authors also introduced and developed the notion of hybrid organising, where an organisation combines multiple organisational forms based on activities, structures, processes and meanings [1]. They provided that a social enterprise is an ideal form of hybrid organisation [1, 4]. Some authors' focused on examining the critical governance challenges social enterprises face, known as hybrid organisations [41]. These challenges include accountability of the objective for dual performance and accountability to multiple key stakeholders to avoid drifting of a mission and maintain hybridity.

The authors performed a systematic analysis to categorise forms of tensions that occur between social missions and financial missions in the social enterprises and then emphasised the prevalence and variety of these tensions [42]. They also explored how four distinct organisational theories offer insight into these tensions [42]. Some authors examined which factors of hybrid organisations affect their social performance by studying work integration social enterprises (WISEs) [43]. They provide the effective usage of spaces of negotiation between the groups for social and economic activities in hybrid organisations to maintain tension with productive attributes [43].

[40] developed a process model to navigate paradoxes of performing [44] for hybrid organisations specifically for change and innovation. [45] provided the understanding of organisations with hybrid forms by analysing the recent development. Authors also considered state-owned enterprises as hybrid organisations [46]. They provided the groundwork based on studying state-owned enterprises for management scholars to understand these organisations in the future better [46]. Authors also performed SLR on hybrid organisations such as non-profit organisations becoming business-like [13], where they mapped the field and provided suggestions for further research.

Figure 3 displays the number of citations year-wise with the minimum, maximum and average number of total citations. This analysis helps understand the impact of the manuscripts published in a particular year as it presents in which years the average is representative and/or distorted. The accurate representation of average means that all the papers published in a specific year received almost the same number of citations. Therefore, it represents the greatest impact of published articles. On the contrary, the distortion of average means that a single manuscript has several citations combined with other papers having few citations. For instance, in our dataset, the years 2010, 2013 and 2014 represent the distortion. In these three years, we have a paper with most citations and other documents with low citations for each year. Therefore, the average number of citations are low. In contrast, the year 2004 represents publications with the most significant impact concerning the average number of citations.

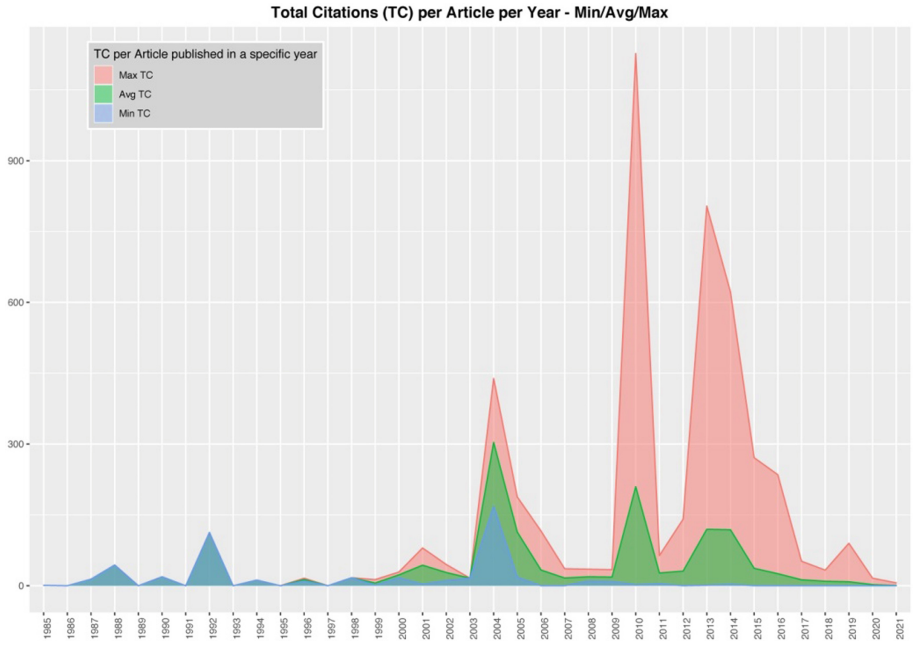

Fig. 3. The average number of citations of papers published year-wise

3.3 Most Productive Authors

Figure 4 shows the production of 23 out of 973 authors' year-wise based on at least two papers in the dataset. The dot size represents the number of documents, whereas the colour intensity shows the total citations year-wise. Figure 4 displays that Battilana J., Grossi G. and Haigh N. have the most contributions in terms of the number of published articles. Interestingly, each author has published 6 papers from 2010 to 2021. The second most contribution in terms of the number of published articles in the field of hybrid

organisations is made by Lee M., Mcmullen J.S., Schröer A. and Vakkuri J. as each author has four contributions. However, the authors with higher impact are Battilana J., Lee M., Doherty B. and Pache A.-C. Another aspect we can identify from this analysis, as explained previously, is that the research on hybrid organisations topic has grown from 2012 and in recent times, there has been remarkable growth.

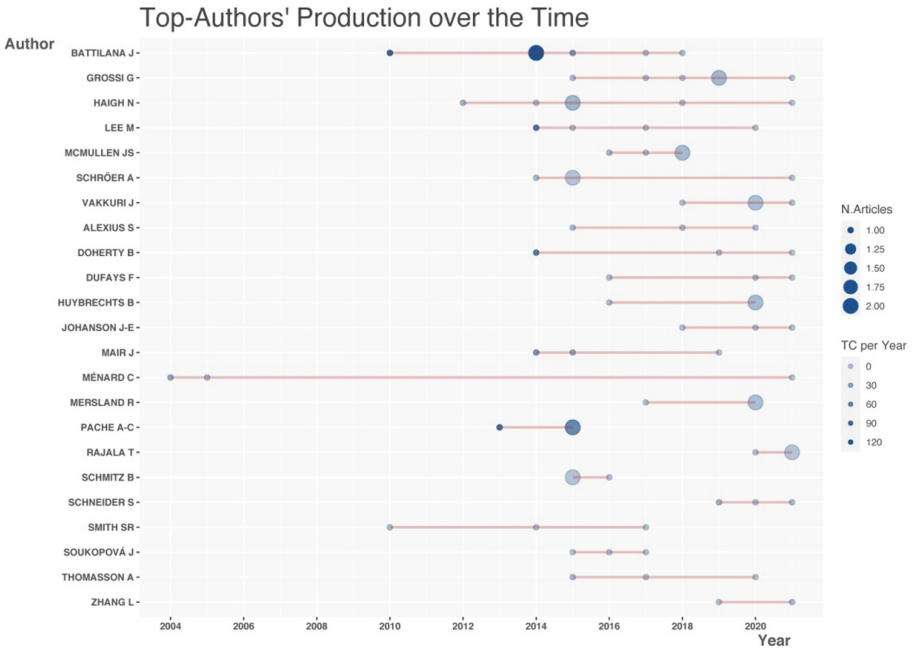

Fig. 4. Most productive authors

3.4 Journals' Publishing Activity

Several scholars have conducted research on hybrid organisations topic and have successfully published them in numerous journals. In Table 1, we present the 21 out of 261 sources with the most number of publications by a journal by considering that each journal has at least five publications. We further provide metrics of each journal for measuring the impact and productivity of any published document, including the h-index, g-index and m-index. The h-index allows measurement of both the impact and productivity of any publication by the researcher. In actuality, the g-index and m-index are versions of the h-index where the g-index provides the information of papers having more citations in a dataset. The g-index is always equal to or more than the h-index. In contrast, the m-index presents the h-index year-wise since the first published work. We further provide total citations and the first publication year of each journal.

We also provide the ranking of each journal based on the Academic Journal Guide (AJG 2018, https://www.charteredabs.org), which is published by CABS (Chartered

Association of Business Schools). The reason for providing ranking details is that it allows for the information regarding their general recognition in the field of business based on both impact and citations. Further, we also include journals respective fields according to AJG.

Table 1 shows that the most productive journal is Voluntas, with 19 out of 471 publications, followed by Sustainability (Switzerland) with 16 publications. The other journals that appear at the top of the table with respect to most publications are the Journal of Business Ethics and Accounting, Auditing and Accountability Journal, with 12 and 11 publications. However, if we consider journal rankings as per AJG-2018, the top journals appear at the bottom of the table due to fewer publications. For instance, Organization Science and Academy of Management Journal are top-ranked journals as 4* each has 5 publications. It depicts the importance of hybrid organisations as we identify publications in top journals. Further, if we consider the field of journals, it appears that the papers on hybrid organisations are published in a range of fields, showing the importance of the topic. Interestingly, the hybrid organisations topic is still growing as the significant growth started in 2012. In this short period, several journals based on different fields have considered this topic due to its relevance in today's world.

In terms of total citations, according to Table 1, the Academy of Management Journal has the most number of total citations, with 2775 citations, and the rest of the journals are too far. Further, the California Management Review is the journal with the second most total citations, with 417 citations. Voluntas also appears on the top if we consider metrics including the h-index and g-index as both indexes are high, which shows higher productivity and impact and papers with most citations. However, in the case of m-index, California Management Review and Journal of Business Research have high m-index. The Academy of Management Journal has higher total citations. However, its metrics are not high due to the fewer publications as it has five publications. On the other hand, Voluntas has higher productivity having high metrics.

Table 1. Most recurring journals, their metrics, total citations, ranking and field.

	Journal title	h-index	g-index	m-index	TC	No. of pub.	PY start	AJG-field	AJG 2018
1	Voluntas	8	16	0.50	285	19	2006	SECTOR	2
2	Sustainability (Switzerland)	4	6	0.67	52	16	2016	–	–
3	Journal of Business Ethics	6	10	0.50	106	12	2010	ETHICS-CSR-MAN	3
4	Accounting, Auditing and Accountability Journal	5	9	0.56	95	11	2013	ACCOUNT	3

(*continued*)

Table 1. (*continued*)

	Journal title	h-index	g-index	m-index	TC	No. of pub.	PY start	AJG-field	AJG 2018
5	California Management Review	7	8	1.00	417	8	2015	ETHICS-CSR-MAN	3
6	Journal of Social Entrepreneurship	3	5	0.50	34	8	2016	ENT-SBM	2
7	Journal of Management Studies	6	7	0.25	347	7	1998	ETHICS-CSR-MAN	4
8	Nonprofit and Voluntary Sector Quarterly	4	7	0.57	301	7	2015	SECTOR	3
9	Organisation Studies	5	7	0.23	236	7	2000	ORG STUD	4
10	Public Management Review	3	7	0.14	66	7	2001	PUB SEC	3
11	Housing Studies	4	6	0.40	154	6	2012	–	–
12	Journal of Cleaner Production	4	6	0.67	60	6	2016	SECTOR	2
13	Public Administration	4	6	0.20	45	6	2002	PUB SEC	4
14	Academy of Management Journal	5	5	0.42	2775	5	2010	ETHICS-CSR-MAN	4*
15	International Review of Public Administration	2	2	0.29	7	5	2015	–	–
16	International Studies of Management and Organization	2	4	0.29	20	5	2015	ETHICS-CSR-MAN	2
17	Journal of Business Research	2	3	1.00	11	5	2020	ETHICS-CSR-MAN	3
18	Journal of Business Venturing	3	5	0.75	88	5	2018	ENT-SBM	4
19	Organization Science	3	5	0.50	50	5	2016	ORG STUD	4*
20	Public Money and Management	4	5	0.80	38	5	2017	PUB SEC	2
21	Strategic Change	1	1	0.20	3	5	2017	–	–

Notes: h, g, and m-index are metrics for research impact, TC is total citations, No. is number, Pub. is publications, PY is publication year, and - indicates that the journal is not in the AJG

3.5 Publishing Activity by Country

The research on hybrid organisations is not limited to only one region or a specific region of the world, as this topic has been studied worldwide. Table 2 shows the list of 38 countries based on the affiliation of 973 authors' in the dataset. This analysis shows each country's output concerning the topic and respective citations.

Table 2 displays different aspects with respect to each country. In the first instance, the volume of the total articles. Second, the Single Country Publication (SCP) indicates authors belong to the same county. Third, the Multiple Country Publication (MCP) shows authors belong to different countries. The articles based on the authors from multiple countries are related to the corresponding author country. Fourth, the total citations received and fifth, average article citations.

Table 2 indicates that most publications are from the USA with 61 papers, followed by the UK with 44 articles. The publications from countries including Germany, Italy, and the Netherlands are few compared to the USA and UK. However, all three countries have the same number of publications, each with 21 publications.

The analysis further indicates that the USA is also leading the chart in terms of collaborations. It has 16 MCP, followed by the UK with 13 MCP, Denmark with 6 MCP, and Italy with 5 MCP. Overall, the analysis represents that the most productive countries are also the most collaborative ones. 13 out of 38 countries have only SCP publications, whereas New Zealand has only MCP publications.

The analyses of total citations and average article citations provide valuable insights to get an accurate picture of the publications concerning the impact and the influence. The analysis indicates that the USA is the most productive country with more citations. However, in terms of average article citations, Austria, France, the UK, Germany, and Costa Rica have the higher number of average article citations.

Table 2. Most productive countries, total citations and average article citation per country

	Country	Articles	SCP	MCP	TC	AAC
1	USA	61	45	16	1285	21.07
2	United Kingdom	44	31	13	1092	24.82
3	Germany	21	18	3	508	24.19
4	Italy	21	16	5	195	9.29
5	Netherlands	21	19	2	421	20.05
6	Sweden	20	19	1	228	11.40
7	Finland	13	11	2	60	4.62
8	Australia	12	8	4	147	12.25
9	France	10	8	2	652	65.20
10	Norway	10	7	3	85	8.50

(*continued*)

Table 2. (*continued*)

	Country	Articles	SCP	MCP	TC	AAC
11	Belgium	9	6	3	81	9.00
12	Canada	9	7	2	63	7.00
13	Denmark	9	3	6	65	7.22
14	China	8	4	4	50	6.25
15	Spain	7	4	3	96	13.71
16	Switzerland	7	4	3	24	3.43
17	South Africa	6	3	3	12	2.00
18	India	5	4	1	2	0.40
19	Israel	5	5	0	39	7.80
20	Portugal	5	4	1	81	16.20
21	Brazil	4	2	2	31	7.75
22	Austria	3	2	1	235	78.33
23	Korea	3	3	0	8	2.67
24	Costa Rica	2	1	1	44	22.00
25	Hong Kong	2	1	1	23	11.50
26	Ireland	2	2	0	31	15.50
27	Japan	2	2	0	0	0.00
28	Malaysia	2	2	0	18	9.00
29	New Zealand	2	0	2	0	0.00
30	Poland	2	2	0	22	11.00
31	Thailand	2	1	1	1	0.50
32	Chile	1	1	0	12	12.00
33	Egypt	1	1	0	3	3.00
34	Iran	1	1	0	3	3.00
35	Pakistan	1	1	0	6	6.00
36	Romania	1	1	0	0	0.00
37	Singapore	1	1	0	4	4.00
38	Slovakia	1	1	0	0	0.00

Notes: SCP is Single Country Publication, MCP is Multiple Country Publication, TC is Total Citations, and AAC is Average Article Citations.

4 Exploring the Main Topics Investigated in the Dataset

We examined the authors' keywords with the most frequent usage to identify the most important topic discussed in the corpus. The keywords analysis sheds light on both the content and major concerns on hybrid organisations topic that have been addressed in 471 articles of our dataset. We provide topic analysis on hybrid organisations is based on the following two steps:

3. the trend of the most used keywords (top 34); and
4. co-occurrences of the authors' keywords

4.1 Top 34 Most Used Keywords

This analysis presents the most used keywords the authors' defined in their respective papers on hybrid organisations with at least 6 occurrences. According to Fig. 5, the most recurred keyword is hybrid organisations with 229 occurrences, followed by social enterprises with 81, institutional logics with 44, social entrepreneurship with 39, governance with 21, and hybridity with 21 occurrences.

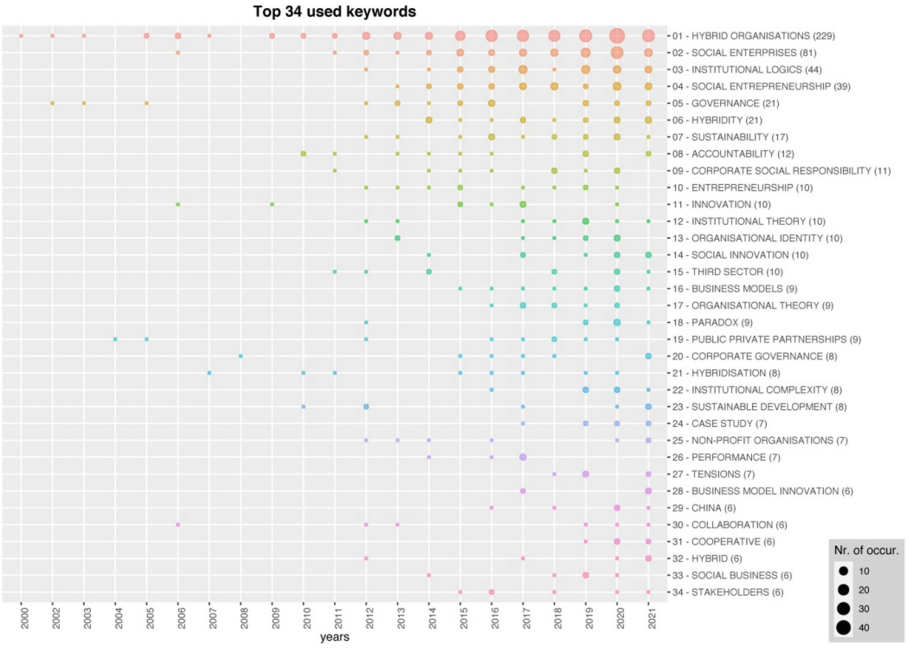

Fig. 5. The main thirty-four keywords used in the dataset over the years

The other most frequent keywords are sustainability, accountability, and corporate social responsibility, with 17, 12, and 11 occurrences. The keywords including

entrepreneurship, innovation, institutional theory, organisational identity, social innovation, and the third sector have the same number of occurrences as each has 10 occurrences. Business models, organisational theory, paradox, public private partnerships keywords also have the same number of occurrences, each with 9 occurrences. The keywords of corporate governance, hybridisation, institutional complexity, and sustainable development recurred 8 times. The keywords with 7 or lower occurrences include case study, non-profit organisations, performance, tensions, business model innovation, China, collaboration, cooperative, hybrid, social business and stakeholders.

We further identify irregularity in the appearance of the top 34 keywords except for the hybrid organisations as it has been recurring almost regularly since 2000. Interestingly its intensity has been increased over the years. For instance, in 2020, its occurrence reached up to 40, which shows its importance over the years and further growth in recent times. The second most frequent keyword is social enterprises which first appeared in 2006, and it frequently appears from 2011 until the present. However, its intensity increased in 2020. Institutional logics is the third keyword with the most appearances, first appeared in 2012 and is regularly recurring. Similarly, social entrepreneurship first appeared in 2013 and since then appeared frequently.

We observe that governance is the first keyword that appeared along with the hybrid organisations in 2002. The second keyword that appeared for the first time is public private partnerships in 2004, which did not appear from 2006 until 2011 and from 2013 until 2015. However, it appeared regularly from 2016 until 2020. The other keywords that appeared for the first time are social enterprises, innovation and collaboration, as all the three keywords first appeared in the year 2006. However, among these three keywords, we observe that social enterprises is the keyword that appears quite frequently. Regarding the most recent keywords, cooperative is the most recent one, which appeared in 2019, and then we have tensions and business model innovation keywords which appeared in 2018 and 2017, respectively.

We also observe that most of the keywords first appeared in 2012 and are still appearing due to the vital role of hybrid organisations. Most of the keywords, among these, are appearing regularly from 2017.

As earlier discussed, hybrid organisations is the keyword the authors used most in a specific year, specifically in 2020. In the same year, social enterprises is also used most compared to the rest of the years. The other keywords that appeared most in a specific year are institutional logics twice in 2017 and 2019, social entrepreneurship in the year 2020, governance in 2016, hybridity in 2021, the paradox in 2020, performance in 2017, sustainability twice in 2020 and 2016, innovation in 2017, institutional theory in 2019, organisational identity in 2020, tensions in 2019 and business model innovation in 2021. Most occurrences of the number of keywords in recent years present the greater interest of authors' addressing the issues of hybrid organisations due to their relevance in today's world.

4.2 Authors' Keywords Co-occurrences

We further analyse the links between the major topics studied in the corpus. This analysis provides a better understanding of hybrid organisations discourse. We create the

co-occurrences network based on the most used authors' keywords with at least 5 occurrences (appeared at least in five papers), as shown in Fig. 6. In Fig. 6, the keywords are the nodes, and there is a link between two of them if those are used in the same paper together, known as a co-occurrence. Furthermore, the appearance of the pair of keywords in a certain number of publications is represented by the thickness of the connection. Lastly, we delete those keywords without any connection in the diagram, removing any isolated node. According to Fig. 6, we can recognise different clusters of keywords based on their connections:

5. the pink cluster represents the link of hybrid organisations with social enterprises, cooperative, social business, organisational identity and tensions;
6. the dark green cluster represents the relation of hybrid organisations with institutional logics, theory, collaboration, and public private partnerships;
7. the light green cluster shows the connection among hybrid organisations and social entrepreneurship, innovation, value, business model innovation and institutional complexity;
8. the navy blue cluster relates hybrid organisations with governance, entrepreneurship and innovation;
9. the sky blue cluster shows the relation among hybrid organisations and sustainability, corporate social responsibility and business models;
10. the orange cluster focuses on the link between hybrid organisations and non-profit organisations; and
11. the red cluster links hybrid organisations with benefit corporation.

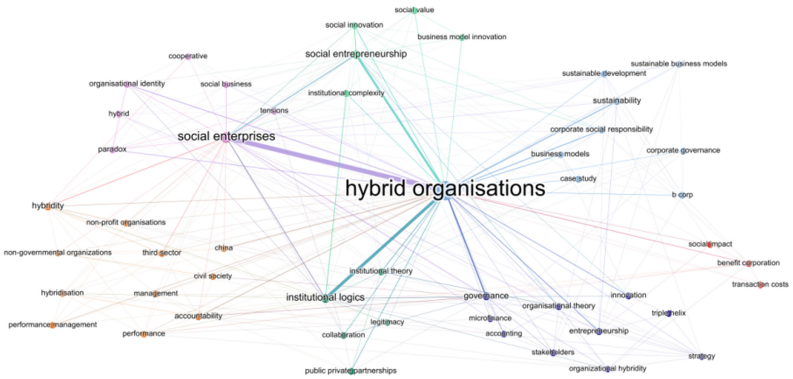

Fig. 6. Authors' keywords co-occurrence

Starting from Fig. 6, we can recognise multiple themes related to hybrid organisations discourse studied in the earlier literature. In the first instance, we identify the social enterprises' theme. In this theme, researchers have considered it an ideal form of hybrid organisations to study the challenges and issues in hybrid organisations. The social enterprises embed the social purpose along with the financial mission. Therefore, this type of organisation is similar to the hybrid organisation.

The second stream is based on institutional logics in which the authors' identified how to combine institutional logics of two different forms of organisations converging in a hybrid one. Each organisation type has distinct institutional logics, and hybrid organisations are based on two different forms. Hence, there exists a complexity between the institutional logics. Therefore, investigating how to combine institutional logics in a better way seems to be quite relevant.

The third stream is related to social entrepreneurship and innovation. In this stream, authors have presented driving forces, challenges, and opportunities for social entrepreneurship to provide solutions to social, cultural, or environmental issues. Similarly, the authors seem to better discuss social innovation to meet social needs than traditional solutions. Hence, it could be interesting to investigate how hybrid organisations focus on social entrepreneurship and innovation due to their social mission.

The fourth stream is related to governance, where the authors explored governance challenges in hybrid organisations. These organisations are not traditional ones, mainly because they combine multi-organisational forms, therefore they need to deal with more challenges related to governance issues. Consequently, it could be essential to identify the main governance challenges to govern hybrid organisations efficiently.

The fifth theme is related to sustainability, where the authors focused on companies' sustainable behaviour. The authors explored building sustainable hybrid organisations to cope with economic, social and environmental issues.

Researchers have focused on non-profit organisations or the third sector in the sixth stream. This sector is based on the social mission, and when it tries to become business-like, it is closely related to hybrid organisations.

Scholars considered a benefit corporation as a hybrid organisation in the last stream. The benefit corporation focuses on public benefit, sustainable value, and profit-generating mission.

5 Conclusion

We examine the evolutionary trend of hybrid organisations by performing a bibliometric analysis. For this purpose, we select a sample of 471 papers from the Scopus database and perform descriptive analysis on the dataset. Further, we perform topic analysis to identify the key topics in the corpus. The results of descriptive analysis depict the growing interest of researchers on the hybrid organisations topic, specifically in the recent past. The progressive growth in publications over the years supports the evolutionary trend of the topic. Interestingly the trend is further developing in the present.

The results of papers with most citations allow us to distinguish articles on different groups based on their examination of hybrid organisations topic based on different themes and challenges. Some authors explored the challenges of combining institutional logics in developing and maintaining the hybrid nature of the hybrid organisations. Other authors present social enterprises as the most representative and ideal form of hybrid organisations. Some authors explored the governance challenges faced by hybrid organisations, whereas others examined which factors affect the social performance of hybrid organisations.

The topic analysis presents the most used keywords by the authors' and their co-occurrences in our dataset. This analysis is helpful to identify the major topics in the

dataset. We observe that the topic of hybrid organisations is still growing, and scholars have highlighted different themes and challenges in hybrid organisations. Based on this analysis, we highlight multiple research themes related to hybrid organisations for further research based on the topic analysis. Specifically, the main debated topics are social enterprises, institutional logics, social entrepreneurship, governance, sustainability, non-profit organisations and benefit corporation.

This study contributes theoretically and practically as well. From a theoretical perspective, this study provides insights into the research on hybrid organisations topic over the years. Specifically, this study presents the most cited papers and papers with the most impact that contributed to the discourse. We further present topic analysis by providing the most used keywords and co-occurrences that highlight the important topics studied in the literature. Hence, this study contributes to the literature by highlighting the emergence of hybrid organisations topic. This study further highlights the more relevant topics concerning hybrid organisations and new phenomena emerging in the field.

For practical implications, we provide insights for the management of hybrid organisations by presenting the different themes with multiple challenges addressed by scholars in recent years. Therefore, they could enlarge their perspective considering these issues and challenges.

This is a preliminary study exploring the hybrid organisation discourse and has some limitations. The current study focused only on the Scopus database to gather the papers' data. Future studies can also consider other databases, such as WoS, integrating the current dataset for the broader analysis. Moreover, this study considered journal articles only for the analysis. Future studies can consider conference papers, case studies, and other publication types. Furthermore, our study is also limited to authors' keywords only. Hence, further analyses could be performed in future studies, such as the analysis of collaboration between authors, the co-citations analysis, the investigation of the conceptual structure map, identifying a set of clusters of papers and performing an in-depth analysis of the relevant contributions representing each cluster.

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The Slow Adoption Rate of Software Robotics in Accounting and Payroll Services and the Role of Resistance to Change in Innovation-Decision Process

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Abstract. Robotic process automation (RPA) has by now for years been viewed as a disruptive innovation that will have a significant impact on accounting, HR and payroll services, and yet the rate of adopting the innovation has not reached a level anticipated in past predictions. As several elements have a negative impact on the organization's rate of adopting RPA, passive resistance to change has a significant impact in the form of constant dithering. Resistance to change can emerge at any stage of the Innovation-Decision process and fluctuate throughout the continued adoption, causing wasted investments, capabilities and resources.

Keywords: Disruptive innovation · Resistance to change · Technology adoption · Diffusion of innovation · Robotic process automation

1 Introduction

Earlier studies of adopting and accepting technological innovations have been heavily centered on consumers', citizens', or organizations' initial decisions on adoption. Continued adoption is a much less known and theorized phenomenon. Later stages of the lifecycle of an information system are not clearly, if at all, portrayed in the established theories such as Diffusion of Innovation (DOI). A technological innovation which is not capitalized even near its full potential is a wasted investment, and it may impair the process of making other strategic decisions. Robotic process automation (RPA) was identified possibly to be one of these innovations when several job announcements for accountants were being spotted. This was related to one of such advertisers, and it was found out that they suffered from a constant lack of accountants and that the need for them had not decreased.

Customers of accounting and payroll services on the public sector expect inexpensive services with high quality while their services need continually to be increasing due to such demands as more advanced economic analyses and forecasts, or because of new regulatory and legislative requirements. Robotic process automation has been on the market for a while as a solution to the urge to increase organizations' economic efficiency and productivity by reducing manual work and transferring routine tasks from accountants

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and payroll experts to robots and thus freeing time for tasks which require competent understanding of financial services, such as customer interaction, substance-related problem solving and economic analysis. It has been viewed as a disruptive innovation that will have a strong effect on jobs and working methods. While many organizations may have initially adopted the RPA, the rate of adoption within the organization may be lower than initially anticipated, and thus the desired economic efficiency, improved quality of services or the desired range of offered services is not achieved.

This paper presents the research insights of an interpretive case study of adopting RPA among accounting and payroll services in the public sector when the role of resistance to change is considered as a part of the Innovation-Decision process of Diffusion of Innovation theory. Reviewing available earlier studies shows only a small number of articles centering on continued adoption, discontinuance, and especially on what role resistance to change is playing in continued adoption when it stops or progresses at a slow rate. This paper is primarily interested not in understanding or evaluating the technological potential of RPA itself but in understanding the critical elements of the slow rate of continued adoption of an innovation and especially examining the role of resistance to change on organizational level. An auxiliary interest lies in examining possible accelerating factors of the adoption process within the organization. This is done with the purpose of identifying possible factors that may impact the continued adoption of disruptive innovations in organizations which rely on both ICT and professional labour to offer their crucial services.

2 Adopting an Innovation

2.1 The Theoretical Background to Adopting Technological Innovations

Several theories and frameworks aim to explain how individuals and organizations adopt and accept innovations, including TRA, TAM, TPB and Diffusion of Innovation (DOI) theory. Theory of Reasoned Action (TRA) can be applied to explain behaviour in adopting technology. It emphasizes intention and personal attitudes and also the subjective norms which prescribe the intention [1, 2]. Technology Acceptance Model (TAM) is a further developed model from TRA and emphasizes perceived usefulness and perceived ease of use as a positive influence on the adoption process. Though widely used, some scholars argue that TAM has significant theoretical limitations because it neglects factors that dominate social, institutional, and individual behaviour [1]. Theory of Planned Behaviour (TPB) is an adaptation of TRA as well. Perceived behavioural control is a key factor of TPB, which has been widely used and further developed into such models as decomposed TPB, which furnishes even more attributes or factors for behavioural models, such as relative advantage, compatibility, the influence of significant others, and risk [1].

Diffusion of innovations [3] and its different models and frameworks is widely used in research relating to diffusion and adopting technological innovations.

The adoption of new technology is influenced by three key elements: the characteristics of the innovation, the aspects of the organization making the decision to adopt, and the prevailing social system [3, 4]. Slow adoption of technology results from several

factors, such as financial costs, resistance to change and slow diffusion of the innovation [5]. Patterns of adoption vary between countries, cultures, and subcultures [6].

Innovations that are based solely on information, the "idea-only" innovations, are, according to studies, adopted at a slower rate due to a lower degree of observability compared to hardware and software-based innovations [3]. The study of RPA adoption encompasses the diffusion of software-based RPA technology as well as the idea of a change in the roles and operating modes of professionals. A fundamental concept of DOI is the Innovation-Decision process where the adopting unit processes information with the purpose of reducing uncertainty about the advantages and disadvantages of the innovation, forming an attitude towards it and deciding either to adopt or to reject it. The Innovation-Decision model has five main stages: *1. Knowledge, 2. Persuasion, 3. Decision, 4. Implementation and 5. Confirmation* [3].

Perceived characteristics of the innovation play an essential role in the adoption process. Organizations may be divided into different *adoption categories* based on their innovativeness [3, 11], and, based on their adoption category, various characteristics of an innovation may be important to them [13]. DOI includes five attributes for innovation*: relative advantage, compatibility, complexity, trialability and observability* [3]. *Voluntariness* and *external pressure* are included in some research [7]. Relative advantage has often been found to be the key attribute in explaining the factors influencing the adoption [8]. *Perceived risks* have been found to influence the decision of adopting technologies as well [9], while the original DOI hardly touches the topic. Scholars have introduced several other attributes to cover comprehensive research of adopting and accepting technologies, such as *trust* [10], *image* and *result demonstrability* [11], and *price, problem solver, standards* and *technological edge* [12].

2.2 Resistance to Change and Insecurity

Resistance to change is an emotional reaction to either real or imagined threats to established practices [14]. Although resistance is a natural tendency in people, not all react equally or at the same degree [15]. Some scholars presume that the more innovations shape our everyday life and technology and science become a more central part of it, the more controversial is their impact on society [6].

The resistance to change may take many forms from direct resistance, such as quarrelsome behaviour and even sabotage, to indifference and passive behaviour, for instance dawdling and withholding information [15, 16] or refusing to accept new responsibilities or tasks [17]. In multi-level categorizations, even more passive actions are called *apathy* [17]. Resistance to new technologies in organizations varies depending on the market and society in which they operate [6]. Different types of resistant behaviour are not entirely similar in customer and organization studies. Thus earlier case studies and their research findings inform the possible outcomes of the new research at hand when adoption in organizations is being studied. Group dynamics and sub-group characteristics are important factors to consider. Individuals may for example abandon a technology because of solidarity towards their colleagues even if they are initially willing to adopt it [17].

Resistance may emerge at different stages of the process of change – and not only in the beginning. For example, in a debate on change relating to software development

it was observed that just as the dialogue was beginning to stabilise a new actor joined the discussion in order to undermine the consensus [18]. *Change agent*s and *opinion leaders*, such as *early adopters* and widely respected persons within the organization as well as at the management level, have been key actors in generating positive response to change and mitigating the resistance [16, 19]. Positive experiences such as work-related improvements may nudge groups and sub-groups towards adoption [20] and work as *triggers* to change [17, 20].

Lower levels of resistance have been observed in processes of change when a given change is compatible with existing practices, the methods are visible and transparent [21], and people can participate in the process [2]. On group level, the loss of control has led to non-adoption and resistance [20]. Without a motivation for change, change itself can be seen as a threat. Its risks are estimated higher than its benefits, and not much trust is placed on the successfulness of the change [15, 22]. For example, it was discovered quite some time ago that e-governance projects tend to fail more often when no preassessment is conducted related to readiness for change, in comparison with projects which examine both readiness for change and the cultural factors of the target organization [23].

On an individual level, resistance to change may be caused by unfulfilled expectations, lack of participation and interest, and the lack of IT skills. On group level, dispersion of interest, power structure and complexity are significant reasons. [2] Resistance to change may vary within an organization both vertically and horizontally, and it is beneficial not just to consider the organization as a whole but to examine its different subgroups. Not only management and specialists may have opposing opinions, but also other teams involved in the change. For example, differing views on the characteristics of an innovation, such as *relative advantage, compatibility* and *price-quality ratio,* may cause disagreements between users and developers [24].

Different demographic groups within the organization may also react differently, and it is tempting to assume that younger workers are more tolerant to change, but age cannot be seen as the only determining factor. Individual characteristics such as IT skills mentioned above have an effect and, among others, it has been indicated that technologically savvy digital natives and flexible thinkers are less inclined to resist change [25].

The results of a scoping review drawing on several research databases seem to suggest a shortage of published research on the process of adopting RPA technology and resistance to change, especially in organizations that provide financial or payroll services to external customers. However, some studies related to attitudes towards disruptive technologies and job insecurity do exist, but resistance to change has not been discussed in them. In Portugal, an RPA study on shared service centres indicated that RPA became institutionalized less on the basis of "normatively rational decision making" but rather "the taken-for-granted norm of increased efficiency", and the speed of adoption was a significant factor [26]. A study among service sector employees in New Zealand indicated that they did not feel particularly worried about their jobs and felt "there is little change forthcoming while their employers appear to be considering the potential cost benefits" of *Smart Technology, Artificial Intelligence, Robotics, and Algorithms* [27].

Official statistics of Finland show that in 2020 only 7% of Finnish companies in the administrative and support services sector used service robots [28]. While official

work-life studies in Finland assert that 23% of employers in workplaces that had laid off workforce within past few years felt that digitalization and robotics were contributory factors in their workplaces [29], the studies do not indicate whether robotics were considered as a threat. Nevertheless, studies show that RPA and AI are on the increase in accounting and auditing and are believed to have a significant impact [30].

3 The Case Study of a Publicly-Controlled Company

Public bodies in Finland have established private companies under their control to provide financial, HR and payroll services for theirs owner-customers – such as municipalities, social and health care districts, and public utilities. The case study was carried out in one of such Finnish service centres owned by several municipalities and other public agencies. The organization under the inspection provides ICT services to its owners along with the financial, HR and payroll services, and the ICT department is responsible for both internal and external ICT services. The ICT department is also responsible for the implementation of robotics for its internal customers, for example the payroll service, as well as providing RPA infrastructure services to its customer organizations. The actual coding of the robots has been outsourced to a contractor. The organization has established a sort of loose, virtual team including payroll and financial services and ICT specialists to survey and evaluate new automatization ideas and to coordinate the development. The company went through a merger in 2019 when three such publicly-controlled companies merged into one and have since been harmonizing its services, processes, and tools.

A case study was conducted to explore this process in its context. It focussed on one company, and semi-structured interviewed were held between February and April 2021 for the purpose of gathering data. The case organization provided process documentation as supporting evidence. The method was chosen because it is suitable for the early stages of building a theory and can be used to understand the phenomenon – a new topic – in context [31]. A case study is a suitable research strategy for "capturing the knowledge of practitioners and developing theories from it" [32].

The interviews consist of discussions with eleven key persons. The interviewees are listed in Table 1, and the interviews lasted between 45 and 90 min. Before the interviews proper some pre-discussions were carried out with interviewees A, B and K so that the interviewer could familiarise themselves with the background information, identify the target services of the case study (accounting and payroll services) and determine who are the correct key persons to be interviewed. People were chosen from all levels of organization to ensure different points of view.

The pre-formulated questions were put together based on the pre-research so as to provide a handbook for the interviews, and some new questions emerged during the interviews. The questions were carried out in an order which best matched the natural flow of the dialogue, and they also varied a little depending on the role of the interviewee. The sample size was chosen to include people from all levels of the organization and only people who had been active in decision-making or the implementation stage or working among robot colleagues. The possibility of adding other interviewees was left open in case the previously selected ones suggested any, but the number of interviewees did not

increase while collecting data as common themes began to emerge from the interviews and the interviewees did not identify anyone else. The saturation point was considered as reached when no more new themes came out of the interviews.

Table 1. Interviewees from the case organization

Interviews	
Interviewee A	ICT architect, technology leader in RPA (among other technologies)
Interviewee B	Project manager in HR and payroll services, responsible for coordinating cross-organizational, virtual RPA and Automation team
Interviewee C	HR services specialist, works with robots and contributes to the development project as substance expert
Interviewee D	ICT specialist, works in automation technology
Interviewee E	Service manager in payroll services, leads the team (internal client) adopting robots as co-workers
Interviewee F	Service director in HR and payroll services, one of the decision makers on questions relating to making use of robots
Interviewee G	HR services senior specialist (responsible), works with robots and contributes to the development project as substance expert
Interviewee H	Accountant, works with robots
Interviewee I	Accountant, works with robots
Interviewee J	Service manager in accounting and financial planning, manages accountants, internal client
Interviewee K	Service manager in ICT development, responsible for the RPA service

The interviews were recorded and written down as interview notes, with key parts of the discussion transcribed word for word. The notes and transcriptions were first divided into themes directly after the interviews, the first results organized into a table of themes and descriptions. These results were then re-examined by re-analysing the notes and listening to the interviews, the themes iterated and adjusted, and the final results construed from this iteration. The earlier theory which was used as theoretical framework when preparing this study (and as introduced in Sect. 2 of this paper) was also revisited during the analysis in order to find out whether it was still in line with earlier studies. Though we did not build heavily on any a priori hypotheses, we used the theoretical framework, and thus the results add to the earlier theories as the analysis of the results expands the Innovation-Decision process and some of the key concepts of DOI. We conclude with a conceptual framework [33].

4 Findings

The interviewees, in general, were not satisfied with the level of robotics used in service processes. Adopting robotics had taken its time, and as Interviewee B recalled, they

had “a bumpy start”. The first robots were taken into use approximately four years ago. Some of the earlier robots had already been retired, as one of the interviewees (A) explained. By the time the interviews took place, the organization had only two robots in use to automate financial and HR & payroll services, and around 40 ideas were under general evaluation, ten of which had advanced to a more comprehensive technological evaluation. The organization’s management was not in general satisfied with the current state of the undergoing change.

The robots currently used by accounting and payroll services were developed to solve problems in VAT logging and data matching for the national income registry introduced in Finland on 1 January 2019. Neither of the robots’ tasks should be considered minor ones – it used to require several days per month from the personnel responsible for these tasks.

The case organization wishes to use robotics to transfer time-consuming work, such as data matching and manual error search (based on knowledge and visual inspection) to robots and to free its’ experts working time to such tasks as development, analysis and problem-solving while relieving the overall workload. Accountants and their directors had pointed out during the pre-discussions that they wished that accountants, for example, could use their time and deep customer knowledge to help those customers who themselves had few resources for analysing financial figures. Other automation technologies were in use, for example, to automate batch jobs, and software developers were sometimes keen to develop automation with IS supplier directly on the IS itself even if it meant delays. The customers were moderately interested in robotics, but in some circles enthusiasm had already waned, possibly because the service centre side had not supplied any, as Interviewee K pointed out. The organization was hesitant to promote robotics to its customers.

Based on the interviews, the organization was, in general, in consensus of the reasons which had led to the slow rate of adopting RPA. The most common reasons highlighted by interviewees were:

- lack of resources (experts) and knowhow at both ICT and financial & payroll services
- lag in establishing structures needed in RPA development
- lack of viable RPA development targets, i.e. ideas, possibly due to resistance to change, lack of trust in technology or general passivity
- prioritizing other projects, e.g. customer projects or general harmonization of service processes after the merger
- technological problems either in RPA projects or in the enterprise architecture (other IS, infrastructure etc.)

Most interviewees discussed resistance to change. The topic was not introduced to them through a specific question, but rather they were asked what positive and negative memories they had relative to the adoption. Many of the interviewees also mentioned that they themselves had not been active enough and/or had not taken time to be interested in and learn about the technology. As opposed to some earlier studies [e.g. 17, 34], we did not note any resistance that would have been heavily related to normative status or peer pressure, at least so that this could have explained the slow rate of adoption.

Other essential sub-elements were found beside the factors given above, but in this paper we concentrate on those which are related to subtle forms of resistance to change, apathy, and the overall concept of resistance within the adoption process. As described earlier, resistance to change was explicitly mentioned in the majority of the interviews, but what was interesting is that the interviewees did not draw particularly direct connections between resistance and meagre use of RPA. They, however, brought up the dearth of viable RPA ideas from the teams and general lack of interest in actively participating in the projects. When analysed, the interview memos and records led to the conclusion that general apathy and dithering were a major factor in slowing the speed of adoption and causing vicious circles of other difficulties such as the factors listed above. *Dithering* is considered in this paper as a specific, hidden type of resistance to change.

4.1 Resistance to Change and Its Impact

Some of the managerial level interviewees mentioned that they had heard, either directly or indirectly, that the personnel saw robots as a threat to their jobs and had even trouble finding a motive to participate if it would lead to loss of employment. Managers felt that this resistance could at some points be sensed in the atmosphere even when no one told them anything directly. As expected, professional level employees were more likely to hear about their peers' fears and attitudes.

The management had observed, again either directly or indirectly, resistance to adopting RPA but emphasized that it was more prominent at the earlier stages of the adoption process. They talked about resistance on service team level, not on management level.

> *"[On a team level] Probably some sort of fear for one's own job, that is there enough work for us? But maybe people have now realized that we have just a terrible lot of work, even if some of it was automatized. But it was this type of thing at least in the beginning, that now the robots are coming and taking our jobs."* Interviewee G.

> *"When the RPA group started, people were maybe feeling expectant and curious, but some remained indifferent – it does not consider them, they are not interested."*

> *"It was a challenge that it took time – for me as well – to see the possibilities in robotics. Also, here still prevails some fear that robotics will eat up our jobs."* – Interviewee J.

> *"Directors, managers, they understood the ideology of what we were doing. But let's say on staff level it is understandable that if you come and say that could you teach a robot in your place, it may have adverse effects on motivation. And I don't know how much it has affected the effective implementation of automation, but I would argue that if not directly, then at least by proxy. The level of commitment may be lower. This point of view has not in my opinion been recognized enough by the management in many organizations, namely that people are actually afraid of losing their jobs."* – Interviewee K.

While interviewees typically believed resistance to be more common in the more senior age group of employees, it was considered to depend on other characteristics of

the individual as well, such as general interest towards new ideas and technologies and willingness to give up routines. Yet they felt that resistance to change, while prominent, was not one of the most substantial reasons for the slow rate of adoption. None of the interviewees were openly against the RPA technology.

People may also have been unwilling to give tasks to robots at earlier stages of adopting robotics during the proofs of concept. The types of resistance and attitudes towards robots mentioned earlier in this paper indicate that resistance experienced within teams may lead to a lack of viable ideas for targets of RPA development. The organization thought it essential that teams are active in generating ideas as managers often do not have comprehensive knowledge about everyday tasks carried out by the services, and the ICT personnel and robot developers were even more unfamiliar with the topic. A small group of enthusiasts could not gather and further refine ideas, because they were often involved in other development projects and had critical roles in service delivery.

Resistance was implicitly found to be more prominent among such personnel who did not actively participate in the process of change. Unfortunately no one discussed how the resistance from peers and subordinates was affecting the motivation of key personnel to promote the change. They however did bring out how little time they had to allocate for development even when they were motivated to participate and wished that more experts would participate in the change. Managers felt guilty for not being able to prioritize the RPA development over their other tasks.

Problems with the robots and shortcomings of the technology itself were often mentioned as reasons why not only the project was time-consuming but also why some ideas were rejected during evaluation. As there are other companies in the same sector that have been able to proceed more swiftly, it should be considered whether negative observations were overemphasized, whether there prevailed a general lack of interest in prioritizing problem-solving in RPA cases over other tasks, or whether the chosen model of production (outsourcing) was suitable for the organization or not. Overall, the consensus was that RPA was not prioritized over different projects and services. Decision-making had taken its time on all levels, and the focus had shifted to other areas.

Though the personnel was generally welcoming the robots they were at the same time critical towards RPA as technology, and especially the ICT team could not wax particularly enthusiastic about it as they considered it as just one tool among others (and possibly preferring others) – maybe even outdated before it was even properly implemented. Interviews hinted at compatibility issues with information systems and technological traditions.

> *"You might think that this [interview] sounds cynical, but I have been seeing this for so long now and I consider RPA as a basic tool. And as a tool it is not a top priority in certain cases of automatization. Nowadays we can take care of it in many other ways."* – Interviewee A.

> *"Maybe we senior specialists are somewhat critical about automatizing all the controls and so our efforts are still needed… We need slowly to teach the robot and teach it about the errors. We cannot trust it completely for a long time yet."* – Interviewee G.

4.2 Factors Behind Resistance

The interviewees who were the most enthusiastic about robotization were either those whose work the first robots had taken or their managers. It is essential to realize in this context that robots were of help to the specialists. They welcomed robots to help them with the time-consuming work of cross-checking, which required an understanding of the task but could be taught to the robot by using a set of rules. For the most part they were also satisfied with the quality of the robots' performance. HR and payroll experts had ever since the introduction of the national income registry faced constant, time-consuming problems matching the data from payroll systems with the data sent to the registry. When the idea of solving the problem with robots came up, it was being lobbied and eventually resulted in one the desired robots that were developed into production.

Beside general knowledge of what kind of robots can be used, HR and accounting experts mooted the lack of knowledge about the practical exploitation of robots as a critical factor that both prevented ideas and caused increased criticism towards robots and their potential. For instance, one of the experts said that a substantial idea had been suggested, but they had been critical whether the robot was capable of such tasks as they did not fully understand the capabilities and limitations of RPA. Another expert pointed out that only after the VAT project they had begun to understand what can be done with robotics and would still need more knowledge to fully participate. One manager told of having being quite indifferent until a certain technological presentation had opened their eyes and created what they called a "wow effect".

> *"We have constantly more work to do at a certain pace, and job descriptions change all the time… I don't know whether this is some sort of treacherous measure, to give us more work so we will realize that hey, we should use robots. I at least feel that my work will go smoother if I can use automation and robots in certain tasks."* – Interviewee G.

The ICT department had the necessary knowledge of technical issues related to RPA, and compatibility with the target systems was often the main cause for resisting further development of robots or automation tasks in general. Technical personnel also took into consideration information security and data privacy in the development and thus saw more risks in automated assignments. The ICT department was lacking professional resources to develop the actual robots themselves and relied heavily on outsourcing.

> *"We have proceeded with implementation taking cautious steps… None of us has been released from other tasks, and especially the IT department is always lacking resources.*"- Interviewee C.
>
> *"People were very positive. In the beginning, when an [Automation and RPA] group was established, we got ideas. Now there is a quiet phase as nothing ends up in production."*

Interviewees said that there had been internal campaigns to promote robots and automation in general, and in those times ideas came in bursts. But when ideas did not soon lead to production, people lost interest. Interviewees expected that attitudes would change towards a more positive direction when more success stories were made

public, such as the VAT and income tax registry robots. The robots were somewhat anthropomorphized during the interviews. For example, Interviewee B wished that the teams would always give robots a human name, such as Pekka or Elina (typical Finnish names). Interviewee A used the term "old age pension" about a robot that was not needed any more.

The factors which had a negative impact and caused slowness or resistance can be summarized as:

1. Problems with the **compatibility** of RPA with enterprise architecture and technological traditions.
2. **Lag in processes** when organizing RPA development and putting new ideas into production.
3. **Scarcity of professional resources and knowledge** creating hesitance to move forward with development and to suggest new ideas.
4. **Fear** of robots taking jobs and distrust of their capabilities.

Based on the interviews, resistance to change is reduced when:

5. **Relative advantage** is seen high either on individual (e.g. personal workload and interests) or organizational (e.g. ROI) level;
6. The organization can advertise internal **success stories** which bolster trust in the innovation and motivate people to participate;
7. **Indirect external obligations** which substantially weaken the status quo shift attitudes towards the original change into more positive directions (e.g. new, substantial workloads generated from changes in legislation).

4.3 Resistance to Change Fluctuates and Has an Impact on Every Stage of the Innovation-Decision Process

The conclusion drawn from the earlier findings (see Fig. 1) is that resistance to change can be prominent even when the original Innovation-Decision process has led to the adoption of an innovation: it takes place on every level of the organization by reducing the speed of adoption. The findings of this study are placed in Fig. 1 into the context of Rogers' Innovation-Decision Process [3] and its basic stages. Resistance takes many forms, often passive ones, and it occurs in pulses or fluctuates throughout the initial adoption process as well as its continuation stage. Resistance may re-emerge even after a period of time when a more positive spirit has prevailed, should the process of change take more time than anticipated, if the overall solution, including the innovation as well as the enterprise architecture, is not as compatible as expected and if professional resources and knowledge, especially knowhow related to the innovation, are scarce and people experience fear or general distrust.

It should be borne in mind that individuals within the organization may go through the process of adapting innovations at a pace that differs from organization as whole. Also such a technology as RPA consists of several stages of its implementation, i.e. there a several robots, and thus the stages in Fig. 1 are repeated over and over during the continued adoption. According to the findings of this case study, resistance to change

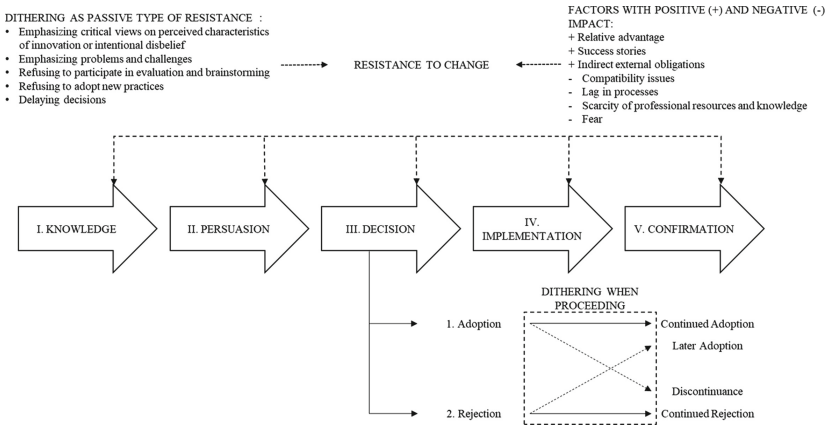

Fig. 1. Innovation-Decision Process (Rogers 2003) and resistance to change. Factors with positive impact reduce the resistance.

can manifest itself at different stages of the Innovation-Decision process as follows: at *knowledge* stage resistance manifests itself as fear or distrust, at *persuasion* stage as unwillingness to take interest in or learn about the technology, at *decision* stage as active resistance or by delaying the decision, at *implementation* stage as dithering and overemphasizing problems, and at *confirmation* stage as emphasis on critical views or as cynicism and refusal to adopt new practices.

5 Conclusion and Suggestions for Further Research

The findings of this study include themes of a priori knowledge but also new observations from which can be concluded a concept that does not completely follow any established theoretical frameworks of IS research. We found out that while the case organizations see many reasons that explain a slow adoption rate RPA after the initial decision to adopt and the first actual use of software robots, these reasons culminate in organization-wide dithering, which can be viewed as a passive type of resistance to change. While more active resistance may emerge within the organization, this dithering is the key problem which not only slows the adoption process down considerably but also creates vicious circles of other problems. This dithering and dwelling on problems, which yet were not deemed insurmountable or significant, caused bottlenecks with may have impacted other projects as well.

We found out that an organization needs a steady flow of **success stories** to build up trust in technology and reduce resistance. Success stories generate much-needed new ideas for robots from the teams. In order to expand properly, RPA requires cross-organizational adoption and also learning from the part of IT and those service teams which are its target. If the development of a single RPA item takes too much time, the adoption process regresses and confidence in the innovation declines. The organization lapses back to apathy which may eventually lead to discontinuity.

The most important factor to accelerate the process of adopting a new robot appears to be an indirect obligation to make other changes. When faced with an external impulse,

a new problem, it seems that motivation is improved and attitudes towards the original change become more positive. RPA is viewed more as a tool for problem-solving than as means for the targeted services to achieve better cost-efficiency or productivity.

We also found out that resistance fluctuates both during the different stages of innovation decision process and the continued adoption phase. Success stories and activity reduce resistance, but if the pace of implementing projects is not brisk the organization may relapse into apathy. Unfortunately, the strongest motivator to pick up adoption speed was an indirect force. Thus circumstances were already tough resource-wise, and the new demands made it necessary to seek out solutions from existing technologies. In this situation it was still difficult to proceed with the projects due to insufficient working time and personnel to allocate for the projects.

Some of the findings in this study are in line with previous DOI-oriented research or adoption theories. We found that the innovation characteristics of **compatibility and relative advantage** play as important a role in attitudes towards technology in the later decisions to continue as in the initial decisions to adopt. The Innovation-Decision process with its five stages was seen as a suitable basic framework on which to build the key findings of the study. Relative advantage works on both organizational level and individual level. On individual level there is an interest in using robots as a tool towards smaller personal workloads but also sometimes as an opportunity to take a new professional direction in work. Accountants and payroll experts found robots to be a welcome improvement when the baseline of workload was optimized.

We come to the conclusion that passivity in taking actions may create vicious circles which have an effect on the further continuance of the adoption process and possibly even on the adoption of new disruptive innovations in the future. Hesitation on all levels has several costs. As Interviewee A put it into words, there was a lot of "waste" and the robots were "underemployed". Thus money and time had already been spent on investing in the technology, business relations with the subcontractor, establishing structures and training employees, but robots were underemployed while human employees were overworked. The waste of potential and investments was considerable. While interviewees from the ICT emphasized that other, possibly more desirable options were available, it was commonly believed that the overall automatization of HR and financial services was not on the desired level, and, as a result, neither were competing technologies used to satisfy the requirements.

Organizations should deepen their understanding of the elements which characterize the organization as a whole and its different departments as well as the management level and delay their processes of change. They should proactively seek solutions that may be exploited during future changes and that prevent wasting investments and other resources. This is developed from the observation that not all forms of resistance to change manifest themselves actively, and yet they have a negative effect on the entire process of change. Management should not be forgotten either. As a conclusion for organizations and IT managers we suggest that:

- Senior management should put effort into managing change throughout the whole lifecycle of the technology on which they have invested and which is deemed strategically important.

- Costs of a single implementation project should be put into a wider context, and it should be taken into consideration whether hesitation in making extra investments and going forward feeds general incapability of progressing and meeting other strategic goals. Projects that do not go forward are still a waste of resources, such as working time and expertise of personnel lost in dithering and money in terms of the basic investment.
- Organizations should investigate whether they have tendencies towards passive resistance, such as constant dithering, and address this topic actively to avoid waste. Constant dithering may easily lead into a vicious circle of problems and shortages that is difficult to undo.
- Process of change can be kept active and the teams' attitudes nudged towards positivity and trust when even small success stories are steadily introduced. When trust and enthusiasm is gained, it needs to be fed.

The conclusions of this study were based on one case study, and they are partly supported by other scholars and their earlier studies. While discussing and analysing the reasons for the slow speed of adoption, the critical finding discussed in this paper is that when adopting disruptive technology, resistance to change should be taken into consideration even when there is no active opposition, and an organization should take active measures to reduce it and build trust during every stage of Innovation-Decision process and not just at the initial stages of change. This finding is in line with some earlier studies [20], but much research is to be done to understand better the patterns on organizational and sub-group level as well as group dynamics in organizations that are not highly normative.

This research has its limits as it focusses on one interview-based case study of one organization and one technology. Further research on the role of dithering, a type of passive resistance, in the continued Innovation-Adoption process of organizations is needed to build up and validate the theory. Thus, these findings should be tested against a larger sample or a wider array of technologies with slow rates of adoption within organization. We also realize that the company in our case study had undergone a merger two years earlier and recognize that this may have an impact on the findings. More comprehensive research into the innovation-adoption of RPA in financial, HR and payroll services may be beneficial when assessing adoption processes of artificial intelligence as well as when determining the next steps in either expanding or discontinuing the use of RPA.

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Towards an Explanation for Why Enterprise Architecture Management Fails: A Legitimacy Lens

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Abstract. Enterprise architecture (EA) is an approach that manages complexities such as organizational structure, technology, and business by providing a holistic view of the organization to coordinate digital transformation efforts. While previous research has highlighted several challenges in taking advantage of EA, few empirical investigations explained how organizations should manage EA attempts to avoid failure. This paper aimed to explore the root causes of organizational challenges for EA management (EAM) by conducting a case study. Our findings illustrate inadequate legitimacy as a root cause of the organizational challenges, such as lack of shared understanding, stakeholders' engagement, and financial and management support, that needs to be managed over time. Particularly, we demonstrate that although pragmatic legitimacy can positively affect the EAM at early stages, regulatory legitimacy plays the primary role in EAM success. In addition, contradictory views and organizational bureaucracy are recognized as significant barriers to achieving normative and cultural-cognitive legitimacy.

Keywords: Enterprise architecture (EA) · Enterprise architecture management (EAM) · Organizational challenges · Legitimacy theory

1 Introduction

As organizations continue to invest in digitalization and transformation, IT managers and IS scholars alike seek structured strategies and approaches for managing the increasing complexity of their digitalization initiatives and addressing the uncertainty associated with an enterprise-wide transformation roadmap [1, 2]. Enterprise Architecture (EA) is an approach that has gained great interest in both research and practice. EA is described as the collection of an organization's IT (and business) components and their interdependence, as well as efforts to align local and short-term investments with enterprise-wide and long-term strategic imperatives [1, 3, 4]. Moreover, the holistic process of managing activities such as planning, and development of EA is called enterprise architecture management (EAM) [5–8].

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Despite EA's benefits, only a few studies have focused on the enterprise architecting process [9]. Other than that, a large number of studies on EA demonstrate that it is more difficult and challenging [10–18]. Unsurprisingly, the majority of EA-related issues identified in this literature are organizational and social in nature rather than technical [e.g., 10, 12]. Additionally, considering the numerous difficulties associated with EA, the primary question is how can organizations better manage such processes to avoid failure? Moreover, to what extent can EA at all be managed in contexts of emergent use and continuous development of new digital solutions? Hence, this paper aims at exploring *why EAM fails*. We accomplish this through a case study of one of the largest Norwegian municipalities (Gov) wherein EA was introduced to the organization in 2012, and EAM activities are currently stopped.

Theoretically, we use the legitimacy concept [19] from institutional theory to shed light on how EA processes and management need legitimacy at various organizational levels among stakeholders in order to succeed. Indeed, the process of obtaining organizational support for IS projects is referred to as legitimization [20]. As a consequence, achieving an appropriate level of legitimacy reduces stakeholder resistance to IT initiatives, which is a critical factor in achieving IS success [21].

Investigating the EA organizational challenges that led EAM to fail in our case study, we contribute to this growing research area by exploring the root cause of these challenges and illustrating how it led EAM to fail. We also argue that recognizing the root cause of EA organizational challenges is not only essential, but also need to be managed over time to reduce the chance of failure in EAM. The paper's remaining parts include a brief overview of EA's recent history and its challenges, the theory and method sections, empirical findings, and discussion section.

2 Research Background

The existing understanding of EA in the literature is diverse [22]. Moreover, the recognized definitions of EA are not necessarily complementary but sometimes in conflict. It is now well-established from various studies that EA integrates with other organizational practices, while EA itself consists of a variety of diverse activities [23–25]. EA's organizational practices consist of different levels, such as top management level, middle management level, portfolio level, and project implementation level [26].

There are several descriptions for EA practices in organizations, including EA development, which refers to the process of developing initiatives, EA implementation, which refers to the process of implementing models and frameworks, and EA adoption, which refers to the way EA practices are incorporated in organizations [27]. Additionally, enterprise architecture management (EAM) [8, 28–30] is a term that has been used in the literature to refer to the management activities associated with the installation, maintenance, and development of an organization's EA [16]. Indeed, EAM is a management approach that provides a holistic understanding of the EA and coordinates EA activities such as planning, developing, and controlling [5, 31] to ensure organizations meet EA principles properly [6, 8].

EAM is not only a technological issue; it is also a social and political one to a large extent [28]. Due to the broad scope of EAM, a large number and diversity of

stakeholders are involved in EAM processes [32, 33], which has impact on EAM's institutionalization in organizations. As a result, organizations find various challenges in achieving the benefits of EAM. Thus, actually paying attention to the quality of the EAM product, EAM infrastructure, EAM service delivery, and EAM organizational anchoring are identified as critical factors need to be considered for the success of EAM [34].

Researchers have been interested in EA challenges, and several have been identified, including a lack of management commitment, insufficiently experienced architects, difficulty of understanding requirements in EA teams, insufficient tool support, rapidly changing environmental conditions, EA consultant-related issues, outdated organizational statutes, and communication challenges [10, 12, 26, 35]. In addition, the root causes of the EA challenges in the public sector are also discovered as problems related to organizational structure, problems from the political influence, legislation and policies problem, and users' readiness problem to adapt EA products [36].

Although extensive research has been carried out on EA challenges, little attention has been paid to discovering how EA organizational challenges accumulate and sometimes lead to EAM failure. Indeed, this knowledge can provide us a fundamental insight into the most effective ways of EAM, as adopting IS innovations are always surrounded by different challenges that need to be managed.

Following studies on other IS phenomena [e.g., 37, 38–40], institutional theory has gained considerable attention in EA research to explore assimilating and institutionalizing EA practices in order to achieve the promised outcomes of EA [e.g., 41, 42–44]. Along with previous studies, we also examine the concept of legitimacy [19], which is central to institutional theory [45]. Legitimacy is widely recognized as a vital concept for accepting IS phenomena/practices in their context [e.g., 46, 47]. Organizations must establish an appropriate level of legitimacy for their IS initiatives to secure the acceptance of initiatives in their context. To demonstrate how EAM fails in an organizational, we use four types of legitimacy criteria to develop our theoretical framework.

2.1 Theoretical Framework

Legitimacy can be classified into four genetic stages: accepted, proper, debated, and illegitimate [48]. The accepted state denotes a more passive evaluation state that reflects taken-for-grantedness, while the proper state denotes conclusions made by a more deliberate process. This distinction demonstrates that accepted organizations, in comparison to proper organizations, are those that are not evaluated actively or recently. The term "debated" refers to a state in which there is an ongoing disagreement within the social system. Disagreements often occur in this state between conflicting stakeholders or between dissident stakeholders and organizations. Debated also includes stakeholder questions or challenges regarding the organization's activities or underlying values. Finally, an organization is deemed illegitimate when the social system deems it inappropriate. In this case, the organization should be fully reformed or terminated.

Internal and external stakeholders determine and assess the legitimacy of the subject, whether consciously or unconsciously, by contrasting them to specific criteria or standards [49]. The term "legitimacy provider" refers to stakeholders that assess legitimacy [20, 50], while the term "legitimacy seeker" refers to those who attempt to legitimize a particular phenomenon [51]. In IT projects, legitimacy seekers include project

executives, project team members, and the project leader, while legitimacy providers include the IT project's beneficiaries, which include business partners, users, and top management [20]. To evaluate legitimacy, four basic types of criteria are used including regulatory, pragmatic, normative/moral, and cultural-cognitive. Different types of legitimacy (e.g., moral legitimacy) gain when specific criteria (moral value) are commonly accepted upon within the social system [48].

Regulatory Legitimacy: Considering that legitimacy is established by associating a social object with a specific feature of the institutional field, regulatory legitimacy is established by associating a new activity with symbolic systems [49]. This alignment is typically accomplished by establishing new practices that conform to the domain's existing legal and quasi-legal rules and regulations [52]. IS scholars have used regulative legitimacy in a variety of ways in their research, for example, by emphasizing that innovation succeeds when it is consistent with government and/or international IT policies and directives [53], or by emphasizing that it aids in gaining agreement with relevant non-IT regulations and alleviates pressures placed on the adopter organization by resource-dominant organizations [47].

Pragmatic Legitimacy: Pragmatic legitimacy is built on the self-interest of an organization's most immediate stakeholders [54]. These estimations can range from a straightforward evaluation of the subject's anticipated benefit to stakeholders to more nuanced objectives [19]. Sometimes, pragmatic legitimacy is followed by an evaluation of the subject's usefulness [54]. Organizational science has shown a great deal of interest in pragmatic legitimacy [e.g., 55]. It has been demonstrated that pragmatic legitimacy can influence the early stages of IT innovation diffusion considerably [e.g., 46].

Normative Legitimacy: Normative (or moral) legitimacy refers to a collection of criteria used to determine whether a new practice adheres to and/or respects moral standards and values endorsed by a specific social audience [19, 56–58]. In effect, the term "normative legitimacy" does not refer to whether a given procedure benefits the evaluator; rather, it refers to the practice being assessed as the correct course of action [19].

Cultural-Cognitive: Cultural-cognitive legitimacy has been deemed the most robust type of legitimacy. Due to the fact that cultural-cognitive legitimacy is based on our in-depth knowledge of practice, it is the most powerful form of legitimacy, but it is also the most difficult to obtain and exploit [e.g., 19, 59]. Cultural-cognitive legitimacy is concerned with acts that facilitate or help in decision-making, resulting in problem-solving. In other words, cultural-cognitive legitimacy is achieved by the internalization of a belief system established by practitioners and scientists to define and codify knowledge about a particular practice [60].Through gaining cultural-cognitive legitimacy, the practice can be taken for granted as a foundation for daily routine activities [e.g., 46]. As such, it is extremely difficult to achieve during the early stages of innovation diffusion [46].

3 Research Method

According to the aim of our research to understand why EAM fails, we opted for a single-case study to have an in-depth understanding of how a phenomenon occurs in a real-life

setting [61]. Thus, we considered the criticality and relevance of the case organization in order to extract illuminating insights [61]. To address our research question, we needed to select a case in which (1) EA practices had previously been incorporated into organizational practices, (2) EA practices were no longer being conducted, and (3) adequate historical information was available, especially through knowledgeable members of the organization.

3.1 Case Description

We chose Gov, a large municipality in Norway, based on the case selection criteria. Since the Norwegian government is committed to achieving the goal of a "one digital public sector", municipalities have committed to providing digital services to their residents as well. Gov is divided into six sections, each of which is in charge of a different aspect of municipal services. The administration section is the central organizational unit that manages and provides services to all other sections. The Digitalization Program is a temporary program established in 2013 in response to a government recommendation to coordinate all Gov's IT projects.

Each organizational section, according to the Gov structure, has its own IT department in charge of managing its IT needs and projects. Additionally, the administration section houses a central IT department. The central IT department coordinates all small IT departments within the various sections and handles the Gov's local projects. The central IT department, and thus the IT manager, has a considerable influence on the administration section manager's decisions due to the operational role. Two other actors who contribute to decision-making in the administration section are the portfolio manager, who is responsible for allocating financial resources to projects, and the leader of the Digitalization Program. The central IT department lacks sufficient internal IT architects to handle all IT projects across various departments. As a result, each project manager has employed a temporary IT architect to work on the requirements of the corresponding local project. A big challenge concerning external IT architects is a lack of organizational knowledge. Over 30 (internal/external) IT architects work with the Digitalization Program to coordinate project activities. To do this, the central IT department collaborates with the Digitalization Program.

Adopting EA to coordinate digitalization processes had been proposed before the establishment of the Digitalization Program; however, the establishment of the Digitalization Program prompted Gov to adopt EA. As a result, EA practices were incorporated into the Digitalization Program's work. Gov employed several enterprise architects between 2013 and 2019 to implement TOGAF principles. However, Gov no longer continues in conducting EA practices. Enterprise architects were hired to take central focus on enterprise-wide topics and to incorporate local IT projects. Nonetheless, they have been more involved in recent years in IT project tasks (as of 2016). As a result, there have been no considerable EA practices conducted since this date.

Numerous changes have occurred in recent years that have affected digitalization processes. For instance, the initial leader of the Digitalization Program was promoted to portfolio manager. He was one of the first to work on implementing TOGAF principles in Gov. Additionally, the IT manager was replaced, and the central IT department's structure was changed. In 2013, there were no subsections within the IT department, and the IT

manager supervised all architects directly. Following the change in IT management, the central IT department created a new subsection called the architecture department to house both enterprise and IT architects.

Apart from this, three distinct types of organizational plans are used to coordinate organizational activities: long-term, mid-term, and short-term. The 12-year long-term plan has a major effect on the Gov's digitalization strategy. As of 2020, Gov is preparing a new long-term organizational plan.

Gov collaborates with another public sector organization on a large-scale collaborative initiative that resulted in creating a new organization. Due to Gov's responsibility to support this new organization, one enterprise architect has been assigned to implement Gov's requirements for the project (new organization). This enterprise architect is responsible for adhering to the Gov's principles and standards. It's worth noting that Gov only had one enterprise architect at the time. Currently, an information architect holds the title of the enterprise architect. S/He is handling several tasks and therefore cannot allocate sufficient time to EA practices.

3.2 Data Collection

The data collection period began in September 2019 and finished in October 2020. We gathered data through semi-structured interviews and focus group workshops (primary data collection), as well as existing documentation (secondary data collection).

The collection and processing of internal and public documents on digitalization, architectural practices, and principles was the first step in the data collection process. Internal documents totaled 600 pages and contained project reports, presentations, historical emails, and the internal portal. Public documents contained statements, regulations, and policies by national authorities relating to digitalization from 2009 to 2020, focusing on the last three years. This step gave us the historical background for EA practices, especially at Gov and the Norwegian public sector.

In addition, we collected data through semi-structured interviews [62]. To begin, an informal interview with the Digitalization Program's leader provided us with background for the case. 14 semi-structured interviews ranging in duration from 80 to 150 min were performed in total. Every interview was recorded and transcribed. Before the interviews, informants were given a consent form as well as an outline of the key topics of the interview questions. We began the interviews with one enterprise architect and then selected the remaining informants using snowball sampling [63]. We explicitly contacted informants involved in implementing EA practices in Gov because information about the previous seven years (since EA was implemented in Gov) was needed. Finally, among the informants were the Digitalization Program's leader (1), portfolio manager (1), project managers (3), architecture department manager (1), IT architects (5), and enterprise architects (3).

We have organized three focus group workshops in Gov. These workshops aimed to supplement our understanding of the case by fostering discussion among a variety of informants on relevant topics. The first two workshops focused on sharing our interpretation of the case situation based on the study of Gov's documents and recent discourses in the EA literature. Later in the study, we held a third session in which we presented our findings to participants and requested their input. We conducted 6 h of workshops with

15 participants (11 individuals), including the portfolio manager, the Digitalization Program leader, IT architects, the architecture department manager, and project managers. Furthermore, with permission, these workshops were recorded and transcribed.

3.3 Data Analysis

We collected and analyzed data in parallel using our qualitative approach [62]. That is, the early analysis of the first step interviews prompted the posing of new or additional questions in the following round of interviews. Nonetheless, because of our theory-informed approach based on the notion of legitimacy in institutional theory, data analysis was guided throughout by a coding scheme built from our theoretical framework. We also developed a coding guideline (based on the coding scheme) that includes definitions and examples for each of the coding scheme's constituent items.

To code the data, we imported all of the interview and workshop transcripts, as well as any relevant existing documentation, into NVivo 12 pro. The coding scheme was used to guide the data coding. In addition to the constituent items of the coding scheme, we categorized architectural practice data into two categories: project and enterprise. At the project level, architectural practices assist in fulfilling the requirements of local IT projects. At the enterprise level, architectural practices give suggestions and decision-making materials for IT strategy and portfolio management processes that are ready for signature. As a result, we were able to follow the reasons that caused architectural practices at the enterprise level (EAM) to fail. After reaching an agreement on the definitions of each of the coding scheme's constituent items, the coding was carried out by the main author. The co-authors then played the role of the devil's advocate, proposing alternative interpretations and counterarguments. The data coding was completed once a sufficient level of agreement was reached.

4 Empirical Findings

Lack of common understanding of the EA practices was the first serious challenge observed in this study's earliest stages. When asked about EA, the participants were not unanimous in the view that what the responsibility or application of EA for Gov was. In particular, we identified several diverging views. On the one hand, the portfolio manager commented that EA must come from the business side, and then IT capabilities should support the business goals. On the other hand, the IT department believed EA is part of the IT strategy, and it comes from the IT side to help organizational goals. Moreover, enterprise architects' opinion was something in between those ideas. Although in this study, enterprise architects worked in the IT department, they had different views from most colleagues in the IT department. Therefore, when we mention IT department opinion, we mean the general idea supported by influential people in this department, while enterprise architects had their own idea.

> *"When we are talking about TOGAF and EA, people are thinking about IT more. An enterprise architect is a person closer to the management level. It should not be seen as an IT person; it should be more a strategic person. Now architects are*

in the third or fourth (organizational) level, in the IT department, and it is very complicated to bring it up to the strategic level" (Portfolio Manager).

"Enterprise architects needs more power; I see some issues in the projects, and I am sure it can make a problem in the future; But, I cannot stop the project (…) only budget and schedule are important for the project managers" (Enterprise Architect).

This ambiguity in the EA understanding had different consequences. For example, some architects felt that the IT manager supported the EA activities and other managers also understood the architectural concerns very well. Thus, they were satisfied with the architects' position, while enterprise architects, who perceived EA practices beyond IT tasks, deemed EA must be placed in the decision-making process. As such, they felt no one pays enough attention to the consequence of the lack of EA consideration in Gov. Therefore, enterprise architects' role was also unclear in organizational processes.

"The challenges of enterprise architect's role are not just related to where it should work; rather there is a question that we (Gov) really need?" (Enterprise Architect).

Also, in this study, no clear response was achieved when asked about how or who confirmed the enterprise architects' tasks. The Digitalization Program's leader believed the enterprise architects could approve their work, and in case they need approval from the upper level, the IT manager or portfolio manager should do it. However, when we asked Digitalization Program's leader why they did not supervise enterprise architects' work, we received this response: *"Although the IT department manages all architects; I think because the IT department lends the architects to the projects, IT manager does not feel that S/he should supervise their task"*.

Moreover, the portfolio manager, who was not the architects' direct manager, did not supervise enterprise architects' tasks due to the organizational bureaucracy. Despite believing that EA deliveries were major input for his work, he did not engage in the architectural work due to the disagreement with the IT manager on EA positioning.

In addition, in response to the question 'why have the EA practices been stopped?', different answers were given. Digitalization Program's leader felt that the financial limitation was the reason, while the portfolio manager considered that the main issue was related to how we look at EA. One enterprise architect also commented that EA was not a priority for the individuals in Gov.

The evidence from this study suggests that although the majority of individuals theoretically knew the difference between IT architecture and EA, they practically did not differentiate between the architectural activities at the project and enterprise level. We received that due to the IT management's support, the architectural activities at the project level were appropriately accepted. Each project manager assigned sufficient resources to fulfil the architectural needs. In addition, the architectural group also had a great collaboration with the project managers. Yet, the importance of architectural activities at the enterprise level was in a debate which resulted in their being stopped. In this way, the EA practices were neglected, and no one, except enterprise architects, was willing to assign time or resources on them.

Having discussed how EA was understood and individuals reacted towards it, the next part, based on different legitimacy criteria introduced in the theoretical framework section, addresses how it was driven to the current state over time.

4.1 Regulatory Legitimacy

Regulatory legitimacy refers to the situation where the object under the study has obtained its legitimacy from, for example, legal rules. In this circumstance, following the rule is coercive for the organization. From this point of view, the some said the main idea for creating Digitalization Program comes originally from a governmental statement, where it was recommended to follow architectural principles in digitalization projects. Therefore, they argued EA also should be at the core of the Digitalization Program. Yet, based on the historical document analysis, we found that both Digitalization Program and considering IT architectural principles were governmental recommendations. However, nowhere pointed directly to EA.

Despite the fact that EA practices had stopped, everyone noted that continuing EA is essential for Gov. For example, Digitalization Program's leader, who thought the financial limitation was the main barrier for EA, expected by emphasizing the importance of EA's role for Gov's IT strategy, in the new organizational plan, they could provide more resources for EA. However, the portfolio manager, who did not assume the financial limitation as a barrier, asserted the only solution to making EA a Gov routine, is bringing it up close to the management level. The portfolio manager also referred to the latest governmental statement and said now it is the time of "a big change". Since he witnessed a similar organizational structure change for IT information security in the past, he hoped the possibility of a new change became more likely through this statement, which recommended Norwegian municipalities to consider EA principles.

> *"Without solving the challenge between IT and Business view, we can place EA in the right position. We should solve it officially. We had this challenge with IT information security, it was solved by changing the position"* (Portfolio Manager).

4.2 Pragmatic Legitimacy

From the pragmatic legitimacy perspective, which considers the individuals' self-interested calculations in the organization, we received evidence that the prior IT manager introduced EA to Gov and supported it.

> *"At that time (2011 or 2012), the IT manager defined an IT evaluation project in Gov. (…) They (consultants) suggested recruiting two enterprise architects and creating an Enterprise Architecture Section and…"* (Enterprise Architect).

The prior IT manager accepted this suggestion, but the point is that his organizational role changed after a while. The new IT manager also supported the IT department well. However, compared with the prior IT manager, the new IT manager supposed the EA practices as a part of IT activities.

At the time of this study, the enterprise architects were the main individuals who actively tried to highlight EA concerns in Gov. Yet, they were more engaged with the

projects. Indeed, although they preferred to spend more time on EA, rather than project activities, they could not change the condition because they were not part of the decision-making board. More correctly, we can say that Gov did not have any enterprise architects at the time of data collection.

> *"When we contribute to making a better alignment between IT and Business, we do it because we want it, not because it is measured! (…) Many people are measured by, you are very successful by leading the project to live. (…) but how are your successes in EA measured? It is not easy!"* (Enterprise Architect).

One participant commented, architects themself also have a significant role in understanding the importance of paying attention to architectural principles. As he said, one of the architects who worked there several years ago did not deliver any task. That person only attended meetings and gave some feedback to others. After a while, others felt the architectural work is not very important. But, after he left Gov and a new architect was hired, this new person, by doing a great job, determined how architects could help others in the projects' activities.

4.3 Normative Legitimacy

The portfolio manager was the first leader of the Digitalization Program and had an IT background. He started to implement EA in Gov. However, after being assigned to the portfolio manager role, he had spent no more time on the EA. He believed EA practices should particularly include business concerns. Thus, enterprise architects needed to be placed at the management level, and they should actively contribute to the decision-making process. Although the portfolio manager aimed to bring EA up close to the management level, he did not achieve it. The portfolio manager assumed two reasons for not succeeding in convincing the section's manager to make an organizational change to bring EA up close to the management level. First, EA concepts were hard to understand. Second, the term "architect" was used to refer to IT specialists in Gov.

Surprisingly, although both enterprise architects and the portfolio manager presumed a similar role for EA, they had never spoken together about this topic. On the one hand, the architects said they invited the portfolio manager to their architectural meeting, but he did not attend. On the other hand, the portfolio manager mentioned all architects, who worked there, were IT architects. The portfolio manager emphasized that they needed enterprise architects who considered business goals. It was interesting because they both (portfolio manager and enterprise architects) mentioned a similar matter. For example, one enterprise architect offered a virtual structure or a change in the organizational structure. In this suggestion, he proposed the idea of "*The Architect Elevator"* [64], and explained how it could facilitate the digitalization and innovation process in Gov. He told us, after sending the proposal to the IT manager, he received only one sentence as a response that *"it is a good idea, but it is not the right time."* The portfolio manager did not know about this proposal. We understood that the conflict between the IT manager and portfolio manager and how the portfolio manager perceived all architects' tasks and abilities, were significant barriers to developing some organizational rules and standards regarding EA practices.

4.4 Cultural-Cognitive Legitimacy

A recurrent theme in the interviews was a sense amongst interviewees that their outcomes measured their job. Since the consequences of the lack of EA consideration were unclear to the managers, the enterprise architect's job evaluation was challenging.

> *"We should show to others that we (Gov) need EA. The challenge is that even without EA, the digitalization processes have progressed. Therefore, this is very difficult to explain to others that, yet in this situation, we need EA. (…) we should show that by bringing EA here, after for instance three years, through standardization, we will obtain more efficiency"* (Enterprise Architect).

Totally, the architectural activities were under discussion at all levels. The architects believed they should fix problems that others had not seen yet. They had to hold different workshops, attend meetings, and participate in the projects to introduce the importance of architectural principles for digitalization processes. However, the overall organizational culture did not support them properly.

> *"People are too busy with tasks they are hired for. This is a big pressure. (They) do not use effort to look at the work outside their work. This is a reason people don't feel willing to do a job that is not part of their job description"* (IT architect).

Together, these findings provided important insights such as understanding how EA came into Gov, the extent to which it was accepted, and why architectural activities stopped at the enterprise level. In the next section, we discuss how EA organizational challenges accrued and led EAM to be failed.

5 Discussion and Conclusion

There is a growing body of research in the EA literature on EA challenges associated with organizational adoption. Several challenges have been identified, including a lack of management commitment, insufficiently experienced architects, the difficulty of understanding requirements in EA teams, insufficient tool support, rapidly changing environmental conditions, EA consultant-related issues, outdated organizational statutes, and communication challenges [10, 12, 26, 35]. However, in order to reduce as many challenges as possible, it is critical to understand the underlying reasons for EA challenges. Consequently, the problems related to organizational structure, problems from the political influence, legislation and policies problem, and users' readiness problem to adapt EA products are all recognized as root causes of EA challenges in the public sector [36]. In complementing the studies about the roots of EA challenges, we examine the root of EA's challenges through a legitimacy lens. Legitimacy is a key element and foundation of institutional theory [19], as it explains how a particular phenomenon obtains or loses acceptance in its institutional context [65].

To do this, we developed a theoretical framework based on four distinct criteria of legitimacy: regulatory, pragmatic, normative, and cultural-cognitive. We evaluated a failed EAM case to determine why EA was unable to maintain its acceptance within the studied organization, based on these distinct but complementary criteria of legitimacy.

The findings reveal that a lack of adequate legitimacy was the primary reason for the emergence of several challenges, including lack of shared understanding [10, 35], stakeholders' engagement [15], and financial [10, 15, 16, 26, 36] and management support [10–12, 16, 35], all of which drove to EAM's failure. However, as IT architectural activities gained adequate legitimacy, they were not challenged with the abovementioned problems.

5.1 Theoretical Implications

Appropriate legitimacy has been identified in the organizational literature as a factor in organizational survival [45] and can be a key element in resource competition [66]. We observed EAM efforts at the time of this study were at a debated legitimacy state, where the disagreement about EA existed among different stakeholders and led to its stoppage. Thus, one can also consider a lack of adequate legitimacy as the root cause of the organizational challenges encountered by EAs in this study. However, the question is how the state of architectural activities, which were previously legitimized at both levels (project and enterprise), has changed over time to the point where they have lost their enterprise legitimacy.

This study's findings confirm that pragmatic legitimacy is important in bringing EA into an organization at an early stage [e.g., 46]. Moreover, whereas normative and cultural-cognitive legitimacy are essential for IS adoption [66], they were never obtained for EAM in this study. Furthermore, this study found that regulatory legitimacy was a major factor in achieving adequate legitimacy. It is observed that regulatory legitimacy significantly reduces organizational actors' pressures when it comes to gaining IT-related innovation [47]. While regulatory legitimacy was never achieved at the enterprise level, this study showed that IT architectural practices gained appropriate legitimacy as a result of the government recommendation.

Although both levels of architectural activities were introduced concurrently to the organization, the lack of regulatory legitimacy hindered the emergence of other types of legitimacy criteria for EA. Likewise, the evidence demonstrates that pragmatic legitimacy is inadequate to sustain enough legitimacy. However, as a result of the impact of regulatory legitimacy on the organizational context, we observed that IT architectural activities could obtain additional types of legitimacy that ensure their survival.

5.2 Practical Implications

The legitimacy lens has significant implications for practice. According to institutional theory, if all regulatory, pragmatic, normative, and cultural-cognitive criteria are met, EA can obtain legitimacy in its institutional setting. This indicates that institutionalization of EA is a function of not only EA governance, principles, and standards, but also of consensus among key stakeholders regarding the expected value of EA and the spreading of architectural thinking to include EA procedures into the organization's norms and routines. This may be evidence of numerous EA failures. In many situations, despite significant effort invested in establishing governance procedures, EA failed to achieve

the desired objectives due to the existence of competing belief systems within the organization or because EA remained in its ivory tower, ignorant to the everyday routines of stakeholders.

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Intra-organizational Nudging: Designing a Label for Governing Local Decision-Making

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Abstract. Even though organizations may plan for long-term enterprise-wide objectives, they are shaped by local decision-maker's actions. The latter tend to have conflicting goals, such as short-term and immediate satisfaction of local business needs over organization-wide objectives. While local and diverse decision-making enables specialized products and services, ungoverned behavior may lead organizations that are hard to control and manage. Hence, the challenge is to harness, rather than eliminate decentral autonomy by reaping its benefits while limiting its downsides. Pursuing this purpose, this Design Science Research (DSR) study presents the creation and evaluation of a governance mechanism: a nudge-based label. It also contains a set of design features, which are evaluated quantitatively and qualitatively with expert surveys and discussions. The contributions include design knowledge about labels and the investigation of nudging as an intra-organizational governance mechanism.

Keywords: Complexity management · Local-global conflict · Behavioral alignment · Choice architecture · Nudging

1 Introduction

While increasing complexity of an organization's information systems (IS) inhibits its ability to adopt technological innovations, to innovate business models, or to satisfy new regulatory requirements [1], it can also enable products and services that are tailored to the needs of individual actors in such socio-technical systems [2]. Especially in large organizations, the mutually adaptive nature of business requirements and information technology (IT) enablement leads to an emergence of hardly controllable growth in complexity [3, 4]. Thereby, the arising challenge in IT governance (ITG, the processes that ensure effective and efficient use of IT to reach organizational goals [5]) does not consist of the elimination or suppression of local decision authority, but rather of finding effective ways to address the problems caused by the latter such as the inhibiting effect on controllability and manageability of enterprises [6]. Possible solutions should therefore reap the benefits of local decision authority, while moderating the evolution of the IT

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landscape [2], to achieve efficiency and effectiveness. Therewith, the research problem can be summarized as the need for means to guide individual and local decision-makers within organizations to act and decide in line with system-wide objectives in the context of hard-to-manage organizational systems.

This class of problems can be observed in non-organizational environments as well. Such domains include public health management, promoting political engagement, and societal welfare [7], where locally effective behavior is misaligned with system-wide interests. In these domains the application of insights from psychology to decision-making has gained significant interest, under the term of behavioral economics [8]. Therein, a general solution approach for guiding dispersed and unaligned behavior is to address the automatic system of the brain. The literature stream that specifically addresses the alignment of individual decision-making and behavior with system-wide objectives is choice architecture, as popularized by Thaler and Sunstein [7] and their nudge theory. Choice architecture reflects that individuals' specific choices depend upon the decision environment and thus the presentation of a choice [9]. Nudge theory advocates for small choice architecture interventions (nudges) to achieve desirable behavioral outcomes, based on reliably observed psychological effects [7].

Even though nudging has been found to be easy to implement, inexpensive, and applicable to a wide variety of domains [10], there is barely any research on how this solution could be applied in the intra-organizational environment. (One exception we found is [11].) Using the DSR approach, we design a nudge-based general solution to the issue of intra-organizational behavioral governance, by designing and evaluating a theory-informed label, for which we specified a suite of design features (DF). The contribution to practice includes ideas of implementation through both the visualized DFs and insights gathered from experts during the evaluation cycle. At the same time, there is a knowledge contribution to research in designing and evaluating a set of DFs and therefrom deducing design propositions, as well as in exploring the idea of using nudging in the intra-organizational context.

2 Theoretical Foundations

2.1 IT Governance

IT governance has become a vital part of businesses as they increasingly invest in technology [12]. These investments in IT and IS as well as the gain in size of organizations, increases complexity [13, 14]. The latter materializes in resistance, increased effort, and likelihood of failure to changing business models, operational processes, or IS [1, 6], thereby inhibiting adaptability of organizations and increasing the cost for changes. The latter is detrimental, since organizations need to be both efficient and flexible to survive in their environments [15]. However, complexity may also be a lever to adopt environmental changes [2] and to enable continuous innovation, which is why it may be harnessed, rather than eliminated [16, 17].

In corporate governance the focus of ITG is on the definition and implementation of "processes, structures, and relational mechanisms in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value from IT-enabled business investments"

[18]. Thus, ITG not only provides structure, but more importantly, effective ITG should include considerations as to how human behavior brings the whole together [19]. Operationally, ITG mechanisms are used to produce IT-related decision and behavioral patterns that align with organizational goals [20]. These mechanisms include decision process designs, policies that guide these processes, definition of accountabilities, etc. [20]. It is believed that ensuring compliance with sanctioned policies, procedures and guidelines yield effective ITG outcomes [20]. Thus, reflective thought processes have been thought to be effective levers to induce behavioral change [8]. However, this leaves substantial parts of the behavioral variance in individuals unexplained [21]. Behavioral economics can bridge the gap by applying evidence from psychology to models of decision-making [8]. In that regard, nudging may be an effective solution to align dispersed behavior in the sense of ITG goals.

2.2 Nudge Theory

The issue of dispersed behavior that may negatively affect a system if it is not properly aligned with system-wide interests, is known in various domains such as politics, public health, and social security systems. In those environments, the concept of decision architecture, as a means of shaping decision making, has been readily used over the past decade as an alternative local view. The nudge theory [7] posits that habits and cognitive limitations may be strategically used to change decision environments ever so slightly to achieve desirable outcomes. The theory thereby relies on insights from reflexive cognitive processes [22], also known as heuristics and cognitive biases [23], or psychological effects [24]. Unlike traditional control-based interventions, nudges only marginally change the decision environment to alter "people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" [7]. While nudging seems to be an effective and efficient way of guiding individual behavior in various domains [10], current research on nudging does not cover intra-organizational environments yet. However, based on its underlying premise that nudges take advantage of human heuristics and biases, it seems reasonable to expect nudging to work on employees in intra-organizational environments as well.

2.3 Psychological Effects in Nudging Literature

Mirsch et al.'s [24] comprehensive literature review on relevant psychological effects for nudging in the physical and digital sphere revealed the twenty most frequently used psychological effects in extant literature. For the design of our nudge-based intervention we have selected all effects that were used at least in five publications. Upon further investigation, we found that the effects of 'hyperbolic discounting' and 'discounting' are of low relevance to our use case, and we therefore excluded these two effects. This has left us with these seven psychological effects:

Framing, governs decision-makers by means of a purposefully designed decision frame that takes advantages of psychological principles to induce a predictable shift in decision preferences [25]. As an example, [25] framed a decision problem by describing it in two semantically different ways. One was positively framed (save X of Y lives), whereas the other was negatively framed (Z of Y people die). While the outcomes where

the same (Y – X = Z), people responded differently depending on how the question was framed. Since then, many studies confirmed this effect [e.g., 26, 27–29].

The *status quo bias*, makes use of individuals' tendency to maintain the current status. The strong desire to remain with the current status quo is rooted in the tendency to overestimate the discomfort of accepting change as well as to underestimate the potential benefits that change may bring [30]. Providing default options is a typical [24] and effective [31] application of how this effect is used to nudge decision-makers.

Social norms is a term to describe "rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of laws" [32]. As a result, people "orient towards the behavior of others" [24] in order to avoid sanctions form their social networks [32]. A well-known example of a social norm nudge is the "Most of us wear seatbelts" campaign by the Montana Department of Transportation, which led to higher use of safety belts in cars.

Loss aversion refers to a psychological effect that individuals' decisions tend to be influenced more strongly by the prospect of negative outcomes than positive ones [30]. Nudging implementations include a statement on the popularity of certain limited offers or adding that a certain offer is only available on a specified day. This may trigger a feeling of loss, unless the opportunity is grasped and the purchase is made [24].

Anchoring and adjustment refers to the fact that individuals lacking reference points tend to estimate values based on cues in their decision environments [23]. Providing individuals with reference points allows them to compare different situations and choices [24]. Whereas a person may not know whether a specific dishwasher is efficient or not, when provided with an efficiency label as a starting point (see Sect. 2.4), they 'anchor' their judgments on relative distances to that reference point [e.g., 33].

Priming is an effect that "can be described as the preparation of individuals for the decision moment by gently leading them to the decision" [24]. One operationalization of this effect is to elicit intentions beforehand [e.g., "Do you intend to vote?", cf. 34].

Lastly, *availability heuristics* describe changes in individual perceptions based on the ease at which one can recall a certain event [24]. People perceive the probability of a certain event to occur as higher if the latter is mentioned frequently or recently [35].

2.4 Energy Efficiency Labels

In this paper, the term label is used to refer to decision information nudges [36] that intend to alter individual decision outcomes by providing succinct disclosure on certain decision-relevant aspects [37]. One of the most successful label types are standardized energy efficiency labels for e.g., dishwashers, washing machines, or fridges [38]. They have been found to be particularly effective in aligning individual decisions with desirable societal goals [39]. Therefore, and because labels (as a low intrusive intervention) were found to have high acceptance, we used generalized design knowledge on energy efficiency labels as a starting point for our design.

The developments and findings on energy labelling research were synthesized from [39] and the design knowledge can be summarized as follows:

1. New energy labels should be designed through end-user-based market research.
2. Comparative energy labelling is perceived as being helpful in decision making.

3. Comparative scales are more easily understood than technical information only.
4. Discrete categories illustrate comparisons more effectively than continuous scales.
5. Adding primary consumption figures (e.g., kWh) comparative scales is helpful.
6. Using colors to exploit their strong connotations is helpful to foster understanding.
7. Information should be carefully organized to avoid overload and poor structure.
8. The adoption of a well-known label design cannot be assumed to be effective in a new environment. It should be confirmed through research beforehand.

Since labelling was found to solve the generic problem class, and energy efficiency labels seem to be highly effective, the subsequent artifact construction will take these findings as a foundation for designing principles that guide the design of the artifact. The next section addresses the past efforts that exist in bringing the label from its public application environment into organizations as a tool to align employee behavior.

2.5 An Example of a Label Used in the Intra-organizational Environment

Little qualified research on the design and use of labels within organizations exist. The same is true for nudging (see above). Study [11] addresses this gap between very successful use cases in the public domain (i.e., guiding individual behavior for the public good) and the lack of exaptation of such solutions to the intra-organizational domain (i.e., guiding employee behavior toward organizational goals). They designed an Enterprise Architecture (EA) label that nudges local decision makers to opt for choices that favor an enterprise-wide perspective. Similar to the case of a label for ITG, the EA label was designed to solve the local-global conflict where local decision makers should opt for IS design alternatives that are aligned with EA goals.

Paper [11] emerged with design knowledge that is also relevant to this paper's objectives. First, in order for the label to be perceived as a nudge rather than a measurement system for quantified performance, designers should favor simplicity over absolute accuracy. Second, they employed several measures, which were aggregated with equal weights to an overall score. The equal weighting created transparency for local decision-makers, which was perceived as beneficial.

3 Method

To design an ITG mechanism for aligning individual decision making with organizational objectives, we opted for a research approach that follows DSR principles. DSR is well established in the field of IS [40–42], and its purpose is to extend organizational and human capabilities through the creation of new artifacts [43].

3.1 The DSR-Approach

The DSR process builds on existing theory, where established knowledge serves as an input informing the design [41, 43]. Thereby both descriptive and prescriptive knowledge is used to inform the researchers about the object of investigation and the design process respectively. While there are various reference processes and guidelines on how

to conduct DSR [40, 42], the framework from Hevner, March [43] is the most cited one [44]. Hevner's three cycle view [45] is an improved and more detailed version of that framework [46], which is why rely on the latter. The process consists of three research cycles: the relevance, rigor and design cycle [45].

The *relevance cycle* initiates DSR by providing research requirements and an application context. In this paper, the application context is motivated in the introduction and conceptually discussed in Sect. 2. Some researchers explicitly translate the knowledge of the problem into (meta) requirements [47], whereas in other papers the inclusion is implicit [48]. In a later step this cycle defines acceptance criteria to evaluate the research results [45, 46]. According to Dresch, Pacheco Lacerda [42] the implementation of an artifact in DSR is not a mandatory step. Due to the great effort in terms of time and costs to field test the artifact, this study does not yet include the evaluation in an application context but features a conceptual evaluation with practitioners.

The *rigor cycle* is a feedback loop to "provide past knowledge to the research project to ensure its innovation" [45]. Grounding DSR can be achieved by including additional knowledge on the problems, existing artifacts, analogies/metaphors, and theories [45]. For this paper, the knowledge base is provided in Sect. 2 and its inclusion in design and development activities is reported on in Sect. 4. The knowledge base will be enhanced by extensions to existing theories (nudging) and design knowledge (labels).

The *design cycle* represents the core of the DSR model [45] and requires the most effort. In this step, artifacts are designed and rigorously evaluated before releasing them to field testing as part of the relevance cycle. The design is explicated in more detail in Sects. 3.2 and 4, while the evaluation is presented in Sects. 3.3 and 5.

3.2 Design and Development Procedures

The procedures that led to the designed artefacts (i.e., design features and design principles) followed four phases: First, (1) we harnessed the existing knowledge bases by searching the literature on the problem (intra-organizational behavioral alignment, see Sect. 1, and ITG, see Sect. 2.1), a possible solution approach (nudging, see Sect. 2.2), known design options within nudging (see psychological effects in Sect. 2.3), and known prescriptive knowledge about a suitable carrier for such nudges (energy efficiency labels, see Sect. 2.4). In the second phase (2) we derived an initial set of design principles for creating a label. Thereafter, (3) we compiled the existing knowledge and an existing label design [11] (see Fig. 1) as a starting point for the design and development of our own label. The actual design phase (4) was based on several workshops during which we iterated between brainstorming and evaluation phases. Thus, design ideas were freely shared, before comparing the knowledge bases from step 3 with these ideas, which ultimately led to the emergence of the designed artefact.

3.3 Evaluation Procedures

To evaluate our artefact (i.e., the design features) and to solidify our design principles, we have opted for two types of evaluation: A quantitative survey and a qualitative expert discussion. Both took place at practitioner workshops, where the artefact and a scenario of its application was presented, before inviting the experts to partake in an electronic survey

with evaluation questions on each of the design features (measurements on 7-point Likert scales). To enhance the insights from the quantitative evaluation, a qualitative discussion ensued directly after the collection of the data. We simultaneously visualized the results and used the visualizations to spur discussions to make sense of the data together. We implemented this explanatory mixed-method design at three workshops with experts from practice in the domains of enterprise architecture management, information systems management, and production management—all of which are regularly confronted with managing the local-global conflict within their organizations. The same procedure was used in all workshops (more detail in Sect. 5).

4 Artefact Development

4.1 Transfer of Existing Knowledge

Based on the knowledge outlined in Sect. 2, we initially transferred the learnings from existing research to the specific case an ITG label by deriving design principles. The following design principles (DP) emerged (in parentheses, the number of the respective statement from Sect. 2.4 is provided).

- DP1: Comparative elements should be included. (2)
- DP2: Comparison should not be solely based on technical information. (3)
- DP3: Discrete categories for comparative elements should exist. (4)
- DP4: Quantitative measures outlined in addition to comparative scales should be included. (5)
- DP5: Colors with strong connotations should be used to foster understanding. (6)
- DP6: Information should be carefully organized. (7)
- DP7: Excessive information should be avoided. (7)

4.2 Starting Point

The starting point for developing the set of DFs was the knowledge base as described above, including the most commonly used psychological effects, knowledge on nudging and the creation of a label, the derived DPs, and a label for a related context [11] (see Fig. 1). Based on the psychological effects presented above, we analyzed that existing label and identified three different underlying psychological effects: The overall rating represented as a classification (A to F) and the belt (red to green), are graphical representations of anchoring and adjustment, since they provide reference points. The second effect is loss aversion, which can be seen in the display of the trend. Displaying a (negative) trend can nudge people to exert additional effort to prevent losing their current rating. Lastly, the whole label can be considered to contribute to a framing effect as the choice of the contents of the label frames the interpretation of its message. With this information stack as a starting point, we have iteratively designed the following set of ten design features.

4.3 Design Features

As described in Sect. 3.2, we have had several workshops among the co-authors of this paper, during which we iteratively developed the design features of our proposed label. The final result can be seen in Fig. 2. Its constituents are the following:

DF1 is adapted from [11] and the Energy Label of the European Union [39]. It relies on the anchoring and adjustment mechanism. It displays the overall rating of the local entity and summarizes the individual measurement items in discrete categories (DP3). Its meaning is underlined by a color scale where red is associated with a bad, and green with a good score (DP5).

DF2 provides an overview of the rating distribution among the different local entities, allowing individuals to more accurately compare their rating with peers (DP2–3).

DF3 is a quantitative measure that indicates the likelihood to lose the current rating for the worse (DP4), which represents the psychological effect of loss aversion.

DF4 is a multitude of measurement items (in this case two are displayed for illustration, DP4). This informs users about the underlying mechanisms that lead to the overall rating, which establishes understanding and clarity, while also framing the label such that certain sub-aspects are made explicitly salient. Thereby, each measurement item is delimited by a box, which should help structure and organize the contents (DP 6).

The boxes with measurement items contain DF5, DF6, and DF7. In DF5, a belt ranging from red to green color (DP5) indicates a low or high performance and makes it possible to evaluate the achieved value XY. Therefore, DF5 is a graphical display for the anchoring and adjustment effect (DP1). DF6 (grey triangle) is an operationalization of the social norms effect and shows the average performance of the peer group for the specific performance indicator. This allows for additional comparison (DP1–2) and, in case of comparably poor scores, motivates individuals to increase their effort to reduce social pressure. The last feature in the boxes of measurement items are the trends (DF7), which implement the effect of loss aversion. The arrows aim at displaying the trend for an individual performance indicator over the last periods (DP2). Thereby, colors are used to indicate their desirability (DP5).

DF8–DF10 are mainly text-based. DF8 is a default selection for corrective actions and will be set by the global entity (e.g., enterprise architects) (DP2). The local entity (i.e., the decision-maker) then has to actively opt for another action, if it is not willing to implement the suggestion. Hence, DF8 represents the status quo bias. However, DF8 can also be seen as a form of priming, since it prepares the local entity for a decision.

DF9 displays best practices and is an example for social norms and the priming effect. It aims to nudge local entities towards an action that has been performed successfully by peers, by raising social pressure and preparing for a specific decision (DP2).

DF10 is an operationalization of the psychological effect of availability heuristic, as it shows past incidents and raises awareness among local entities. Thus, individuals may judge the probability of such incidents occurring as higher than others (DP2) and are more likely to work against them.

To keep the label understandable, trustworthy, and simple (DP6, DP7), the different DFs are arranged by following a top-to-bottom approach: First displaying the DFs that show an overall rating. Next, single measurement DFs elaborating on the overall rating,

followed by additional informational DFs that are not necessarily relevant for the overall rating. This arrangement itself has the psychological effect of framing.

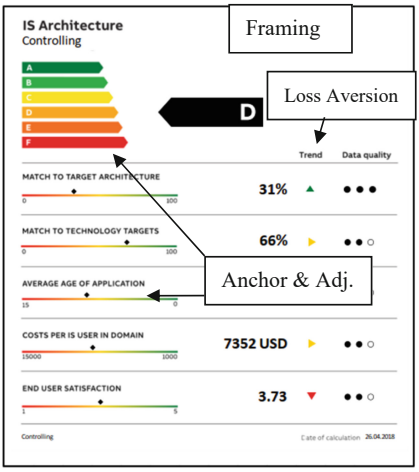

Fig. 1. Identification of psychological effects, see Schilling, Aier [11]

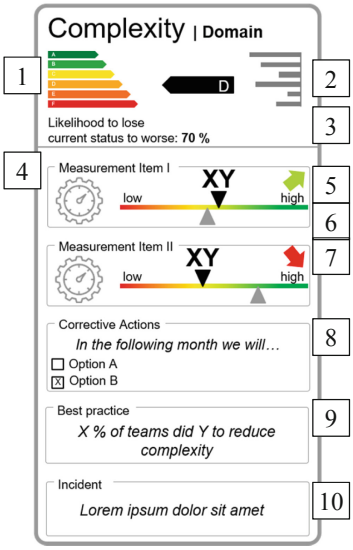

Fig. 2. Label with the ten DFs

5 Evaluation

Our evaluation of the DFs comprises quantitative and qualitative analyses. We quantitatively surveyed experts on the perceived effectiveness of the DFs, before confronting them with the results of the survey in a qualitative group discussion to interpret the data.

5.1 Quantitative Expert Survey

To evaluate the effectiveness DFs in aligning local actors' decisions with global objectives of an organization, we created an electronic survey and proceeded as follows:

Phase 1: General Introduction. In the first phase the participants were shortly introduced to the problem of behavioral alignment in ITG by means of nudges in general and a designed label in particular. In case of unclarities, the experts could ask questions.

Phase 2: Provision of a Scenario. In order to increase the shared understanding for the specific application of the label and thus the potential usefulness and effectiveness of the DFs, the participants were provided with a scenario that operationalizes the problem. In that scenario, two decision options (A vs. B) were presented, where B aligned with organization-wide goals and A primarily serves local decision-makers.

Phase 3: Data Collection. Each individual DF was presented and explained by one co-author such that its operationalization for the specific scenario became apparent. For each DF, the participants were asked to respond anonymously through an online survey to the following question: "Is this design element effective and thus suitable to nudge local decision makers to opt for the enterprise-wide desirable outcome (option B)?" Responses were gathered on a 7-point Likert scale ranging from 1 (very ineffective) to 7 (highly effective).

The workshops took place in October and November 2019 in Switzerland and Germany. Since participation was voluntary, not all participants responded to the survey (workshop 1: 44/52 attendants (84.6%); workshop 2: 10/12 (83.3%); workshop 3: 11/15 (73.3%)). The experts were highly experienced, with many of them having more than ten years (45%) and most of them (72%) having more than five years of experience in their current field of work. The overall average of the ratings for the DFs was 4.87 out of 7 and each question was answered by 63 to 66 experts. The descriptive statistics of the individual effectiveness assessments of the DFs are ordered according to the mean effectiveness votes in Table 1.

Apart from DF3, all DFs were assessed to be above average (>4.0). However, it is apparent that DF1, DF4, and DF5 are judged to be highly effective and DF6 and DF7 are also highly rated. Together, these DFs engender the design principles DP1-DP6. DP7 (not featuring excessive information) is necessarily dependent on the combination of DFs. In that regard, the question of how much information is 'excessive' needs to be determined. This, among others, was part of the qualitative discussions.

Table 1. Description of quantitative survey data including results from the factor analysis.

Effectiveness rating	N	Mean	STD	F1	F2	F3	F4
DF4: Split into individual items	66	5.47	1.459			0.61	
DF1: Rating	64	5.33	1.624				0.93
DF5: Colored belt	65	5.26	1.482			0.93	
DF6: Average of all entities	66	5.02	1.583		0.60		
DF7: Trend	66	5.00	1.608		0.59		
DF8: Measures for improvement	66	4.86	1.654	0.76			
DF2: Comparison of rating distribution	63	4.86	1.848		0.81		
DF10: Issues in the past	66	4.52	1.825	0.67			
DF9: Best practice suggestion	65	4.40	1.748	0.82			
DF3: Probability of losing current rating	63	3.97	1.732		0.73		

A factor analysis to identify types of DFs has yielded four factors (F): F1 contains DF8–DF10, which are the text-based DFs. F2 contains DF2–3 and DF6–7, which are the comparative DFs (between periods and/or entities). F3 contains DF4–5, which split the overall rating (DF1) into more detailed measures. F4 only contains DF1, the overall rating, underlining its relevance and unique nature.

5.2 Qualitative Expert Discussion

The responses from the quantitative survey were visualized as histograms (distribution of votes on the 7-point Likert scale per DF) and bar diagrams (relative effectiveness rating between the DFs) as the foundation for the discussions to interpret the data. At each of the three workshops, two of the co-authors took notes on the insights provided by the participants. In case of unclarity, the participants were asked to elaborate. The qualitative data gathered in this way was thereafter summarized and aggregated into four additional design principles. Hence, the main findings from the qualitative expert discussions can be summarized as follows:

- DP8: It should be clear to users how the components of the rating are built. (Explanation: If employees do not understand how the rating is built, the credibility and thus the effectiveness of the label is low).
- DP9: A label should be very simple. (Explanation: Understandability is more important than completeness. A focus on some objectives, e.g., 3–4 design elements, may be beneficial in gaining approval of the measures and to avoid selection and discussions about relevance (DP7). As a minimum, DF1 and DF5 may suffice).
- DP10: Text-based DFs must be relevant for the specific local entity. (Explanation: While the ideas of measures for improvement (DF8), best practice examples (DF9), and information about incidents (DF10) are perceived to be conceptually interesting, their implementation was judged to be difficult, since their success depends on their suitability for each individual. It is crucial that users can directly relate to them).
- DP11: Each label has to be designed with and for the intended userbase. (Explanation: Finding the right measurement items was deemed a core difficulty in operationalizing the DFs shown at the workshops. This seems challenging, not only for text-based DFs, but DFs in general. Our findings back the earlier finding that labels are more effective when designed in collaboration with its target audience [39]).

The idea of introducing a label into the intra-organizational context has been well perceived. However, participants voiced concerns regarding the operationalization of the DFs. This is in line with previous findings requiring new labels to be designed along with end-user-based market research [39].

6 Discussion

This study has set out to create design knowledge toward solving the problem of misalignment between individual (local) behavior and organizational (global) goals, which—in the context of mutually adaptive business requirements and IT enablement—leads to a hardly controllable growth of complexity in IT governance. Therefore, extant knowledge on how to influence individual decisions toward system-wide objectives was combined with design knowledge on how this problem class is addressed in other domains to develop DFs for a governance label that carries nudges.

The design process has yielded a label with ten distinct DFs, based on well-established psychological effects in the choice architecture literature and knowledge on how to create an effective label. The evaluation of the DFs was conducted at three

workshops with experts in managing such local-global conflicts within organizations. At each workshop, the effectiveness of the artifacts (DFs) was quantitatively assessed first, and qualitatively discussed afterwards.

The main findings of this DSR study includes the design of ten semi-abstract design features (see Fig. 2) that may serve as a baseline set of features for label designers. However, the latter must adapt and specify these DFs together with prospective users to the specific application context.

Furthermore, this study has brought forward a set of eleven design principles (DP) for the design of labels in the intra-organizational environment. Seven DPs were transferred from the existing bases of knowledge (Sect. 4.1). The remaining four DPs stem from the qualitative discussions with experts (Sect. 5.2).

The main findings furthermore include that visually implemented DFs are more effective than text-based ones, and the expected effectiveness for the ten DFs created in this study is heterogeneous. Furthermore, a label should be simple and therefore limited in scope. Otherwise, local decision-makers may distrust the label's accuracy, argue about the various DFs' relative importance, misunderstand it, and potentially disregard it. Combining the findings on the relative expected effectiveness of the DFs (quantitative surveys) and the strong request to focus on a lower number of DFs (qualitative discussions), as well as the design principles that informed the label design in the first place, we conclude that an effective label should focus on a small selection of simple-to-understand DFs.

Having positioned the abstraction level of the artifact such that the DFs are not directly applicable but must first be 'translated' to a specific setting is certainly a limitation of this study. The evaluation revealed that the effective operationalization of the DFs (and in particular the text-based ones) is highly challenging. Furthermore, the findings are limited to solve the problem of guiding individual behavior towards organizational objectives. The creation of a full-blown design theory (level 3 contribution) is out of scope for this paper and the design knowledge created from a very situated solution (level 1) would not sufficiently contribute to solving the research problem. Therefore, the level 2 contribution type was deemed suitable for this paper [41].

Another major limitation, due to time and effort constraints, is the fact that the artifacts were not translated and tested in the real application domain.

In future studies, these limitations may be addressed by translating the design knowledge created throughout this DSR project (i.e., the design principles and the suggested design features) together with organizations to test its effectiveness. Since this would entail interventions with real employees, ethical concerns should be addressed as well. Based on the insights that may be drawn from such studies, a more complete design theory for the design of a nudge-based ITG mechanisms may arise.

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An Agile Approach to Business Process Analysis with Knowledge Management Support

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Abstract. This paper proposes a methodology for business process analysis, conceived in the context of business process (BP) management. The proposal addresses business process analysis with a knowledge management approach, adopting an Agile philosophy. It is based on the progressive, iterative construction of a knowledge base about the business organization and, specifically, the process to be innovated. The methodology proposes a set of information structures, in the form of a sequence of seven different knowledge artefacts that starts with a simple, intuitive process specification and then evolves towards richer models. The method has been conceived to be easily adopted by business experts, allowing them to acquire, model and manage business knowledge without the need of knowledge management experience. In this way, business experts are kept at the centre of the business analysis process and the created business models can be easily transferred to a Low-code platform for a seamless development of enterprise information systems.

Keywords: Business process analysis · Agile method · Business process modeling · Knowledge representation · Glossary · Lexicon · Class diagram · Ontology

1 Introduction

In the last decade the economic system underwent a significant transformation, due to several factors: from the globalization to the digital revolution, to the fight against the climate change with the green transition. In addition, the advent of the Covid-19 pandemic and the post-pandemic phase, that (hopefully) is ready to start, are further increasing the speed at which enterprises need to change, redesign their processes and organizations.

Within enterprise innovation, Business Process (BP) [1] innovation plays a central role, in fact a BP cannot be considered in isolation with respect to other elements of the enterprise. Even if our initial focus is on the innovation of a specific business process, we need to consider other related business elements, such as documents, enterprise structure and organization, roles and skills of the involved people. Conversely, if our focus is on, say, product innovation, then we are forced to change the involved processes as well.

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For the above reasons, BP innovation is one of the most strategic field of a dynamic enterprise [10]. It consists in the transformation of an existing BP from its current configuration (*AsIs*) to a future, improved configuration (*ToBe*). Business Process Analysis (BPA) [2] represents the first phase of any digital transformation: it requires a deep understanding of the target business processes and the building a set of models.

Business Process Analysis is a territory of research and practice that traditionally belongs to business experts, who are supported by methodologies that provide, mainly in an informal mode, schemes and guidelines for their activities. Such methodologies lack of a formal grounding and the absence of a formal approach concerns also the documents to be released at the end of the analysis process [3]. Due to the informal nature of the produced documents, often containing imprecise statements or missing information, traditional methodologies demonstrated a number of shortcomings that are often propagated in the successive development of enterprise information systems. One consequence is the well-known Business/IT Alignment problem [4], i.e., the misalignment between business needs and the services offered by the information system. Several efforts have been deployed to find a solution, but yet with a limited success [5].

To solve the issue, one idea was to establish an early cooperation between business and IT experts and the adoption of a rigorous approach in BPA. Moving earlier the adoption of formal methods would improve the quality and the reliability of the released business models. Along this line, the adoption of a semantic approach started to emerge, proposing knowledge-based solutions centered on business ontologies [6], yielding to ontology-based enterprise models [7]. However, such solutions appeared too complex and were not well received by the business community, and today there is not yet a winning solution for business experts to build and manage formal specifications of a business scenario.

This paper proposes a knowledge-driven approach to business process analysis consisting in a progressive construction of knowledge artefacts, in a sequence that starts from simple, narrative models, and then proceeds building semantically richer models, eventually achieving an ontology of the business scenario. All the models, except the final ontology, can be built without specific knowledge engineering competences. To improve its effectiveness and further ease the BPA process, the proposed methodology adopts an Agile approach [8], therefore we named this methodology ABPA (Agile Business Process Analysis).

One of the main characteristics of ABPA is the paradigm shift that moves the focus of the business process analysis from the '*how*' to the '*what*'. In essence, the traditional methods are focussed on how to carry out the analysis, providing a number of best practices, rules, recipes to be followed (the '*how*'). Conversely, we consider business analysis as a 'knowledge management affair', therefore we put at the center of the stage the knowledge artefacts that are produced during the analysis (the '*what*'), leaving a great freedom on how to proceed in building them.

In essence, the ABPA methodology is based on three main pillars: (i) the adoption of an Agile philosophy [9], characterised by an iterative, incremental approach and frequent delivery, in the construction the of knowledge artefacts; (ii) the progressive introduction of a formal approach in the creation of an Agile Business Process Ontology (ABPO); (iii) the positioning of business experts at the center of the whole business analysis process,

giving them full control on the business models that are built and relegating technical expert tasks to the final coding of the ontology.

Now we introduce three research questions that have guided our work, the answers are reported in the last section.

RQ1 - Research question 1: Is it convenient to adopt an Agile approach for the analysis of business processes?
RQ2 - Research question 2: Is it handy for business experts to adopt a systematic knowledge management method in the construction of business process models?
RQ3 - Research question 3: What are the advantages of involving business experts in a systematic, formal business process analysis?

The rest of the paper is organized as follows. In the next section we provide a short review of the literature in the area of agile methodologies and knowledge management for business process analysis. Section 3 describes the proposed methodology, by means of a running example. In Sect. 4 some conclusions are reported.

2 Related Work

As anticipated, the paper is rooted in two key scientific areas, Agile methodology and knowledge-based business process analysis. At the intersection of these two areas we have agile business analysis, with a further focus on business processes.

A literary review highlights a lively scientific and practical activities in the area of Business Process Management (BPM), however, little results are focused on knowledge-based BPA that is the focus of this paper. BPA can be seen as a supporting activity for BPM, considering that the former is more focussed and the latter has a wider scope. In particular BPM includes the operational aspects, the monitoring, improvement and redesign of business processes. All these activities require a solid knowledge about the business context where the BP takes place. Here we briefly review some of the key principles of the Agile philosophy, then its adoption in the BPA and, finally, some of the proposals for knowledge-based BPA, yielding to an BPA ontology.

2.1 Agile Methodologies for Business Analysis

The Agile philosophy [11] continues to attract the attention of scientists and practitioners, for the advantages it presents when developing software systems in a fast and ever changing world. It started in the software development area, then its popularity expanded beyond the software development. One promising area is represented by business analysis. However, the existing proposals tend to address the topic in an informal way, mainly providing good practices, advices and guidelines [12]. There are some contributions towards a more systematic approach, such as the Agile Modeling Method Engineering (AMME) proposal [13]. This proposal, that has a wider scope than ABPA being targeted to enterprise modeling, provides some interesting indications but its four stages organization remains at a descriptive level, failing to provide precise directions for business experts.

Another interesting proposal is the agile methodology referred to as Integrated BPM (IBPM) [14]. Within its wide scope, IBPM proposes a very rich framework based on the idea of combining process-oriented and service-oriented approaches. The framework proposes five project phases: Planning, Analysis, Business Design, Implementation Design and Implementation, with best practices and modeling guidelines. The key result is represented by BPMN (Business Process Modeling and Notation) process diagrams. The key difference between the ABPA and IBPM is that the later focuses on the 'traditional' Agile principles concerning the management of the projects, i.e., the '*how*', while ABPA has the primary focus on the deliverables, i.e., on '*what*' the project should produce, in terms of business models.

2.2 Knowledge-Based Business Process Analysis

The quest for a systematic method for BPA produced a relevant literature where, in particular, several ontology-based solutions for BPA have been proposed. Among them, we may recall COBRA, a Core Ontology for Business pRocess Analysis [15], that is based on a Time Ontology. Another research line, with a wider scope, is represented by the adoption of ontologies and semantic web services for BP management, such as Semantic Business Process Management (SBPM) [16]. All such proposals appear to be more inclined towards the formal aspects than the ease of use by business experts.

A different research line, rooted in the business culture, starts from a business standard, the Universal Business Language (UBL) [17]. In essence, UBL is an open library of business data components, such as Address, Price, Quantity, and business templates of the most common documents, such as Invoice, Order, Receipt, plus a number of standard process models. An interesting proposal [18] is based on the association of a business ontology to UBL. It proposes a formal modeling the UBL components and templates, including the UBL process flow, with an ontological formalism (essentially OWL: Web Ontology Language). Probably due to an excessive formalization, the proposal was not accepted by the business community.

Another interesting proposal is represented by BPMO [19], a Business Process Modeling Ontology that besides UBL considers also other business modeling standards, including ebXML[1]. BPMO has been mainly conceived to allow the exchange of information among cooperating enterprises rather than to support BPA.

It is widely recognised that the existing proposals had a limited practical impact, failing in the objective of convincing business experts to adopt more rigorous and formal business modeling methods. We believe that there are several causes. The first is the clash of the business and the ontology cultures, with the pragmatism of the former and the formal approach of the latter. Then, the idea of building large, encompassing, enterprise ontologies turned out to be too complex, difficult to be achieved and to be maintained over time. We believe that starting with local solutions, e.g., a departmental or an application ontology, would have more chances of success. Also, the idea of pushing extensive competencies of ontology principles and theories in the business world appears not practical. Then, there is a need for a 'soft' methodology that supports business experts

[1] ebXML: Electronic Business using eXtensible Markup Language, an international standard aimed at representing business concepts with the XML notation.

with a progressive approach, from informal to formal, to knowledge modeling. For these reasons, the ABPA method starts by building simple intuitive models, in the form of textual descriptions, that are progressively enriched producing structured, semantically tagged artefacts and, eventually, a business ontology. Only the last step, prepared and supported by the previous ones, requires ontology engineering competences.

3 An Agile Method for Business Process Analysis

BPA requires a thorough understanding of the business domain, achieved by a comprehensive analysis and modeling of the current state of play. As anticipated, such an analysis goes beyond the given BP and considers also other business elements, such as the actors who operate or superintend on the process, documents that are exchanged among the actors, data and information that are managed during the process. ABPA proposes seven models, with a preliminary (informal) analysis of the static facets of the business scenario (i.e., without considering the actual business flow), and then a progressive formalization. ABPA is a preparatory work for the full-fledged Business Process Reengineering (BPR) that includes the diagrammatic modeling of the business flow, yielding detailed BP diagrams. In essence, ABPA focuses on the structural elements of the BP, including activities, operation, and the links with the other cited elements (document, actors, etc.), avoiding the formal modeling of temporal sequencing.

In ABPA, the models that represent the enterprise knowledge can assume various forms, with different levels of details and formality. In particular, we have: (i) *plain text*, a narrative form of knowledge representation; (ii) *structured text*, e.g., itemised lists (bullet points, numbered lists, etc.) that collect and organise short statements; (iii) *tables*, typically providing a systematic visualization of knowledge items; (iv) *diagrams*, where the knowledge is graphically represented, according to a given standard; (v) a formal representation of the business domain by means of a *reference ontology*.

3.1 A Running Example

The methodology proposes the acquisition, modeling and management of structural knowledge concerning the current business process scenario, building the following knowledge artefacts.

a) **BP Signature.** The first knowledge artefact, in the form of a table, aimed at providing a synthetic description of the business process, gathering key information about it.
b) **BP Statement.** A preliminary plain text description of the business scenario and the business process, described in general terms (i.e., at an intensional level).
c) **BP User Story.** A plain text description of an exemplar execution of the BP (i.e., at an extensional level). In essence, it represents an instance of the BP Statement.
d) **PB Glossary.** A collection of terms, with their descriptions, that characterise the BP domain.
e) **OPAAL Lexicon.** This is a structured terminology that provides a first semantic tagging of the key terms used in the previous structures.

f) **UML Class Diagram.** The construction of the UML Class Diagram (CD) starts form the knowledge collected so far, modeling it in a graphical form. Such a graphical representation is particularly useful to exchange the knowledge among people.
g) **BPA Ontology.** This is a formal representation of the analysed business process. It is the final knowledge artefact of the methodology.

Below we illustrate the details of the listed knowledge artefacts. To this end, we adopt a running example concerning a pizza shop. The example will help to show the progression in complexity and formality of the business knowledge artefacts to arrive, eventually, to the definition of the BPA (Business Process Analysis) ontology.

BP Signature. The Table 1 gathers the key knowledge aimed at providing the essential information about the BP.

Table 1. BP signature scheme.

Knowledge items	Description
BP name	<The name of the business process>
Trigger	<The event that causes the BP to start>
Key actors	<The most relevant actors that operate in the BP>
Key objects	<The most relevant objects involved in the BP>
Input	<The objects required to start the BP>
Objective	<The objectives that the BP intends to achieve>
Output	<The final deliverables released at the end of the BP>

Then we provide the first description of the pizza shop BP (Table 2).

Table 2. Pizza shop BP signature.

Knowledge items	Content
BP name	Home Pizza Delivery
Trigger	Order Arrived
Key actors	Customer, Cook, Delivery Boy
Key objects	Order, Dough, Pizza, Delivery Vehicle
Input	Order
Objective	Cook and deliver pizzas to customers
Output	Pizzas Delivered, Customer happy

BP Statement. The text of the BP Statement is the synthesis of an interview to a (fictitious) pizza shop owner, whose business has name *PizzaPazza* (Fig. 1).

My business, PizzaPazza, is a home delivery pizza shop. The customer fills in the order and then submits it to the shop, with the payment, by using our Web site. Making good pizzas requires good quality dough, produced in-house, and a careful baking of the pizza. To make clients happy, we need to quickly fulfil the order and the delivery boy needs to know streets and how to speedily reach the customer's address.

Fig. 1. BP statement text box

BP User Story. This text reports a specific execution of the BP, i.e., it represents an instance of the PizzaShop BP (Fig. 2).

John connects to the PizzaPazza Web site and places his order of two Napoli pizzas, providing also the payment. On the arrival of John's order at PizzaPazza, Mary, the cook, puts the order on the worklist. When the John's turn arrives, Mary prepares the ordered pizzas, cooks them, and then alerts the delivery boy Ed to come and pick up the pizzas. Thus, Ed takes the pizzas and starts his delivery trip, eventually achieving the delivery to John's home.

Fig. 2. BP user story text box

3.2 Building the BP Glossary

This knowledge artefact is built starting from the textual models that have been produced so far. It is created extracting from the BP Signature, the BP Statement and the BP User Story the relevant terminology, i.e., the terms that represents entities, attributes, and activities that are representative of the analysed business context. For each term, a short description is provided. Below an excerpt of the Pizza Shop Glossary (note: the descriptions have been derived from The Free Dictionary) (Table 3).

3.3 Building the BP Semantic Lexicon

Here, we start introducing the first semantic elements, organising the terms of the Glossary according to five semantic categories. Then, we build a lexicon structured following the OPAAL scheme.

(i) Object: any passive entity with a lifecycle that follows to the CRUDA paradigm, i.e., the traditional Create, Read, Update, Delete [20], to which we add *Archive* that is particularly relevant in business processes;
(ii) Process: a partially ordered set of tasks aimed to enact CRUDA operations on one or more business objects;
(iii) Actor: any active entity involved in one or more processes;

Table 3. PizzaShop glossary.

Terms	Descriptions
…	…
Customer	One who buys goods or services, as from a store or business
Cooking	To cook food with dry heat, especially in an oven
DeliveryBoy	One that performs the act of conveying or delivering
Order	A request made by a customer at a pizza shop for food
PizzaKind	Different types of pizza the customer can chose to order
…	…

(iv) Attribute: a property (simple or complex) associated to one of the former concepts;
(v) Link: a relationship between two of the above listed items.

Table 4 reports an excerpt of OPAAL Lexicon. Please note that here we do not mean to be complete, the reported structures have mainly an illustrative purpose.

Table 4. The OPAAL Lexicon of Pizza shop.

Categories	Business terminology
Object	Order, Pizza, Margherita, Dough, Topping, …
Process	Cooking, MakingDough, PlacingOrder, AcceptingOrder, DeliveringPizza, ReceivingPizza, …
Actor	PizzaShop, Customer, Cook, DeliveryBoy, …
Attribute	Price, Quantity, PizzaKind, Address, …
Link	Customer-Order, Order-Pizza, DeliveryBoy-Pizza, Customer-Address, …

To better clarify the elements of the Table 4, we provide a formal account of its content, introducing five predicates, each of which corresponds to a row of the table, and a set theoretic notation for the content.

– *object(x), evaluate true if x is an object*;
– *process(x)*, evaluate true if x is an activity, an operation, a task, a process;
– *actor(x)*, evaluate true if x is an actor;
– *attribute(x)*, evaluate true if x is an attribute;
– *linked(x, y)*, evaluate true if the concepts represented by x and y exhibit a form of relatedness in the application domain.

Assuming that we have the full application lexicon L that gathers all the terms used to describe a Pizza business, then we define the four subsets of L:

$$O = \{o \in L : object(o)\};$$
$$P = \{p \in L : process(p)\};$$
$$A = \{a \in L : actor(a)\};$$
$$AT = \{t \in L : attribute(t)\}$$

and the relation *L:*

$$L = \{(x, y) \in L \times L : linked(x, y) \wedge ((actor(x) \wedge actor(y)) \vee (object(x) \wedge object(y)) \vee (actor(x) \wedge object(y)))\}$$

Please note that the above formalization does not intend to be complete, for sake of brevity we left out the attributes that can be associated to all the entities. In the *Link* category we listed only the domain dependent terms, giving for granted the general conceptual modeling constructs, such as *partOf, ISA* (the generalization operator), etc.

3.4 Building the Pizza Shop Class Diagram

Starting from the above knowledge artefacts, and in particular from the semantic OPAAL Lexicon, we proceed in drawing the UML-Class Diagram (CD) [21] of the Pizza shop BP. The CD is built according to the following rules:

- Class boxes are labelled with one of the terms in the **Object** or **Actor** sections.
- **Attribute** terms are listed within the box of the corresponding concept (not reported in the figure).
- Pairs of terms in the **Link** section are represented by arrows (with or without head) connecting two boxes. Such arrows can be representative of:
  - *ISA*, if linking an object, an actor or a process with its more general concept.
  - *PartOf*, if linking an object, an actor or a process that is a component of a more complex assembly to which it is part of.
  - *Action*, if linking an actor with another actor or an object. The action name is one of those listed in the **Process** section (we recall that the term Process in OPAAL is more general than 'business process', including various behavioral notions, such as task, operation, action, activity, function) (Fig. 3).

Please note that the knowledge artefacts have been described in a sequence, but in building them we proceed back and forth, and in a spiral way. For instance, all the labels used in the UML-CD need to be already identified and reported in the Glossary. In the case that, when drawing a UML-CD, new labels not yet identified should emerge, we go back to the Glossary and the semantic OPAAL Lexicon adding the new labels to them, in order to keep the different models aligned. Then, when we involve the stakeholders of the business process for a validation, their comments and observations may cause the models to be updated and a new version of the knowledge artefacts is achieved.

The next knowledge artefact, the BPA ontology, represents the final outcome of the ABPA methodology.

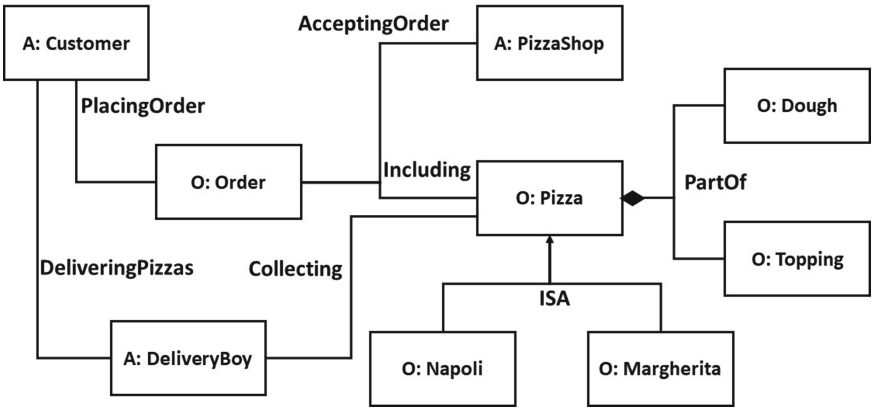

Fig. 3. Excerpt of PizzaShop class diagram

3.5 PizzaShop BPA Ontology

To build the BPA ontology we revisit the knowledge collected so far encoding it in the Turtle formalisms (a jargon of OWL). A formal representation offers various advantages, from the ease of querying the knowledge artefact (e.g., to discover which actors perform what actions) to the possibility to apply a reasoner (we adopted Protégé) to prove the absence of (formal) inconsistencies.

The Pizza shop BPA ontology is built starting from the Class Diagram. As anticipated, only this last step requires an ontology engineer, who will be supported by the following rules for ontology building.

- *Object* and *Actor* terms are modelled as OWL *classes*
- *Attribute* terms are modelled as *datatype Properties* (not reported in the example)
- *Processes* are modelled as *Object Properties*, having *Actor* as *Domain* and *Object* or *Actor* as *Range.*
- *Links* are modelled as *Object Properties*, where *Domain* and *Range* are defined by the pair of boxes reported in the CD and the property name is the label of the link connecting the two boxes. Then (assuming that the actions are not in a passive form):

  – If the domain (i.e., the source of the arrow) is an ***Actor***, the link represents an action on another Actor or Object (i.e., the range).
  – If the domain is an ***Object***, than the range is another object and the label will be, for instance, *partOf*, *subClassOf*, or another relation among objects (e.g., *nextTo*).

Figure 4 reports a fragment of the Pizza shop ABPA ontology, built by using the Protégé platform. For sake of space, it is a small fragment, but we believe that it can provide at least an intuition of such a knowledge artefact that concludes the ABPA activities.

```
...
:Customer rdf:type owl:Class;
    rdfs:subClassOf :Thing ;
    rdfs:label "Customer".
:Order rdf:type owl:Class ;
    rdfs:subClassOf :Thing ;
    rdfs:label "Order" .
:Pizza rdf:type owl:Class ;
    rdfs:subClassOf :Thing ;
    rdfs:label "Pizza".
```

```
:PlacingOrder rdf:type owl:ObjectProperty;
    rdfs:subPropertyOf :Process ;
    rdfs:domain :Customer ;
    rdfs:range :Order ;
    rdfs:label "PlacingOrder".
:Including rdf:type owl:ObjectProperty ;
    rdfs:subPropertyOf :Link ;
    rdfs:domain :Order ;
    rdfs:range :Pizza ;
    rdfs:label "Including".
...
```

Fig. 4. An excerpt of the Pizza shop BPA ontology encoded with the Turtle notation

4 Conclusions and Discussion

In this paper we presented ABPA, an agile methodology for business process analysis based on the acquisition, modeling and management of business knowledge. With respect to previous proposals, this methodology has three main innovations: (i) it is based on the Agile approach; (ii) it is rooted in the knowledge management discipline, modeling BP knowledge with a focus on '*what*' rather than '*how*'; (iii) its progression of model building, from informal to formal, has been conceived to facilitate business experts in assuming a central role.

In brief, the ABPA methodology proposes a set of knowledge artefacts represented by models to be progressively built, from simple to complex ones, from informal to formal ones. Such a progression has been conceived so that the first six out of seven models can be easily built by business experts without the need of specific technical competences. Only the final artefact, the ABPA ontology, requires ontology engineering competencies. We believe that giving to business experts a central role has a number of advantages, first of all it contributes to solve the long-standing Business/IT alignment problem [5]. Then, the proposed knowledge management approach appears easy to be adopted also by SMEs that, traditionally, lack competencies and resources required to carrying out BP innovation, supported by advanced methodologies [22]. On a more technical ground, the ABPA ontology, and the associated semantic services (e.g., semantic search, automatic reasoning, etc.), are fundamental to achieve a high quality business process analysis.

On the practical ground, the ABPA methodology is currently being experimented in a real world business context, an office of the central Italian Public Administration, Ministry of Economics and Finance, State General Accounting Department (*Ragioneria Generale dello Stato*). The first feedbacks encourage us to continue along the lines illustrated in this paper.

Below we provide the answers to the research questions reported in the introduction.

(RQ1) Is it convenient to adopt the Agile approach for the analysis of business processes? The answer is positive and we believe that a complex endeavor like business process analysis, and the corresponding construction of business models, need incremental achievements with frequent deliveries to involve users and stakeholders in the validation of the produced knowledge artefacts. This is further facilitated by the ABPA philosophy that

focuses on the 'what' (structural business models) and not on the 'how' (behavioral knowledge) in carrying out the analysis activities.

(RQ2) Is it handy for business experts to adopt a rigorous knowledge management method in the construction of business process models?

Despite the failure of previous attempt to bring formal modeling methods in the business community, ABPA is primarily based on the production of a set of intuitive business models. It starts from simple intuitive models, using natural language specification and tabular organization of the collected knowledge, progressively evolving towards more complex and semantically rich ones. Only the last of the seven models requires specific ontology engineering competences. ABPA proved to be largely manageable by business experts without a specific education in formal knowledge management and, from the first experiment on the field, it appears to be well accepted by business experts.

(RQ3) What are the advantages of involving business experts in a systematic, formal business process analysis?

In developing an information system, business analysis is a fundamental phase and ABPA offers to business experts the possibility to thoroughly manage it. Furthermore, the business reality is a 'moving target' since it constantly evolves, therefore, information systems, starting from their underlying business models, need to be periodically revised, updated, and improved. With ABPA, such operations remain under the control of business experts, with the advantage that, seen the tight connection between formal business models and the enterprise information systems, ABPA guarantees a timely update of the information systems and a substantial reduction of the Business/IT misalignment. On a more technical ground, the availability of a computational knowledge base (in particular, and ontology encoded in OWL) provides several advantages, such as the possibility of exploring, navigating and querying the business process models; another important advantage is the possibility of running a semantic checker to prove its consistency. Last but not least, the adoption of a Low-Code platform [23], an emerging technology capable of transforming business models into running software, will provide a progressive control of business experts also on the development of the software implementing an enterprise information system.

Our work will continue along two main lines. The first intends to continue the development of the ABPA methodology to include the temporal sequencing of activities and tasks in the form of BP diagrams. In particular, we are experimenting the adoption of the international standard BPMN (BP Modeling and Notation) [24].

The second line is represented by the development of a digital platform aimed at supporting business experts in building the ABPA knowledge artefacts. The platform will be primarily based on Natural Language Processing services, aimed at analyzing the first three artefacts (BP Signature, Statement, and User Story) to automatically extract the terminology, proposing a first semantic tagging in accordance to OPAAL. A second set of services will be devoted to the (semi) automatic construction of the UML-CD diagram starting from the OPAAL Lexicon. Another set of services will be devoted to an automatic support of ontology building guided by the UML-CD, eventually extending the participation of ontology experts in the ontology management tasks. The ultimate objective is the interoperability of the ABPA platform with a Low-Code platform, for the

seamless generation of enterprise information systems software. A preliminary study, adopting the BonitaSoft Low-Code platform [25], is on the way.

The absence of a supporting platform currently represents one of the main obstacle for the adoption ABPA, since today the consistency of the different business models needs to be achieved manually. Another obstacle may be represented by the resistance of enterprises to embrace the new Low-Code technology, pushing business experts to assume a higher responsibility in the development of an enterprise information system.

The work presented in this paper is the continuation of the work carried out in the context of the European Project BIVEE (Business Innovation in Virtual Enterprise Environment) where a first proposal of knowledge-based enterprise analysis has been proposed [26].

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Supporting Smart Workers During a Pandemic. Lessons Learned from a Case Study

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Abstract. The purpose of this study is to analyze the adoption of practices and tools finalized to support smart workers to improve their work conditions during the Covid-19 pandemic. Indeed, we believe that such a peculiar situation has represented an important "opportunity" for companies to reaffirm the centrality of the wellbeing of their people and the need to take care of it, to put at the heart of internal policies wellbeing and inclusion reinforcing - and in some cases redesigning - their already existing systems. In detail, our research aims to examine how some practices even more fostered through electronic channels have been used and how these are expected to change the usual people management with an impact on future organizational behaviours. The analysis was carried out on the case study of a big MNC. During the pandemic, this company has implemented an ongoing survey articulated in three waves (April 2020, July 2020, and October 2020) to understand employees' feelings toward working in the new situation and their perception of organizational inclusion in conditions of physical distance – being aware that the "new" approach represents a no-return point in the evolution of HRM. These results offer interesting stimuli for practitioners and scholars in the field of HRM and OB towards the new normal.

Keywords: Smart working (SW) · Covid-19 · Pandemic · Organizational support · Wellbeing · Multinational company

1 Introduction

International literature [1–3], as well as Italian one [4–6], have introduced smart working (SW) as a new approach to work organization. It is based on greater flexibility [7, 8] and larger discretion in work activities, in place and time they are carried out, and on increased responsibility towards results that workers are requested to provide. Technologies play the role of enabler for SW; their features in terms of portability and connectivity have opened new possibilities concerning where and when people can work.

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Some enterprises have been practicing SW for some years as a feasible response capable of balancing often conflicting needs, such as efficiency and productivity on the company's hand, and flexibility and work-life balance on the individual's hand [9, 10]. Combined solutions were usually proposed, so that workers continued to go to work for most days of the week as usual and, for the other few days, they worked remotely as smart workers [5, 6].

Notwithstanding the attention devoted to this new model of work organization, smart workers still represented a small percentage of the total workers in Italy even if they were slightly increased in the last few years [11]. At the same time, it was underlined that the enterprises, where SW was normally used, appreciated it for its many benefits, confirming literature suggestions [4, 12, 13].

During the Covid-19 pandemic, the Italian government fostered SW diffusion (also introducing some exceptions to the law prescriptions - namely the law n. 81/2017, which represents the regulatory framework in Italy on agile work in the field of subordinate work - so to facilitate its implementation), as a good solution able to allow people to work as better as they could, but granting limitations to physical contact, considered as a potential source of virus diffusion. So, SW became the "new" way of working for most workers. Enterprises with consolidated experiences in managing this model were facilitated in organizing it at a large scale, but all at once, they had to develop more intense practices to support workers - and their superiors too - in a context where the whole work and connected relationships were run at distance.

This new scenario offered the possibility of observing the dynamics traditionally associated with SW in a context characterized by the absence or weakness of certain conditions, which are considered as fundamental for the success of such work practices [14]. Among these: the specific preparation for the transition to the "smart" mode, the character of voluntariness, the agreement between employer and employees, finally the complementarity between working time in the company and remotely.

Psychological challenges and risks for remote workers have been largely investigated in the last years by a number of scholars, e.g. [15]. However, very few studies, so far, have been conducted in working contexts when remote working was practiced at such a large scale - as it has been during the pandemic - and in which its discretional nature was replaced by an almost mandatory feature. So, as suggested by [16] a need in the shift of research focus is requested to understand "how to get the most out of remote working" rather than whether to implement it as it previously was.

In this vein, our present study aims at shedding light on the role played by organizational practices in supporting employees' success at work, as a result of fostering their positive feelings, wellbeing, and perception of inclusion, coherently with the traditional perspectives of analysis of SW experiences, focused first on the benefits in terms of a better balance between work, family, and leisure, and its relationship with individual wellbeing.

In particular, we think that interesting stimuli could be offered by investigating the relationship between the supportive practices created or improved in the new context - for which the usage of electronic channels was the standard dimension - and the taking care of employees' wellbeing and sense of inclusion. Indeed, these two latter represent some of the most critical features for the evolution of work. In detail, we wonder if and

to what extent those practices devoted to employees' support were perceived and were able to foster their attitudes toward the organization and the work, in the SW experience run during the lockdown.

To pursue our goal, the paper is organised in the following manner. The second section introduces the theoretical background and our research questions. The third part presents an explorative case study and its most relevant results. Specifically, a qualitative method for the analysis was chosen because of the pioneering nature of the investigated phenomenon [17] and to better understand which and how supportive practices are applicable for organizations in the specific pandemic context. The data were collected on a sample of about 1800 workers of an MNC in Italy through three online structured questionnaires administered at different times: at the beginning of the pandemic, when the pandemic situation was thought to be over, and in October, with a view to new restrictions. In the last section, some preliminary suggestions about our research question are established and the main limitations it shows; also, considerations useful for future development of the study are proposed.

2 Theoretical Background

2.1 Telework Towards Smart Working as an Evolving Way of Working

The new important evolutions in information and communication technologies have enabled the change of work [18–20]. Also, this evolution was led by increased work digitalization, both in terms of skills requested by employees [21] and organizational design interventions [22]. As well, the general attitude toward the use of technology at work has been analysed, and its changes over the years emerged [23].

Among authors, there is general recognition of the first milestone. Indeed, Nilles [24] coined the term "telecommuting". After some decades, Bailey and Kurland [25] propose this definition: "working outside the conventional workplace and communicating with it by way of telecommunications or computer-based technology" (384). Many labels have been used to identify "unconventional" ways of working in the years to come, such as telework, distance work, e-work, mobile work, remote work, and smart working: the most recent label.

In literature, telework is defined as "the substitution of communication technologies for work-related travel and can include paid work from home, a satellite office, a telework centre or any other workstation outside of the main office for at least one day per week" [26]. It regards different forms related to work contents, depending on its nature (more executive or more conceptual). In a focused perspective, it is strictly associated with working from home [27]. This has been the most diffused meaning when technologies were characterized by stationary status, allowing to work only in specific conditions.

Kim and Oh [28] suggest that SW is an "extended version" of telework, and they describe it as telework, that individuals perform upon convenience smartly and innovatively using ICT and mobile devices and "regardless of time and place". On the other hand, SW is intended as a new approach to work organization, challenging the traditional logic of hierarchical control and the conventional models of work design [2], in which technology seems to be a simple enabler and not a constitutional element.

Several distinguishing dimensions characterize SW; one is related to flexibility which is declined in terms of working spaces, time, and tools; also, it is remarked that the new way asks for more discretion in work activities and more responsibility for results provided [4, 7, 8, 14].

Studies have so far demonstrated that these features foster employees' better performances and organizational competitiveness [29, 30], organizational survival, and development [31]. In the end, they reinforce the perceived importance and the usefulness of this newly adopted model [32].

In managerial practice, SW was introduced marginally, particularly in the Italian context [11]. Among the organizations that adopted this working solution, the way mostly applied foresaw a few days of remote work – on average around three and four per month - so that a limited usage did not require an intense preparation for doing it and specific support to manage it by workers themselves and superiors [5, 6].

2.2 Managing Employees Working Remotely During Lockdown for Wellbeing and Inclusion

Recent studies concerned with the Covid-19 pandemic highlighted the relevant role of HR Departments and HR practices in helping employees handle the current changes affecting employees' conditions in their workplace [33]. Some studies identify the relevance of work design practices for managing remote workers; it was especially demonstrated that social support, job autonomy, and workload prevent workers' challenges, loneliness, and procrastination [16]. In the same context, other studies demonstrated the increased effects of digital transformation at work and the need for upgrading employees' digital skills and developing their abilities in the use of new technologies. Further, HR professionals were requested to help employees to arrange the new way of working by enabling them to handle automated tasks and make decisions [34], cooperating in teams, promoting knowledge sharing [35] and, most important, arranging their wellbeing [34] in the new virtual work environment.

The rapid spread of the Covid-19 pandemic has resulted in a sudden and forced change in the working space-time modalities from one day to another. So, the particular and contextual circumstances forced companies to focus on employees' perceptions about their sense of inclusion and the support they could offer during the lockdown first, and for the period of the pandemic as well, in a condition where a gradual and proper preparation and planning for change had not been possible.

The perception of the sense of inclusion by employees represents a critical topic for organizations. This is true, especially when considering the current work scenario characterized by the pervasiveness of digital transformation and the recent pandemic crisis. In this context, because of increased work digitalization, the physical and psychological distances between employees and the employer improved dramatically; this happened in a context characterized - as well and because of the pandemic - by a general social discomfort.

Several studies on work digitalization, still before the pandemic, raised concern on critical issues related to employees' sense of inclusion such as professional isolation due to telecommuting and the importance of "social" support systems as essential to improving employees' sense of belonging [36, 37].

First studies on inclusion at work define inclusion as "the degree to which individuals feel a part of critical organizational processes such as access to information, connectedness to co-workers, and ability to participate in and influence the decision-making process" [38].

Some authors suggest the presence of relevant outcomes arising from employees' inclusion, such as job performance, job satisfaction, organizational citizenship, organizational commitment, and affective outcomes [30]. Also, contextual determinants favoring employees' perception of inclusion in a specific working context are highlighted. In particular, Shore et al. [40] underline the importance of some "organizational inclusion practices" such as communication and sharing of knowledge among members of the same working group, participation in decisions making, group discussion, and in the end, caring and support from the direct supervisor and his/her critical role in promoting a culture of inclusion [41].

The practices to enhance employees' inclusion can be considered belonging to the organizational support dimension, which lies in the theoretical domain of the social exchange theory [42, 43]. Some examples of these practices can be coworking space and fab lab, internet cafè, innovation time off, hackathon, but also "dogfooding" and so on [44].

The perceived organizational support is recognized as being very close to the one of organizational wellbeing. Indeed, in a definition provided by Eisenberger and colleagues [45] perceived corporate support is reported as employees' "beliefs concerning the extent to which the organization values their employees' contributions and care about their wellbeing". Further, the authors add that: "perceived organizational support is assumed to increase the employee's [actual] attachment to the organization and his or her expectancy that greater work effort will be regarded" [45].

Evidence is found of relationships between support perception, firm performance, and workers' wellbeing. For example, authors remark a positive relationship between organizational support with organizational citizenship behaviours, affective commitment [46] job satisfaction, and job performance [47, 48]. Moreover, it is suggested that perceived support from the organization reduces employees' psychological strain and social isolation [47]. In the same vein, Kowalski & Swanson [49] demonstrate the importance of a relationship based on trust between employees and the employer on the performance and satisfaction of teleworkers.

In our perspective, organizational support does also include the job design dimension since we consider the choice of implementing mechanisms that enable and favour workers' activity – making work more sustainable even in the "humane" dimension - as evidence of the organizational willingness of supporting employees' even if its evidence might be hidden, in reality, to the employees' perception. So, can the choices behind the design of integration mechanisms be considered as supportive of the action of the employee? Our answer is positive.

In conclusion, our research question is how and by which practices can smart workers be supported to increase their organizational wellbeing and inclusion perception within a corporate setting?

3 Empirical Analysis

3.1 Method

A qualitative method for the analysis was used here. In particular, the case study [50] seemed the most suitable methodology to answer our research question. Indeed, it allows us to correctly answer a "how" question in a specific context [51] (in particular: which and how supportive practices are applicable in the particular pandemic context; so that, peculiarity and uniqueness of an organizational setting can be understood [52]. This methodology is also adequate because the scientific research on support practices during a pandemic is necessarily still in a pioneering phase [17], as shown in the previous section.

The case analysed was that of the Italian branch of an MNC operating in the food and beverage sector. This case was considered particularly significant because it was representative of an extraordinary situation, both for the number and type of applied home working activities (from teleworking to smart working), for the attention that the company showed in supporting workers during the pandemic, for monitoring wellbeing and organizational inclusion trough the Sustainable Engagement Index (SEI).

This case study was also chosen because of the privileged situation of one of the researchers, who had access to data collection so facilitating the in-depth analysis. These data were collected through three online structured questionnaires. The questionnaires' results were analysed by the HR managers of the MNC to decide what to do for monitoring and improving the new working activities asset caused by the pandemic, just like a survey. For this reason, the words "questionnaire" and "survey" are considered and used, in this case, as synonyms. The first survey – made up of 10 questions, of which six single-answer, three open, and one multiple - was administered on 9 April, at the beginning of the pandemic, when the lockdown in Italy forced most of the workers to work from home. The second was proposed in July 2020, when the pandemic was thought to be over. The third survey was launched in October with a view to new restrictions.

The sample was composed of about 1800 workers, working in commercial functions (the majority, more than 63%), supply chain related functions (i.e., Production, Logistics, QSE, SC Planning, and procurement; about 20%), financial function (approximately 7%), human resources function (2%), legal, and others to a minor extent. For the first survey, the respondents were about 1500, with a response rate of 86%, divided into males (72%) and females (28%); 26% of them were line managers. The second survey was answered by approximately 1.130 people, 60% males and 31% females, and 9% not stated; 24% of them were line managers. In October, about 1450 people participated, which corresponds to 81% of the sample, to the survey; 67% were males and 33% were females; the line managers answered were about 25%.

The HRM team of the company then processed the results. Through a group of work and discussion, the researchers selected the most interesting and relevant contents from the incoming materials and, when necessary, transcribed these contents with a word processor to build a homogeneous archive for the analysis.

3.2 The 'MNC' Case Description

The company we studied has about 1900 employees, distributed in several regions across Italy. It operates in the food and beverage sector, in consolidated markets, and

is responsible for product merchandising, customer relations, promotions, Corporate Social Responsibility activities, and public and institutional relations. The actions of the Italian branch are based on three fundamental pillars: vision, purpose, and values. The vision expresses the strong desire to "be the most respected company in the beverage sector and lead growth in all the categories in which it is present". The purpose declares its commitment to invest and consolidate the link with the community it belongs to, both environment and people. Finally, the values of organizational culture are part of a holistic vision, that includes customers, employees, the communities in which this branch operates; they are integrity, continuous learning, and teamwork and are considered as essential ingredients for success.

The company has a robust policy of attention to its collaborators that puts "people first"; it considers training, professional development, safety, and employees' wellbeing as fundamental elements for value creation; therefore, it supports creating a work environment based on the enhancement of diversity and inclusion, promoting the development of equal opportunities. Its clear conviction is that success comes from the ability to attract and retain talented people in a stimulating environment, given that people's wellbeing is considered a primary driving force to harmonize positive results, productivity, and people's work-life balance. Coherently it obtained a certification from an Institution, which globally certifies companies that stand out for the excellent working conditions reserved for their employees.

Our branch has been experimenting with teleworking since 2011 to promote a greater balance between workers' private life and professional activity, allowing them to combine flexibility, security, quality of performance, and reconciliation of work with personal and social life. The use of information and communication technologies and more flexible ways of working could also constitute a response to important environmental needs by reducing CO_2 emissions and social needs, with positive effects on family management and community.

Telework represented only a change of the place where work is performed, not affecting the integration of the worker in the company organization and allowing the employer the normal exercise of the powers of direction, management, and control.

The worker was requested to correctly use the equipment granted on loan for free use (laptop, a printer, a Wi-Fi line dedicated to working, and a mobile phone) by the technical instructions provided, as well as, moreover, take care of their safety inside the home intended as a place of work. To facilitate the maintenance of interrelationship with colleagues, the activation of teleworking (especially if indefinitely), required the presence at the workplace for at least four days a month. Of course, training played an important role.

Smart Working

In September 2014, three years before the law n. 81/2017, a "Policy on remote working" of the company has been defined with the related guidelines.

This way of working implies the possibility of carrying out one's job from a location other than the workplace or one's office of reference, in an impromptu and non-continuous manner, everybody can voluntarily adopt it so to manage at the same time better work performance and a satisfactory work-life balance. As a first experiment, smart

working could be performed for a maximum of three days a month where, however, there were elements of "Job Eligibility".

Another essential factor to carry out remote work extemporaneously was to have, in the chosen place to work, a Wi-Fi network that was able to guarantee confidentiality and processing of data to ensure the same precautions expected by the carrying out work at the company offices. After a year of monitoring, the possibility of agile work was also extended to the "credit" and "treasury" departments, defining at the same time the need to start new monitoring to carefully assess the possible effects of this expansion over a longer period.

In June 2017, in consideration of the positive evidence that emerged during the monitoring period, the maximum number of days usable in SW during the r month went from three to five. At the beginning of 2020, an agreement was signed to increase to seven days per month. Further, in May 2021, another important step was implemented by adding another five days, the effect of which will take place at the end of the pandemic state of emergency.

A central aspect in developing the smart way of working was the reference to the workplace safety regulations in the signed agreement. To ensure the health and safety of its employees, an annual report is shared with the workers' safety representatives (RLS) in which both the general and specific risks are associated with the method of execution of the employment relationship. This particular attention was specifically intended to ensure that the worker cooperates in the implementation of the prevention measures prepared by the employer to face the risks associated with the execution of the service outside the company premises and take all possible steps to avoid accidents at work or occupational diseases.

Regarding the company assets for carrying out the activity, the equipment was granted on loan for use. The prohibition to use the above-mentioned work tools for purposes unrelated to the work activity was clarified, also providing that any damage caused by negligence by the assignee during the remote service would be borne by the same and had to be repaired at his care and expense.

Starting from March 2020, the company management and the workers' representatives have defined by mutual agreement and to the satisfaction of both the parts, to increase further the days that can be spent remotely, passing from five to seven days a month for each person, normalizing the improved solution adopted during the pandemic.

3.3 Analysis and Results

Our branch monitored the workers' feelings over the pandemic three times, as reported before.

The data analysis showed that in October 2020, 40% of people felt good in their work and family situation, but less than in July, when 65% of workers were serene and satisfied, and in April, when 42% felt well. The 92% of workers felt well informed on how the COVID-19 situation has been managed in their company, without significant changes (−3% versus July, +4% versus April). 76% of the respondents felt supported by their manager in their current situation, a little less than in July when the pandemic seemed to have been resolved. 82% of workers felt connected to their team and colleagues during the

day, and 98% of people answered they were aware of health and safety policies/protocols that their company put in place due to the COVID-19 pandemic (see Fig. 1).

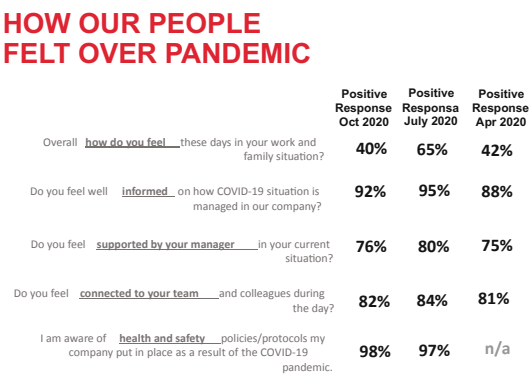

Fig. 1. Data analysis of survey (Source: MNC elaboration)

Based on these data, the HRM team thought and planned, and designed some specific actions to maintain the sense of belonging of workers and their inclusion.

All the actions were implemented following the surveys and were a response to the main areas to improve the critical situations that emerged during the pandemic. They have been deferred over time and created because of the needs of the moment.

Regarding information and connection, they suggested a General Managers' monthly update, a weekly update from Human Resource Director, Questions and Answers sessions managed by HR with all functions, Sales weekly calls, and no-contact meetings in Plants. A good practice to encourage remote workers to interact in an office was virtual coffees.

Our company offered free psychological sessions and Covid-19 insurance to improve organizational wellbeing, both for workers and their families, free anti-flu vaccines, and a free sport@home app.

A smart working etiquette was another response to the request for a better work-life balance that emerged in the first survey; finally, anti-fragility coaching was implemented for the out-of-home teams right after lockdown.

Moreover, support and engagement were improved through several actions: monitor & chairs at home, five virtual Family Days with Netflix free subscriptions, Virtual Learning sessions, a new discounts platform, a flat rate for smart workers, and also some vouchers & gifts to spend with their families.

Most of the actions were designed and implemented for the occasion, but the HRM team also re-communicated, enhanced, or digitalized some initiatives already in place (the Christmas party, for example, completely transformed it into a digital event). A series of agreements for employees were available but, in the pandemic, the company signed another agreement to access many more opportunities, in the same way, and provide economic support for workers in layoffs.

Measuring the Sustainable Engagement Index (SEI) 2020 and comparing it with that of the previous year (2019) and of the year before (2018), our company was able to

verify the success of the adopted actions. The SEI 2020 was 87%, and it had remained unchanged since 2019, in which it was increased by 5% from 2018. SEI was measured through six sub-indicators which showed the following trends: *ability to sustain the level of energy* at work decreased slightly (−5%) during the last year, but it was stable compared with the previous year's results; *possession of equipment/tools/resources to do the job effectively* has growht since 2018 (+6% versus 2019, +4% versus 2018); *willingness to help each other by people of their team*, increased by 4% since 2019 and 1% since 2018; *trust in the company's strategic priorities* has decreased by 3% during the pandemic, but it grew by 9% compared to 2018; *company sense of belonging* equal to 2019, and grown over 2018; *recommend <the company> as an excellent place to work*, approximatively the same of 2019 (−2%) and more than 2018 (+9%).

Despite the stability of the SEI index, between 2020 and 2019, some of the sub-indicators might have been directly and negatively affected by the pandemic (e.g., the ability to sustain the level of energy I need throughout the workday); so overall the positive tightness of the SEI demonstrates a positive effect of policies implemented.

4 Conclusions, Limitations, and Further Research

As it has been underlined, "HR without technology is hard to imagine nowadays" [53]. This has become particularly true after the full immersion we lived during the pandemic. As our case has shown.

We had wondered if and how the practices devoted to employees' support in SW, especially during the lockdown, were really and effectively perceived by workers and were able to foster their attitudes toward organization and work. The herein described results show that supportive practices implemented – some already existing, but increased and finalized, and others identified newly by the company - represented a successful manner for our company to cope with the potentially detrimental effects arising from the new working condition, even if they had already experimented both teleworking and smart working, in ordinary times.

Especially three complementary areas of intervention can be considered as key drivers for the company's success. First is represented by actions devoted to implementing coordination and communication among workers that favours work integration and communication among employees by rethinking, formalizing, and granting interaction mechanisms and suitable channels. The second area referred to the care of employees by pointing to the current emergency and promoting initiatives devoted to their health and safety, which represented a critical issue and a priority. In the end, the third area was specifically devoted to promoting employees' engagement. Based on the system already existing in the company, the MNC operated mainly by redesigning events and interventions in a more usable mode – that is mainly through electronic channels - given the new working condition.

It is important to underline that these three lines of intervention were implemented systemically so that coherency among the single initiatives and their provision at the same time was granted. This again might be a further element that acts for the success of all the developed actions.

The main limitation of our work is the infancy of our study; the description is quite detailed, thanks to the high number of answers, and shows the trend on which the HR

managers were able to base their actions, but we didn't yet correlate all the variables. Also, the analysed timeframe, despite the three times survey, is less than a year.

Future research could be directed to deepen managers' opinions and judgments concerning the necessary tools and their best use according to their experience and attitude. Moreover, it would be very interesting to understand which are the most significant workers' and managers' competencies able to contribute to their organizational well-being and inclusion. Also, more analyses might be developed to deepen how the use of digitalisation at work will change with the gradual relaxation of restrictive measures and how supportive systems will evolve in the various phases of the return to the new normal.

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Do Organizations Need a Head of Remote Work?

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Abstract. Following the Covid-19 pandemic emergency, the number of remote workers has increased exponentially with a large proportion of the workforce operating from home in April 2020. After the first lockdown period, the percentage of remote workers decreased radically, and was estimated to be around 35–40% in 2021. However, doubts and criticisms have arisen as to whether organizations are carrying out remote working practices effectively. Adopting the socio-technical system (STS) perspective, this paper aims to investigate the specific characteristics of remote working in order to identify the major factors which might affect the adoption of agile working, rather than simply remote working, in organizations. A causal-effect path will be depicted to explain the evolution of remote working adoption in organizations, and the need for task and job redesign, business processes reingeneering, innovative eHRM policies, cultural changes, and new organizational roles. The paper describes the new organizational roles, tasks and competences aimed at enabling an effective adoption of agile working in organization.

Keywords: Remote working · Agile working · Socio-technical system analysis · New organizational roles · Pandemic Covid-19

1 Introduction

This paper focuses on the combined effects of two main phenomena that have been impacted by the innovations of digital technologies since the 1990s:

– Flexible and remote work: many organizations introduced flexibility in managing the time and geographical location of work by defining and introducing organizational practices referred to as teleworking [19]. Over the past two decades, remote working, conceived as working elsewhere other than in the office [18], has become a widespread practice. Recently agile working (flexibility about where, when, and how practitioners do their work) is increasingly common across all production fields [17, 38].

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– Knowledge management and the role of a knowledge worker: knowledge, in its different forms, has been increasingly recognized as a crucial asset in modern organizations, and knowledge management refers to the process of creating, codifying and disseminating knowledge within organizations through the deployment of corporate-wide intranets. This ensures physical accessibility to information, the design of contribution processes which enable employees and knowledge workers to codify their knowledge in the corporate language, and the development of enterprise knowledge portals which provide a simple interface through which people can provide, share, and retrieve information and knowledge.

Before the SARS-COV-2 (commonly called Covid-19) pandemic emergency, the average adoption of work-from-home practices, under the names of remote, agile, or smart working in Europe was: 20.2% in UK, 16.6% in France, 8.6% in Germany, and only 2% in Italy, with a total of 570,000 employees [2, 12, 13, 24]. Various decrees issued by the Italian Government (*Decreto del Presidente del Consiglio dei Ministri – D.P.C.M.*) during the ongoing COVID-19 emergency have facilitated this new organization of work, and remote and smart working have been indicated as the preferred, in some case the compulsory, method of carrying out work as a remote service.

Because of the situation generated by the spread of Covid-19 and the enforcement of public health measures to contain the virus, many companies shut down operations thus forcing the adoption of remote working [4, 33]. In March, April, and May 2020, 65.9% of Italian companies shut down and half of the remaining active companies (17.1%) decided to adopt smart working with the involvement of 2,205,000 employees [16, 26, 27]. In Italy, the diffusion of smart working increased from 3.9% (1,124,754 employees, 13th March 2020) to 7.6% (2,179,000 employees, 25th March) rising to 28% (8,000,000 employees, 20th May 2020). The Italian National Institute of Statistics (ISTAT) estimated that in June 2020, 90% of large enterprises (more than 250 employees), 73% of medium-sized enterprises (50–249 employees), 37.2% of small business (10–49 employees) and 18.3% of micro-enterprises (2–9 employees), introduced or extended the possibility for their employees to engage in smart working during the emergency period [16].

One year after the first pandemic wave (2021), 40% of the workforce was willing to continue to work remotely. However, numerous doubts and criticisms exist about whether organizations are carrying out remote working practices effectively and in a profitable manner. According to various nationwide surveys[1] and recent studies, a lack of strategy, policies, practices, and incentives badly affected the remote work [20, 38]. In particular the following issues were raised:

– Spaces: only one third of workers has a dedicated space and around 20% of workers practised home nomadism, moving from one room to another;
– Work wellbeing: little or no attention is paid to the right to disconnect and immense stress is caused by remote monitoring (considered a form of control);

[1] https://www.assolombarda.it/centro-studi/smart-working-2021; last retrieved 30/08/2021.https://intranet.unige.it/survey-sul-lavoro-agile-epoca-pandemia/ last retrieved 30/08/2021.

– Organisation of work: only half of the workers have changed part of their job, mainly in the relationship with a direct superior/manager;
– Technologies: no proper tools and platforms/software for remote work were available to one third of the workers.

Discussions have arisen between big players on how to deal with remote and agile working, since most of the workforce has gotten used to working from home or abroad. Google recently backtracked from its plan to make all employees return to the office and allowed many to work remotely. Apple's plan to force its staff back to the office has caused many to leave the company and led to substantial internal opposition[2]. Jack Dorsey, CEO of Twitter, had stated a few weeks after the outbreak of the pandemic that company staff could work from home forever if they wished to do so. Contrarily, Reed Hastings, CEO and founder of Netflix, stated that home-working is "a pure negative". In February, David Solomon, CEO of Goldman Sachs, called it, "an aberration" and in June, Morgan Stanley's CEO stated, "we want you in that office"[3].

This disagreement reflects the current uncertainty about the impacts of the pandemic on the future of the workplace.

Adopting the socio-technical system (STS) perspective, this paper aims to investigate the implementation of remote working in organizations in order to identify the major factors influencing a successful adotion of agile working. Each factor will be clarified in nature and aim. According to the STS approach, which follows a cross-disciplinary perspective, because of the strong link between work systems and the people who interact with each other and/or with machines, a human-centered design perspective is required for making any changes within organizations [3].

In the following sections we will provide data regarding the state of the art of smart working, how it has changed in the last few years, and we will sketch out the research question. Then we describe the framework of analysis, taking into consideration the most common variables of the STS analysis framework. These variables will be used to study the process of digital transformation and how remote working adoption is evolving as a result of the exogenous tension caused by the Covid-19 pandemic. From a research point of view, the paper demonstrates that a STS framework can be used to unveil a list of critical aspects and interdependences between social and technical aspects which enrich the model, and improve innovation and change management in a more evolutionary perspective. From a more practical point of view, the paper underlies the needs for a new set of organizational roles.

[2] https://fortune.com/2021/06/08/return-remote-work-hybrid-model-surveys-covid/ last retrieved 1/06/2021.

[3] https://forbes.it/2021/06/18/se-potete-andare-al-ristorante-potete-venire-in-ufficio-il-richiamo-alle-armi-del-ceo-di-morgan-stanley/ last retrievd June 2021.

2 Theoretical Framework

Over the last decades, the prefix "smart" has gradually been recognized as a term to qualify the innovative use of digital technologies in numerous business areas, and even remote working. Studies now propose conceptual frameworks that highlight the semantic differences between the term teleworking, flexible working, smart working, and agile working. An analysis of trends in flexible working was conducted by Yu et al. [42] and Sullivan [39]. Grant [14] introduced the basic notions, concepts, and measurement of agile working, while Torre & Sarti [36, 41] analyzed the trends in smart working in academia. All these studies shed light on cases, practices, policies but only a few do so regarding the regulatory framework, with the exception of Rymkevich [35]. In addition, a socio-technical theoretical approach was proposed to effectively analyze the phenomenon [3] and described in Cuel, Ravarini & Varriale [9]:

- Teleworking or remote working refers to the ability to work in a place other than the company office, such as another office, coworking areas, home, park or any other location that has internet connections and online platforms (e.g. Skype, Hangout, Slack, Hibox, Asana) which would ensure communication and coordination.
- Flexible working refers to flexibility in locations, hours, and/or contracts. It may include teleworking, compressed weeks, part-time and project work or other contractual agreements.
- Agile working refers to practices that allow organizations to optimize work by emphasizing proactivity, agility in managing activities and coordinating with others.
- Smart working refers to a new approach for designing work to address the efficiency and effectiveness of activities ultilizing a combination of flexibility, autonomy, agile collaboration and coordination, and the optimization of work tools. Bednar & Welch [3] found that in smart working, organizations and workers are invited to substantially rethink their relationships by creating new jobs, acquiring new and more innovative skills (multitasking, virtual team work, etc.), choosing spaces, hours and work tools more independently, and acquiring greater responsibility for outcomes.

Unfortunately, the above-mentioned terms are widely used as synonymous in the managerial lexicon and in organizational practices because of the lack of widespread, shared best practices.

This paper aims to shed light on the real implementation of remote, flexible, agile, and smart working by identifying the critical variables for the management of organizational change.

The evolution of remote work practices, as described in the previous sections, provides an exemplar use case - and possibily the most representative during the coronavirus pandemic - of organizational change driven by technology. Indeed, the literature on this topic is very broad and still rests on the basis of studies carried out long before the advent of the internet. Recently, Pasmore and collegaues [28] effectively reviewed the progress of the research in this field, concluding that, in the current times of social and technical disruption (possibly made even harsher by the pandemic), the principles of STS represent a compass to interpret the transformation of organizations. Similar considerations arise when adopting the lens of the fourth industrial revolution [21]: the

changes synthesized in the concept of Industry 4.0 find an appropriate representation by "considering the socio-technical systems impact on people, infrastructure, technology, processes, culture and goals" [31: p. 1]. However, Purser and Pasmore [30] did show the applicability of STS to non-routine knowledge work, and leveraging this and other foundational research, Bednar and Welch [3] proposed to extend the result of the research using STS for Industry 4.0 to knowledge-intensive activities, and more specifically to smart working.

In smart working, the worker is seen as a provider of a service, located in non-predefined places, delivered at intervals that change over time, and who operates in a continuously evolving relationship with the organization. Coherent with this definition, smart working is claimed to be based on three fundamental pillars [32]:

- the social dimension, concerning the human resource management practices and the behaviors of workers within organizations;
- the technological dimension, referring to digital technologies that enable employees to work remotely;
- and the physical dimension, related to the layout and ergonomics of the environment where the work takes place.

Therefore, the conceptual framework of STS represents an excellent basis for interpreting smart working as decomposable along both technical and social dimensions which are strictly interdependent and complementary to each other. Complementary, in this case, refers mainly to communication processes, workflow management, co-creation of knowledge and competence, balance between private and work life, leadership oriented towards work flexibility and knowledge sharing, autonomy and proactivity, and workers empowerment [11].

The STS approach is based on the assumption that change requires a human-centered design perspective since work systems see the participation of one or more people who interact with each other and/or with machines [3]. This approach, following a cross-disciplinary perspective, suggests combining variables that are typically the subject of distinct disciplines into a single representation [25]. Figure 1 shows the typical representation of an STS [5, 7, 8, 40, 43]:

- a technical subsystem, including organizational variables interacting in business processes (subdivided into activities and tasks) converting inputs to outputs; and technological variables, i.e., technologies, resources and tools recognized as the main engine for implementing processes;
- a social subsystem, that includes human variables relating to the characteristics of the people who operate in the organizational system (qualifications, attitudes, motivation, personality); and social variables, i.e., the set of interpersonal relationships that people create within the organizational system and formalize through the organizational structure.

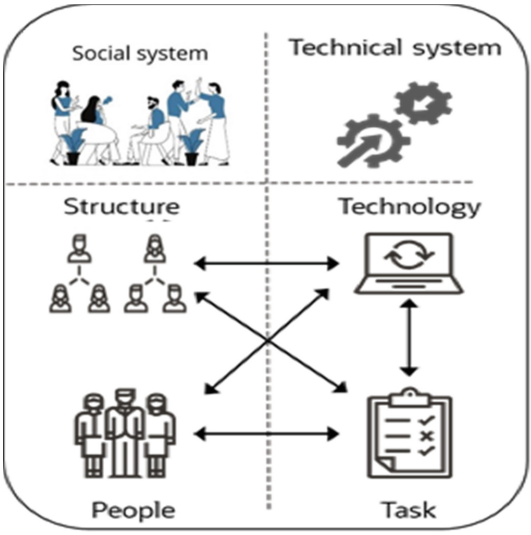

Fig. 1. Socio-technical systems (Source: Adapted by [9])

3 Main and Expected Findings

By observing the evolution of smart working through the lens of the STS framework, the four components described above can be recognized, and in the following sub-sections we analyze and discuss them respectively.

Smart working requires a radical change that should drive institutions to move from a logic of fulfilment towards a logic of service. In this perspective, the objective of smart working is to enable workers to balance work and private life, while encouraging productivity through more efficient processes but also reducing the time associated with commuting. To protect workers, the weakest category in the loop, an agreement between the employee and the employer is required regarding:

- the alternation of work outside the company boundaries and onsite;
- the direct interaction with superiors and the socialization with colleagues at certain times of the day;
- the compliance with the maximum limit of daily working hours;
- the right to disconnect from work electronic devices;
- the control and evaluation of the workers aimed at measuring their results.

Therefore, to adopt remote, flexible, agile, and smart working, organizations should ideally, on the one hand, study and approve an implementing regulation involving the HR division; on the other, they should train executives and other employees within different office locations to deal with IT, administration, and technical professionals.

During the pandemic emergency all these activities were sorely lacking and replaced by the mere recommendation to employese to stay home and work using the digital devices, both company or personal, already available to them [6, 12, 13, 29].

3.1 Technical System

From the point of view of the structure of IT systems supporting smart working, a key issue is to ensure workers easy access to these systems. This can be achieved by utilizing technological solutions, like the integration of platforms and the improvement of the user experience of software applications, especially workplace collaboration and video-conferencing applications, or with organizational solutions, such as the provision of help desk services [10].

At the individual level, the choice of the technological equipment should primarily take into account - with regards to the applications - the familiarity with digital technologies and the different acquired technical skills in the use of the software. Therefore, a one-size-fits-all model could prove highly inadequate [15]. Concering the hardware infrastructure, during the pandemic organizations were only concerned with providing employees with a personal computer, a mouse and a keyboard.

The core issues during the pandemic were to provide tools, IT services and instruments to allow employees to work from home or elsewhere. No recommendation was provided, at the outset, on HR training with executives regarding communication, behaviors, task performances and measurements: nor was training to monitor and empower agile work. Much attention was paid instead to the strengthening of security by improving Virtual Private Network (VPN) connections, and purchasing new IT devices and cloud services.

In previous studies, we found that in organizations where smart working had already been discussed, developed, or introduced, the pandemic emergency had accelerated the processes of internal socialization. In all these cases, the emergency facilitated the formalization of agreements between organizations and workers without officially negotiating with the trade unions. Paradoxically, the lack of rules facilitated and streamlined the implementation process of remote and smart working by enabling people to attend to their own work dynamics, and the institutions to deal with their own self-regulations. From an operational point of view, one of the enabling factors was that the remote, agile and smart working activity was addressed at an individual level.

The adoption of smart working is associated with [3, 36]:

– the recognition of greater control of workers over their activities;
– the reduction of phenomena of alienation and routine at work;
– the creation of a more articulated and creative professional network;
– and job enrichment and greater involvement in work activities (empowerment).

All of these precepts were introduced a few months after the massive introduction of remote working, during what we can identify as the second phase of the emergency. Work did not change radically, but a series of factors - such as the pressure on workers' performance, the need for remote supervision, the issue of well being in a stressful situation, (the so-called *zoom fatigue*), and the need of an adequate space to work from home - brought to the fore the debate on the implications of remote working and which specific solution would be ideal in which organization. Only recently has smart working been considered as a new model of work organization based on trust, goal-oriented approaches, restoring flexibility to people, and the higher autonomy and empowerment

of employees. In addition, in the managerial shere the greater virtualization and delocalization of work require innovative leadership models based on an agile, mindfulness approach targeted at coordinating remote workers and virtual teams.

3.2 Social System

In the second half of 2020, during what we can identify as the third phase of the pandemic emergency, it was quite clear that remote work entailed drawbacks and risks, such as a larger gap between employees with or without digital skills, a lack in organizational trust and organizational culture, the isolation of workers, and digital overload.

As a result, radical changes would also be required in the organization of the work and in the formulation of the roles. For remote workers, their personal and working lifes often overlapped, and digital tools have become, for some, the only point of contact with the outside world. Employees were catapulted into a new way of working without the time to provide them with adequate training. Furthermore, the replacement of physical interaction with digital interaction, combined with a culture of constant connection, is compounding digital overload which had already been identified as one of the defining problem of today's workplace [34]. In addition, following the strong pressure to digitalization driven by the pandemic, researchers and executives have now been questioning how business processes should be redesigned to make remote work effective and more sustainable in the long term. Some issues to consider are [1, 37]:

- to redesign the set of tasks of a process and their allocation across the involved individuals;
- to take into account the constraints on interpersonal communication arising from the physical distance between individuals, the allocation of tasks, the increase in autonomy in the management of activities, the temporal distribution of the tasks for each individual to ensure a proper work-life balance, and the management of diversity and disabilities;
- to favor the management of work spaces at home;
- to reduce the digital skill shortage due to increasingly complex technological tools;
- and to manage communication and the sense of belonging of workers.

Companies should develop abilities in the design, planning and control of objectives [22, 23]. Moreover, HR managers have to manage relationships between employees, unions, managers, and team leaders, and doing this remotely certainly requires innovatire skills and tools.

In a massive virtualization and relocation of work, employees need to learn how to define and plan tasks and activities and schedule them, to optimize time and process management, and cope with the overload associated with the sheer quantity and high rate of information received in *push* mode from multiple sources like workplace collaboration applications, corporate messaging tools, video-conferencing systems, and work/personal devices.

They also need proper skills to master new digital collaboration tools, to run digital meetings and provide management feedback as required.

Moreover, managers should be trained in their new role to work by objectives by strengthening employee skills for effective virtual interaction with colleagues, and more effective communication.

4 Discussion: The Need of a Head of Remote Work?

The classic distinction between the technical and social components of the STS refers to a static representation of an organization. However, in this paper the STS model is used as a compass to describe the dynamics of organizations adopting remote working. As mentioned in the previous paragraphs, it is possible to analyze the experiences of remote working adoption from a time span perspective. It is therefore possible to recognize four phases in which technical and organizational components play different roles. First, a pre-emergency and experimentation phase where both technical and social aspects are taken into consideration. Then an emergency phase with the massive introduction of new tools and methods, and when the technological aspects are more relevant than the social. Finally the post-emergency phase, or rather a phase of consolidation in which human and organizational aspects become more and more pertinent. In each phase, common elements emerge.

1. Pre-emergency/experimentation phase: Generally the process of innovation is slow since it takes into consideration both organizational and technical issues. In this phase, discussions usually emerges since workers prefer to maintain the status-quo. Innovators need to negotiate with unions aimed at protecting the workers' benefits and rights. The experimentation usually involves a very limited number of individuals with a voluntary willingness to innovate and test the new solution. Changes are incremental and often refer to a small and non-significant part of the whole organization such as a few individuals, minimal changes in the tasks, etc. Technology is an enabling factor but the effects of its introduction are controlled and delimited.
2. Emergency/sizable introduction of new tools and methods: Innovation is mainly driven by the technological variable. The social and individual variables formally take a back seat, and task changes are limited only where new services for citizens/users are required. The attempt is to replicate the previously well-established behaviours in the new technological settings. Some tensions may occur because the new settings have generated a substantial change in the work-life balance and in worker habits. The more autonomous and empowered workers craft their job, adopt tools to measure and assess the activities, and change the nature of their job, but the majority continue to carry out the well-established behaviours.
3. Post emergency/consolidation phase: The technological variables are consolidated but a stronger need for social aspects arise. The development process can take two directions: keep the changes and improve the social side, or return to the previous pre-emergency state reinstalling pre-emergency behaviours, attitudes, incentives, tasks, and processes. The choice of institutionalizing change and improving the organization seems the most challenging since workers, at all levels, need to learn a new form of work organization.

In the third phase the need for a new managerial role emerged and in medium-large US companies, a new role 'hit the market': the Head of Remote Work[4]. The numerous examples available provide an interesting variety of job titles and C-level positions: Director of Remote Work, Head of Dynamic Work, Head of Remote, and Director of Remote Work. According to a study by T3 Advisors[5] 12% of companies in the US tech sector created a managerial role with organizational ownership for remote working, while in 39% of the analyzed cases the role was created within the Human Resources function.

Despite the lack of a standard definition of these roles, some common features can be defined. As the job title would suggest, it is safe to assume that this role oversees the remote share of a workforce: however, the role is more complex than that. A head of remote work should display good communication skills, be able to channel complex decisions to a broad audience, to act on a constant stream of feedback, and demonstrate a proactive attitude for innovation, problem-solving, and self-starting. The most difficult and technical competencencies required appear to be project and program management, business processes and design principles, user experience in design tools and methodologies, ability to understand how people operate when working remotely, and the knowledge of organizational development and organisation design principles. The head of remote work should also be experienced in management level roles, like Business Operations, People Operations or Human Resources, with business process redesign, change management and communication, and with planning, design and delivery of digital internal communication events.

Analyzing online job postings for this role, we identified the following filled or vacant posts:

- Director of Remote Work (shared with Head of remote learning) by Facebook
- VP of Real Estate & Workplace and Remote Experience by Twitter
- Head of Remote (shared with Work HR specialist) by Quora
- Head of Dynamic Work by Okta
- Head of Remote by Hopin, GitLab, AngelList, Prezi, Oyster
- Remote Hub Site Lead by Stripe
- Director of Remote Work by Gong
- Head of Virtual First (shared with VP of Design) by Dropbox
- Senior Director Colaboration & Productivity by VMWare
- Head of Distributed Work by CloudFlare
- Remote Communications Manager by Zapier
- Manager of Remote-First by Vistaprint/Cimpress
- Director of Remote Workforce Solutions by Cleveland Clinic
- SVP & Director of Remote Work by Avalon Consulting Group
- Director of Remote Operations by Strata Solar
- Remote Operations Manager by iTech Media

The following are a sample of the responsibilities required:

[4] "The three new executive roles that define 2020", The Economist, December 8th, 2020.

[5] https://www.t3advisors.com/ retrieved June 1st, 2020.

– Lead a team of "cross-functional" leaders across the company to help make the transition to remote work (Head of Remote Work @Facebook)
– Work with company leaders on strategy, structure, and process around the hiring and management of remote teams (Head of Remote Work @Gitlab)
– Audit and pressure test all existing workflows, policies, and cultural underpinnings to ensure that they are adapted for remote-first (Gitlab Remote Playbook)
– Collaborate with all functions of the business to support clients and partners seeking guidance on mastering remote workflows (Head of Remote Work @GitLab)
– Collaborate with the HR Department to improve on-boarding and manager training to operate with remote-first workflows (Head of Remote Work @Gitlab)
– Champion a company-wide all-remote culture and initiatives through content creation, interviews, webinars, case studies, podcasts, and partnerships with external organizations (e.g. universities; industry board; etc.) (Head of Remote Work @Gitlab)

5 Conclusions

The presence of a strong external contingency factor, such as the Covid-19 pandemic emergency, forced organizations to massively adopt technological tools and implement new forms of remote, flexible, agile, and smart working practices. As often happens, a crisis situation becomes a trigger for radical innovation. After the imposition of working remotely during the lockdowns, companies realized the need to introduce flexible, agile and smart working practices. In this paper, this evolution is described using the STS approach as a conceptual reference framework. As a last but current phase in aforementioned evolution, organizations are now aware of the need to acquire and develop new competences, procedures, and, in particular, new managerial roles. These more recent requirements are described in the last section.

Further research is needed to investigate if and how the different approaches discussed so far by the most advanced organizations will converge into new templates or organizational models. However, our study is able to provide interesting insights from the practice viewpoint. It is clear that organizations should invest much more and pay attention to: on the one hand, the new and digital competenecs and skills required for developing and introducing these innovative forms of remote, flexible, agile, and smart working practices as well as the new, different needs of the workforce in terms of sources of work-related stress or tools required for their regular job. Effective training and learning programs are required, including focused interventions to improve leadership skills for top and middle managers and the overall governace of the organizations, adequate corporate welfare policies (work-life balance, support for disability relatives, fast wifi connection, etc.) and practices to mitigate the risks of digital overload.

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Blended and Online Learning Environments: Motivations, Contradictions, and Influencing Factors

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Abstract. Blended and online learning environments continue to grow, transforming higher education. The motivation behind this study is to explore blended and online learning environments, from the perspective of students, through the lens of Activity Theory (AT). Based on 12 virtual semi-structured interviews with Master's (MSc) students at one University in England, the paper sheds light onto some of the findings with respect to student motivation underlying engagement, as well as tensions and contradictions in the activity system.

Keywords: Blended and online environments · Higher education · Covid-19 · Activity theory · Student engagement · Motivation · Tensions and contradictions

1 Introduction

This paper presents research-in-progress exploring a blended and online learning environment at one University in England, from the perspective of students, via the lens of Activity Theory (AT). This theoretical framework helps researchers gain insights into tool-mediated human activity, within its natural environment [1, 2]. Compared to other social theories, AT's distinguishing contribution is the acknowledgement of tensions and contradictions, which interrupt the flow of an activity, as a means of change and understanding [3]. AT was applied in this study to investigate the underlying student motivation(s) that result in class attendance and engagement, as well as illuminating examples of four levels of tensions and contradictions in the activity system.

This qualitative research was conducted as a single case study based on one Masters (MSc) Course. The structure of the course included multiple lectures in the form of pre-recorded material and/or activities, and Live class discussions held on a weekly basis. The data were gathered over a one-semester period and data collection methods included 12 virtual semi-structured interviews (via Zoom or Google Meet), observation of the face-to-face and online activities, and document analysis (e.g. resources for students, course outline and information, activity statistics, and University guidelines/regulations).

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Digital technology has transformed society and, in particular, the landscape of higher education during the pandemic [4]. First, there was a requirement for essential short-term crisis management, but now there is a broad recognition and acceptance that there is a need to commence working toward a 'new-normal' as the Covid-19 disruption continues [5, 6]. For the 2020–2021 academic year, many UK universities have initially decided to adopt Blended Learning (BL) approaches in order to deliver modules, courses, and programmes. However, due to the Covid-19 cases increasing and the third national lockdown (January 2021–March 2021), institutions have been 'forced' to revert to complete online delivery (with an exception for a few disciples).

The introduction and implementation of technology in learning and teaching is not a new paradigm [7]. Indeed, the number of online and blended learning classes will most likely increase in the near future and, hence, there is a need to gain a deeper understanding of such contexts, and in relation to how student interactions and engagement could be improved and maintained. Furthermore, discussions regarding 'value for money' has increased over the past year [8], meaning that there is a pressing need for Universities to provide 'value' to students by improving their learning experience. This could be achieved by understanding potential tensions and how they could be addressed effectively, along with identifying factors that influence student engagement and motivation during the course.

The remainder of the paper is structured as follows: the next section presents the background and related literature, followed by a description of the theoretical framing. Next, the preliminary findings are presented and discussed. Finally, we offer a brief conclusion and outline the future plan for the study.

2 Background

In this section, a short overview of blended and online learning environments is provided in order to present the research context, along with student engagement, motivation, and challenges associated with both modes of delivery.

2.1 Blended and Online Learning Environments

Over the past two decades, educational institutions have adopted Blended Learning (BL) for various reasons. However, BL has recently received significant interest due to the Covid-19 pandemic [5, 6].

BL appeared in the late 1990s and refers to an approach in education that combines face-to-face elements with online learning [9]. This approach can consist of implementing face-to-face delivery with educators, followed up with online activities with peers. Alternatively, online learning may be delivered first (i.e. in the form of pre-recorded lectures/activities), followed by face-to-face interactions. This latter approach is usually termed as 'flipped teaching' [10, 11]. Although there does not appear to be a single definition to the term, BL is essentially a model that combines different forms of media such as video, audio, and text at different time scales (such as asynchronous, synchronous) with a face-to-face element in the same course [12]. Usually, this is supported with the adoption of Learning Management Systems (LMS), which enable the facilitation

of asynchronous and synchronous activities, whereby students have the flexibility to engage in learning activities in terms of place and time. Such systems also facilitate interaction and collaboration between students (e.g. in the form of discussion forums).

A number of studies have identified the advantages of BL. For example, the combination of computer-mediated instruction and face-to-face delivery enables gaining the benefits of both approaches [13]. Furthermore, scholars assert that it may potentially enhance student learning performance, and allow them to become more engaged in the learning process [14].

2.2 Student Engagement

While the pandemic has resulted in higher education institutions rethinking future education and the role of technology, many scholars have revisited the notion of student engagement pre-, post-, and during the pandemic [4, 15].

Engagement and interaction are closely related, and in some instances, the terms are used interchangeably. It is argued that, in the learning context, engagement describes the active involvement of the learner and is directly related to a potential learning outcome [16]. According to Moore [17], three types of interactions are significant in effectively delivering learning via online methods; (a) learner-to-learner interaction, (b) learner-to-instructor[1] interaction, and (c)learner-to-content interaction (Fig. 1).

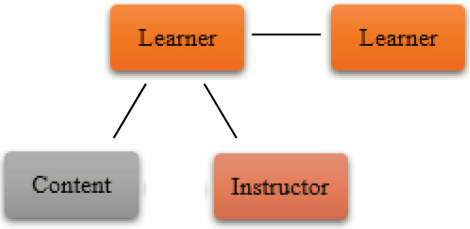

Fig. 1. Illustrating the relationship between different entities described by Moore [17]

Although Moore [17] recognises the three fundamental entities involved in learning environments, he does not explain the 'type' of interaction involved. He emphasises that online or distance programmes should be designed in a way that maximises the "effectiveness of each type of interaction" [17:23], and to ensure that a suitable type of interaction is selected for the learners and the teaching task. Hillman et al. [18] extended this model to include learner-interface interaction since distance and online environments involve learners interacting with a medium/tool. In line with this, research concludes that there are three major types of engagement; cognitive, behavioural, and emotional [19].

Student engagement lies on a continuum ranging from disengaged to engaged, and in-between lies varies degrees of engagement. There is confusion as to whether the

[1] The literature uses the terms 'instructor', 'teacher', 'lecturer', 'educator', and 'academic' almost interchangeably. However, to remain consistent with the terminology adopted by the University in this study, the term 'lecturer' will be adopted hereafter.

terms engagement and motivation should be used interchangeably. However, there is an understanding among scholars that motivation is usually a moderator or an antecedent to engagement. Motivation is the unobservable force or intent that drives behaviour, while engagement is the effort and energy in action, which is observable [20].

2.3 Motivation

Originating from the Latin word for "to move", motivation is considered as the fuel for action. "To be motivated means to be moved to do something" [21:54]. Scholars interpret motivation as the process by which an individuals' desires and needs are set in motion. Usually playing a role in satisfaction and success, motivation is fundamental to learning. Undeniably, motivation is a crucial factor to address in enhancing student learning outcomes and performance [9, 22] and has received increased interest from scholars during the pandemic [4, 15].

The literature highlights two types of motivation associated with learning: extrinsic and intrinsic. Intrinsic motivation focuses on the inherent pleasure and satisfaction from undertaking a specific activity. On the other hand, extrinsic motivation is linked to goal-driven behaviours and reasons from undertaking an activity, including rewards gained, benefits, or recognition. Together, extrinsic and intrinsic motivations affect individual intentions and behaviours with respect to an activity. Some scholars argue that intrinsically motivated students are more likely to show better performance and complete tasks compared to extrinsically motivated students.

Ryan and Deci's [23] Social-Determination Theory (SDT) suggests different forms of extrinsic and intrinsic motivation (Fig. 2) and is argued to be a valuable framework in understanding students' self-determination during a learning task, the quality of effort evidenced, and, hence, engagement. For example, research shows that self-regulated students are generally more motivated to learn regardless of the content covered in the course.

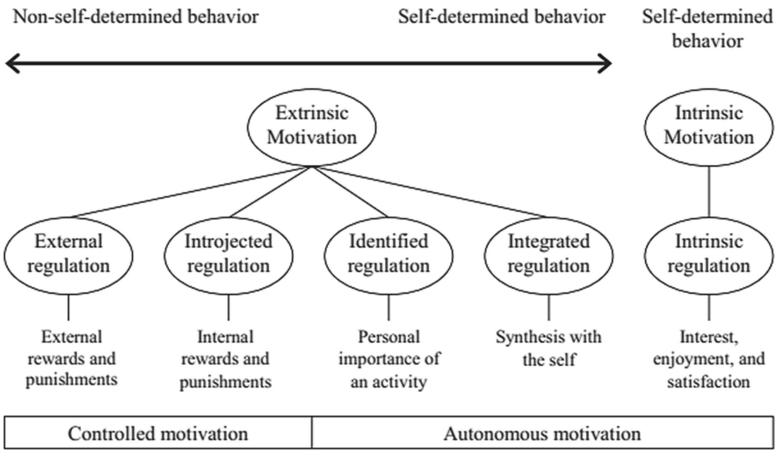

Fig. 2. Self-determination theory (based on Ryan and Deci [23])

2.4 Challenges

Recent studies highlight a number of challenges experienced by students in blended and online learning environments, such as challenges associated with self-regulation, technological literacy and competency, and student isolation [13]. Similar findings were reported in studies conducted over the Covid-19 pandemic across multiple disciplines [24, 25]. From a content and technology perspective, studies have alluded to the need of creating an infrastructure that enables locating 'learning-objects' and resources effectively and the development of protocols or standards that support this [26]. Furthermore, [27] highlight that lecturers' main challenges were associated with learning the new technology tools and the discomfort with implementing, and indeed understanding, online pedagogy, in addition to the difficulty in sustaining student engagement in the online component of the programme.

3 Theoretical Framework: Activity Theory

AT was selected as a theoretical framework to investigate student motivations and understand the tensions and contradictions experienced in a blended and online learning environments. Scholars argue that AT is one of several practice-based approaches that has evolved into a cross-disciplinary and global approaches and is useful when aiming to frame and comprehend complex activities [1, 2] and understand how new technologies can impact educational change [28]. The model allows the analysis of complex and evolving practices by providing a multi-dimensional and systematic approach, which considers aspects such as tools, motives, always-present dynamics of history, culture, and the wider community [3]. Figure 3 depicts the activity system studied in this paper in the form of the second generation AT model.

3.1 Principles of Tensions and Contradictions

Allen et al. [2] highlight that an 'activity' is under continuous development due to the impact and effect of instability, subject and community needs, tensions, and contradictions. Contradictions are not considered the same as problems, but are recognised as tensions, which occur between and within activity systems.

Four levels of contradictions are proposed by Engeström [1]:

- Primary contradictions – takes place when tension is brought by one construct/element within an activity system (found within a component such as the 'rules/norms', 'subject', etc.).
- Secondary contradictions – takes place when there is tension between two elements (e.g. between the division of labour and object). For instance, strictness or flexibility of the rules to achieve the objective.
- Tertiary contradictions – takes place when there is tension between the original activity (before change) and a more advanced form.
- Quaternary contradictions – takes place when there is tension between the activity and another co-existing or concurrent neighbouring activity.

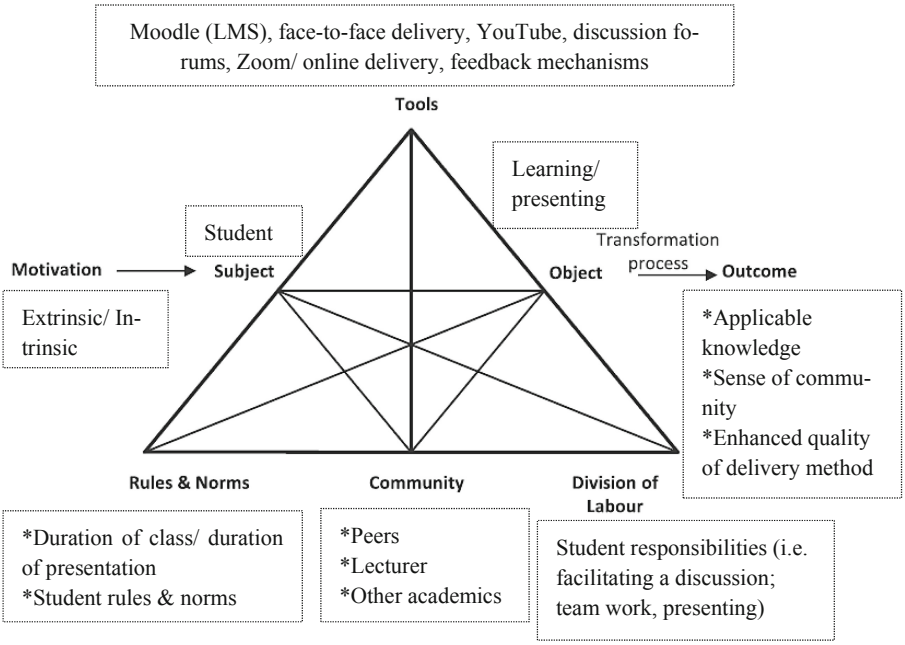

Fig. 3. Activity system using the second generation AT model

This theoretical framework, and the notion of tensions and contradictions, has been adopted in previous studies exploring the inter-relationship between the physical classroom and the virtual classroom, further supporting its adoption in this study [29].

4 Findings

A total of 12 virtual semi-structured interviews were conducted with students undertaking an MSc course specialising in Information Systems (IS) and digital technology at one university in England, over a period of one semester. All students enrolled on this course were contacted via email (*total of 23 students*). Interview questions were framed in line with AT and sought to understand students' initial expectations from studying this degree during Covid-19 and their motivation in terms of engagement and attendance in both blended and online classrooms, along with the challenges they had experienced in either mode of delivery. The interviews were very open and students shared their opinions in an open manner. They did not hesitate in expressing their opinion about the challenges they experienced and their expectations. Checking against their activity statistics in the LMS, they did not 'hide' or 'cover' their non-engagement, but instead spoke freely about their experience. Each interview lasted between 60–90 min and all responses were audio-recorded, transcribed, and annotated. Table 1 highlights the demographics of the participants.

Table 1. Interviewee details.

Code	Gender	Nationality *Home (UK) or International*	Code	Gender	Nationality *Home (UK) or International*
Student 1	M	Home	Student 7	M	International
Student 2	F	Home	Student 8	F	International
Student 3	F	Home	Student 9	M	International
Student 4	F	Home	Student 10	M	Home
Student 5	M	International	Student 11	F	International
Student 6	M	International	Student 12	F	Home

4.1 Main Findings of the Semi-structured Interviews and Document Analysis

The data that emerged shows contrasting views of motivation. Table 2 illustrates examples of intrinsic and extrinsic motivations revealed when asked about attendance and class engagement. In some student responses, it was difficult to distinguish whether students were intrinsically or extrinsically motivated, since both types were found to co-exist.

Table 2. Student motivation towards attendance and engagement.

Theme	Example of quotations
Intrinsic Motivation	*"It's something new for me…So it is new knowledge" (Student 1)* *"There's always hints and tips that your professor [instructor] gives you." (Student 7)* *"If you're paying for something, you want to get your money's worth … but not everyone does that. Finance [for the MSc degree] – I see it come out of my bank account, I know that it is coming out of my bank account and it can be a lot but it is not a factor I consider every time I log in to a session. It's more of 'I want to do it'." (Student 2)* *"For a Master's course, you can get behind very quickly if you don't attend. And because it is quite in-depth and specific knowledge, it can be difficult to teach yourself if you do miss a session. I always thought if I always attend, then it meant that I didn't have to do that amount of catch-up to get to the same level as everyone else" (Student 3)*
Extrinsic Motivation	*"Missing a session meant that you would be missing what you would have learnt that day. And that is not really an option because you are paying for this degree." (Student 2)* *"I didn't want to miss the classes and material for which I am paying high fees. I would feel that it is a waste of money, I paid for it and didn't use this opportunity." (Student 10)*
Opportunities	*"…then every seminar, every lecture, every conversation in English for me is practice to improve my English language. For me, it is also like training for my brain and my English skills" (Student 6)*

(*continued*)

Table 2. (*continued*)

Theme	Example of quotations
Norms that govern behaviour	*"That's what I'm used to. I went straight from Undergrad where we had to go in [attend] because we have to tap our [student] cards. So that was already built in." (Student 2)* *"My motivation is that I've been doing it for years." (Student 1)* *"If it is in your schedule, then you do it." (Student 11)* *"I would say I've been groomed to attend class from day 1." (Student 3)*

Moving on to consider the second major theme in this paper, Table 3 presents examples of four level contradictions observed in this case study. Some contradictions were specific to a blended learning environment where there is an element of online delivery and face-to-face contact, while others were observed across both blended and fully online learning environments.

Table 3. Four levels of contradictions observed in this case study

Contradiction level	Observation from the case study	Example of quotations
Level 1 Primary contradiction	• Not all students are motivated to the same extent or for the same reason (*blended and online learning environments*)	*"…because I applied to this postgraduate course, I still like to feel like a student and have a student life and I wanted to experience this so I needed to attend lectures and seminars for that one year" (Student 6)*
	• Different objects among students (*blended and online learning environments*)	*"…attending meant that I wasn't necessarily missing gap in knowledge by teaching myself and if I did have any questions, then I could just ask rather than having to catch-up again with a lecturer [instructor] at a later date" (Student 9)*
		"For me, it depends on what I am going to do that session"(Student 11)
		*"Well, I stopped attending those face-to-face sessions only because other students wouldn't follow the rules, you know wearing a mask and all that" (Student 12) - *Blended learning environment*

(*continued*)

Table 3. (*continued*)

Contradiction level	Observation from the case study	Example of quotations
Level 2 Secondary contradiction	• Interaction between the subject and community (peers and/or lecturer) (*blended and online learning environments*)	*"But if I was in the position if I was on Zoom and not physically in the classroom, I might miss out on what someone else was saying because they talk to you [instructor] and not talking to the screen." (Student 2) – *Blended learning environment*
	• Different culture, rules and norms between students in a class (*blended and online learning environments*)	*"…so it became a bit difficult that you were put into two worlds. You're trying to listen and interact but you're also trying to listen and interact with those online so you are kinda torn between the two." (Student 9) – *Blended learning environment*
		"breakout rooms are enjoyable until you are working in a group where no one contributes or all the work is on you" (Student 7)
Level 3 Tertiary contradiction	• Pre- and post- activity system – after-session activities/ behavior (*blended and online learning environments*)	*"I have the opportunity to visit the Library straight after and do some work. Also, if I wanted to speak to the lecturer for a quick question, I could catch them at the end of the class." (Student 4)*
Level 4 Quaternary contradiction	• University-wide regulations (*blended and online learning environments*)	*"I know people who, to have a good [Wi-Fi] connection, need to attend the class from the Kitchen and they have their mum cooking, there's a TV on and they can't do much, and it is a bit discouraging for them to put their camera on and having to deal with many things going on. Same thing with the microphone if they are in a place with a lot of noise, for example, if they live in a small house." (Student 5)*

The following section contains a more in-depth discussion of the findings.

5 Discussion

The findings revealed a variety of student motivations underlying their attendance and engagement in classes, in addition to several contradictions occurring within and between elements of the activity system.

5.1 Student Motivation and Engagement

The selection of quotes in Tables 2 and 3 reveal that a wide variety of motivations exist in a classroom [also known as 'poly-motivation'] [30, 31], driven by either intrinsic or extrinsic motivation or both. In our study, we identified that while some students engaged in classes due to the content/topic being delivered or their desire in broadening their knowledge, others engaged, or merely attended classes, due to extrinsic factors such as course finance and attendance recoding. Research shows that students who are intrinsically motivated achieved higher grades, showed higher levels of persistence, and processed reading materials more deeply [22, 23], compared to those who are extrinsically motivated.

The findings also indicate that some students only engaged in classes if their peers showed some level of interaction, and/or if the instructor was "enthusiastic" about the session or had prior experience in using the specific tool to deliver the session [4, 27]. We argue that peer interaction in our research refers to learners contributing to the class and not the development of a 'learning community'. Research shows that feeling part of a learning community positively influences student engagement [32]. In some instances, this was observed in this research, and in other instances, the findings do not support this argument. In fact, it was found that such learning communities resulted in some students missing classes because they were certain that their 'friends' would catch them up with the content.

Interestingly, some International students were driven by the opportunities associated with engagement in terms of enhancing language skills, learning, communication, and broadening their networks. However, one must take into account when the research was conducted as studies have shown that near the end of the semester and/or course, students become results-focused [33] and may not be driven by such opportunities.

Furthermore, students who have undertaken the MSc course straight after Undergraduate study (i.e. graduated from Undergraduate study in the same year/did not take a 'gap' year), whether Home or International, indicated that it was the 'norms' that governed their behaviour that drove them to attend and engage in classes.

Our research has alluded to the importance of 'managing student expectations' [34] as students have a set of expectations based on their educational experience to date, as well as from messages made by the University regarding teaching (*i.e. expectations are influenced by the socio-cultural environment and norms*). It appeared that the disparity between their expectations and the actuality of blended and online learning affected how students approach their studies and their motivation to engage in classes as expectations influence what is and what is not tolerated/seen as appropriate.

On the other hand, in some student responses, it was difficult to distinguish whether students were intrinsically or extrinsically motivated, and that both types were found to co-exist. One must also highlight the importance of 'motivation for what purpose?',

as the student may exhibit intrinsic motivation for one aspect of the course, while not another. This reflects what is and what is not valued and that motivation varies based on contextual and situational factors. This, in turn, sheds light onto 'what does it mean that some students were engaged?', 'what do they appreciate?', and 'what were their expectations?'. For example, two students may state that they are motivated to study, but deeper analysis would reveal different objectives; one may be driven by wanting to obtain a 'good' degree outcome but with the least possible learning, while another may be genuinely curious about the subject and their inherent enjoyment and interest [23]. In line with AT, this suggests that students may appear to share similar understandings of the object by demonstrating similar behaviours on the surface, but on a deeper level, the object is meaningful in different ways. This demonstrates that each student can have multiple and competing motivations that remain unresolved and increase the complexity of the activity system. This could be explained by the Argyris' [35] theory-in-use and theory of action espoused. Although this was not investigated in much detail in this research, it could explain some of the findings.

Going back to the discussion on Moore [17] and Hillman et al. [18] in Sect. 2, this research highlights a number of entities influencing the activity system and we propose an extension to their discussion. We argue that the type of interactions and engagement between the entities are either direct or indirect.

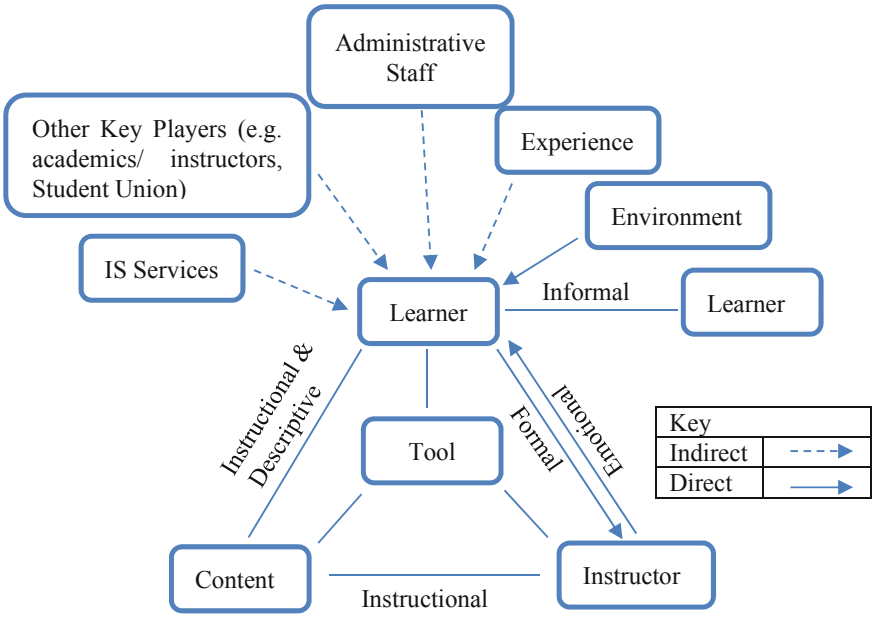

Fig. 4. Proposed model of the entities and the relationship between them that influence the learning environment, whether online or blended

Our findings reinforce Engeström's [1] argument that an activity is a historically, socially, and culturally contextualised phenomenon. We argue that motivation is a

dynamic entity, influenced by a number of contextual factors (e.g. peer support, the lecturer, task, etc.), and students will most likely exhibit various degrees of the motivation continuum [23] throughout the semester.

5.2 Tensions and Contradictions

Primary Contradictions

AT suggests that a subject has 'motivation(s)' towards achieving an 'object' [1, 2]. When asked about motivations, a variety of responses were obtained. This created tensions as some students' engagement was dependent on peers' level of interaction and/or the interaction of the lecturer. This finding complies with the literature and other studies that have highlighted that students value interaction in a class, which is usually evident in traditional classrooms.

Another primary contradiction witnessed was that the 'object' was different among students. For some students, the object was deep understanding of the concepts/ topic, while for others, its was more surface-level understanding and the aim of passing the module. The former approach involved 'studying for understanding', and the latter involved 'studying for the assessment'. An analysis of the log statistics for each student revealed that those who were more prepared to invest reviewed almost all course material and participated in all the quizzes or learning opportunities available on the LMS, compared to those who invested minimal effort to meet the requirements of the course.

Secondary Contradictions

With respect to the blended learning aspect, tensions experienced were related to the delivery method chosen by the lecturer. Due to some students not being able to join physically (for reasons such as self-isolating, shielding, Visa issues, quarantine, etc.), the lecturer decided to deliver the class to all students simultaneously, instead of arranging separate classes. The literature refers to this approach as a 'hybrid classroom'. Although, compared to other methods, students believed this was a successful model of delivery, some students attending the class virtually experienced tensions associated with the fact that they could not hear other students attending the class physically as they were more inclined to speak to the lecturer in the classroom rather than to the Zoom platform.

Other tensions included the availability of pre-live session material and timetabling, and the availability of necessary information that could influence decision-making with respect to attending classes face-to-face in a blended learning environment.

All students identified benefits regarding the tools used in both an online and blended learning environment, such as those associated with Zoom/Zoom breakout rooms, Padlet, feedback mechanisms, Moodle/Moodle Books, and discussion forums. Some students believed that the 'breakout rooms' imitated face-to-face interaction which allowed them to undertake group activity, with the fundamental difference of the activity occurring online. They also appreciated the "*variety included in the course overall*" (Student 3). For example, some modules relied heavily on pre-recorded material, while others consisted of designing Moodle Books that included a range of different activities. Furthermore, Padlet and discussion forums allowed students to discuss their thoughts with their peers and undertake "*a mini research on a thought-provoking question or topic*" (Student 4).

Having said that, tensions were evident in terms of break-out room student composition and the non-contribution of some students. Nevertheless, the opposing argument here is the advantage of working with students with different skill sets, abilities, background, and experience, in order to enhance skills and challenge students further [7]. This also raises the significance of the lecturer role in facilitating discussions in break-out rooms.

Tertiary Contradictions

A number of students stated that they preferred to attend classes face-to-face due to the ability of going to the University Library or the ability to speak to a lecturer on a one-to-one basis straight after the session, which was not possible when classes were conducted online as a lecturer, for example, would 'end the session' immediately when the class ends. One solution students stated is requesting the possibility for instructors to say to students that they will be available at the end of an online lesson for 5–10 min for any queries. This strategy, although it may create further tension from the perspective of the lecturer (e.g. if they need to deliver another class immediately after the session, workload issues), is perhaps an attempt to imitate face-to-face delivery or aid in the transition.

Furthermore, some students mentioned that the blended learning environment provides them with a high degree of flexibility [9] in terms of reviewing pre-recorded lectures and materials. However, despite this feature being considered as an advantage, some students recognised this as a challenge because it removes the structure that would have normally been present if courses were delivered face-to-face (i.e. traditional learning settings). In addition, this meant that student motivation and engagement were dependent on deliverable deadlines as blended and online learning created an illusion that students could review materials at any time rather than studying/ working regularly. To resolve such an issue and provide structure to students, a lecturer "*could request timetabling to add a 'lecture' slot in student timetables*" (Student 3), where students will be able to view the pre-recorded material at that time. This also highlights that there is a need for students to understand the set-up of a blended and online learning environment and all components (e.g. lecture materials, quizzes).

Quaternary Contradictions

There is a debate regarding whether student cameras and microphones should be switched on during classes. While some students thought that it was necessary to have "*at least microphones on*" (Student 9), as it facilitates collaboration, interaction, and engagement, others believed that it would be "*inconsiderate to force such a rule*" (Student 5). This is because there are many reasons as to why students might not be able to switch on their cameras and/or microphones, and it is inappropriate to assume that their 'home' environment is the same as a face-to-face classroom environment [4].

According to Bednar and Welch [36], change does not only involve technological adoption or changes in an organisation, but also involves the disruption of work and community. Consequently, subjects need to 'control the process of transformation', and re-create and revise their perceptions and understandings to positively impact all those concerned in the activity system. Smart working offers a number of benefits that go

beyond saving on fares for commuters and accommodation costs. However, it is crucial that these benefits are communicated across the organisation in order to support meaningful practice.

It is noteworthy to emphasise that these tensions do not only depend on the nature of the delivery, but also on the 'type' of class being delivered and the nature of module undertaken (i.e. a technical module/topic, where students are learning a software/application, or a more theoretical module based on theory and case studies).

6 Conclusion, Limitations, and Future Research

With the number of blended and online learning courses and programmes continuing to increase [4–6], lecturers will need to be aware of the tensions and contradictions, or 'challenges', students experience in both forms of learning environments in order to improve the student learning experience. This research has highlighted several contradictions occurring at various levels of the activity system, and illuminated a wide range of student motivation that drive attendance and engagement. Our findings reinforce Engeström's [1] argument that an activity is a historically, socially, and culturally contextualised phenomenon. We argue that motivation is a dynamic entity, influenced by a number of contextual and situational factors (e.g. peer support, the lecturer, task, etc.), and students will most likely exhibit various degrees of the motivation continuum [23] throughout the semester. However, it is important to note some students may demonstrate similar behaviours on the surface, but on a deeper level, the object is meaningful in different ways, as explained and suggested by Argyris' [35] theory-in-use and theory of action espoused. We also emphasise the significance of managing student expectations as they are influenced by the socio-cultural environment and norms and were found to impact student motivation underlying attendance to, and engagement in, classes.

Although all students recognised that blended and online learning environments offer them a high degree of flexibility, almost all noted that this removes the level of structure that would have normally been present in a fully face-to-face environment. Hence, students appeared to prioritise certain tasks based on deadlines rather than regularly studying/ working, which in turn drove their motivation and engagement. An unexpected finding in our research is that students did not mention the importance of pre-recorded videos, but instead reported that their engagement was associated with the interaction in the class and that they highly valued classes that involved a high degree of interaction, even if no pre-material was provided for them to prepare.

Based on our data and analysis, we propose an extension to the discussion offered by Moore [17] and Hillman et al. [18], highlighting entities, and the relationship or 'type of interactions' between them, that influence blended and online learning activity systems (Fig. 4).

The limitations of this study include the sample size used and the focus on the context of a single course, during one semester. Therefore, research should continue to investigate these areas, further extending the sample to not only include students, but also lecturers in order to capture a full picture of the activity. This could ultimately lead to the identification of entirely new, or possibly, overlapping tensions in the activity system. In addition, it may be beneficial to extend the interviews to a larger cluster of

students (from different courses and disciplines) to provide better insights and allow comparisons. By understanding the learning and engagement process, lecturers may be able to enhance the quality of delivery in blended and online learning environments.

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