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Digitization And Co-Production Of Healthcare: Toward A Research Agenda

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In public management and administration, co-creation, co-design and co-production of public services are a very significant trend, both theoretically and practically. These efforts aim at simultaneously improving service delivery and legitimacy. At the same time, digitization is extending in public services. Beyond using information technologies for production, public organizations are increasing their use of social media and other citizen- or service-oriented platforms, not to mention the burgeoning use of AI. The combination of these two trends – co-creation / co-design / co-production and digitization – is under-researched and poses important practical questions at policy, strategy and delivery levels. We outline a research agenda based on a combination of theoretical and conceptual discussion, a literature review and three case studies from the healthcare sector. The main paths for future research revolve around 1) challenges about engaging patients or citizens in designing e-health services, 2) the necessity to develop pluridisciplinary research and reach a common taxonomy, 3) patient empowerment, 4) the impact of digitization on healthcare practices and the relationship between patients and healthcare professionals, and 5) insufficient strategic and policy reflection about the impact of digitization.

Keywords Digitization, Co-creation, Co-production, Healthcare policies, Research agenda.

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DIGITIZATION AND CO-PRODUCTION OF HEALTHCARE: TOWARD A RESEARCH AGENDA

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ABSTRACT

In public management and administration, co-creation, co-design and co-production of public services are a very significant trend, both theoretically and practically. These efforts aim at simultaneously improving service delivery and legitimacy. At the same time, digitization is extending in public services. Beyond using information technologies for production, public organizations are increasing their use of social media and other citizen- or service-oriented platforms, not to mention the burgeoning use of AI. The combination of these two trends – co-creation / co-design / co-production and digitization – is under-researched and poses important practical questions at policy, strategy and delivery levels. We outline a research agenda based on a combination of theoretical and conceptual discussion, a literature review and three case studies from the healthcare sector. The main paths for future research revolve around 1) challenges about engaging patients or citizens in designing e-health services, 2) the necessity to develop pluridisciplinary research and reach a common taxonomy, 3) patient empowerment, 4) the impact of digitization on healthcare practices and the relationship between patients and healthcare professionals, and 5) insufficient strategic and policy reflection about the impact of digitization.

KEYWORDS

Digitization

Co-creation

Co-production

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Research agenda

1. INTRODUCTION

Digitization is a core feature of our societies, and the last few decades have been influenced by the strong development of new information and communication technologies (ICTs). These technologies are directly affecting our lives, through a wide range of activities now dependent on them; companies are increasingly relying on ICTs to grow their business, or to make their processes more efficient; and new businesses are flourishing through the usage or creation of new technologies. According to the European Commission (2018), digitization and new technologies are expected to add €110 billion of revenue to the European industry annually. Benefits of and opportunities raised by this shift have been boasted all over the world; it is definitely not limited to Europe.

New technological systems and platforms are also increasingly adopted by public administrations to better interact with their citizens, provide services more efficiently, and modernize their daily operations. They are creating an ecosystem in which governments are connected to almost all stakeholders. In this vein, being absent from digital networks or not using digital tools would place them in a critical situation. This has a significant impact on public policies, especially on its implementation since citizens can be more deeply involved (Maniam, 2020). Finally, decision-making processes will also be strongly affected by the digitization process, in particular through the usage of algorithms, which are designed to guide decision-making in an automated fashion.

Several contributions have described this shift of practices and the evolution currently taking place in the public sector. According to Dunleavy et al. (2006), public administrations live in a new era, characterized by an extensive use of ICTs. The authors call this new paradigm “Digital era governance” (DEG), followed by other, subsequent works on the same issue (e.g., Dunleavy and Margetts, 2015). The shift from new public management (NPM) to a period marked by the predominance of technology is summarized by Dunleavy et al. (2006) as follows: a focus on A) *regeneration*, through agencification rollback, re-governmentalization and the reengineering of back-office functions; B) *needs-based holism*, through agile government processes and interaction-based relations with citizens; and C) *digitization processes*, through electronic services, automated processes and increased co-production.

More recently, additional authors concentrated on the rise of artificial intelligence (AI), and algorithms especially. In this regard, Meijer, Lorenz and Wessels (2021) depict a new phenomenon, which they call an “algorithmization” of public administrations. From this point of view, the use of algorithms to prevent crime, tax fraud or to better anticipate certain situations is progressively leading to automated decision-making systems that tend to replace human-based decisions. The authors describe two patterns that emerge from real-life cases: the “algorithmic cage” (more hierarchical control) and the “algorithmic colleague” (professional judgment is more important). In both cases, though, behaviors seem to derive from social norms and cultural administrative traditions rather than technological determinism *per se*.

This global shift toward digitization has raised concerns among scholars, managers, and users. Some have for instance argued that digital tools have reinforced the “black box” (and therefore secrecy) of administrations, and they have shown that digitization may reinforce the asymmetry of information in the state-citizens relationship; others have pointed out that a global digitization movement would impact negatively on the less equipped individuals, leading to a worrisome digital divide (Bélanger &

Carter, 2009). Nevertheless, the promises of digitization have generated much enthusiasm in all communities (researchers, politicians, users, developers, and providers). For example, a report from the OECD (2019) states that “health lags far behind other sectors in harnessing the potential of data and digital technology, missing the opportunity to save a significant number of lives and billions of dollars”. Almost all sectors are directly interested in developing and using new technologies, and most public policies are affected by the recent technological developments. However, healthcare stands out for several reasons: the challenge of reducing health costs, an ageing population, ethical concerns, the Covid-19 epidemic and the related applications, etc. In this sense, technological evolution and the related promises are especially relevant and compelling to study in healthcare. For Gellerstedt (2016), technology is a game-changer in health policies; and innovation is often depicted as a crucial process to address the increasing needs of an ageing population in most countries (Blix & Levay, 2018).

Challenges facing the healthcare sector are numerous, and they are expected to expand in the next decades. They include a decrease in human resources (we observe a decrease of physicians, especially in primary care, in multiple countries), an increasing number of patients, due to chronic diseases and increase in life expectancy, and a decrease in financial resources (Menvielle et al., 2017). Against this backdrop, the alleged benefits and expectations raised by the new technologies are *the* key factor leading the current digital transformation. They include economic and efficiency gains for multiple stakeholders, better quality care, high levels of patients’ trust, as well as better doctor-patient coordination and data security.

These hopes are not completely new: the *Lancet* mentions a first usage of the telephone to diagnose a child in 1897, and in 1910, the telephone was used by a physiologist to record electrical heart signals of patients 1.5km away from the hospital (Pascal, 2017). The present interest for digitization in healthcare results from several factors, including a push for transparency and patients’ access to medical information (DesRoches, 2020), information sharing between organizations, investment opportunities, innovation, quality of care, etc. These expectations are not limited to rich countries: Agrawal (2020) discusses how India’s new “National Digital Health Blueprint” aims to “build better public health infrastructure that is natively digital and telemedicine capable”, and how the country’s e-health system does already have some assets in that way. Moreover, demand for digital healthcare services and tools is growing among consumers, as highlighted in a survey conducted by Accenture (2018) in the United States. Such demand is driven by the desire to better communicate with doctors and to better monitor one’s own health condition, especially with wearable devices.

Interestingly, though, most promises made by information sharing, the automation of data treatment and decision support raise at least as many tensions and challenges. The digital transformation raises the challenge of organizational change and workforce transformation. The recording of personal data promises more efficiency, but automatically poses the question of data protection. The usage of algorithms aims at improving decision-making processes, but issues of discrimination and inequality arise. The usage of electronic devices and automated systems are synonyms of efficiency gains, but they are facing serious security threats. The technology-intensive health services risk disempowering both healthcare workers and patients. Specifically, telemedicine and the usage of devices raises a debate about the transformation of the patient-doctor relationship (Mabillard et al., 2021). These first questions raise the need to explore paths for future research in a more systematic way. In this vein, the aim of this working paper is to provide a global view on the issues raised by digitization in the

healthcare sector, with special attention to co-creation, co-design and co-production, to draft a research agenda.

The remainder of the paper is structured as follows. We start by explaining the method used to explore our topic with three approaches: a) a critical review of the main concepts and approaches (*courants de pensée*) in the PA/PM literature on technological evolutions and collaboration; b) a review of the literature on e-healthcare policies, and c) case studies. In the first section, we define and discuss the main concepts that intersect in our topic, the notions of governance, digitization, and collaboration. Then, we review the literature, including the healthcare dimension, as we will see that introducing sectoral publications changes the emerging issues compared to the main PA/PM conceptualizations. Third, we use case studies to further complement the tensions and challenges identified in the literature. Finally, we provide an overview of our results and propose a research agenda on designing and managing collaborative digitization in healthcare.

2. METHOD

There is no established method to explore potential paths for future research. Scholars must adopt a broad approach, in line with Stebbins' advice (2001): "to explore effectively a given phenomenon, [researchers] must approach it with two special orientations: *flexibility* in looking for data and *open-mindedness* about where to find them" (p. 6). Exploratory research is best suited to generate hypotheses for future research (Yang and Miller, 2008). This working paper is exploratory in nature: it aims at providing a clarified understanding of complex issues that remain too fragmented (Plume, Page and Garelick, 2020). We will rely on a threefold approach to explore congruences and gaps between the first theoretical/conceptual part, the review of the literature on selected key notions, and the case studies. Based on this methodological approach, a concept map, which includes the main issues identified in the paper, will be presented in the conclusion to support the discussion of our findings.

In our theoretical and conceptual overview, we will compare the main definitions about the issue nexus of designing and managing collaborative digitization. Remaining within mainstream PA/PM research, we will retrace the history and dialectics of salient conceptualizations of governance, co-creation and co-production, and digitization. This will already point to tensions and contradictions indicative of potential research perspectives. A first glance at healthcare research will provide some tentative confirmation of the relevance of these tensions (see Table 2). Importantly, this clarifies the subjects (and categories) for carrying out the literature review.

In the second step, the literature review will rely on several criteria to select the most relevant contributions *vis-à-vis* our study. Focusing on e-healthcare policies, it will complement the critical discussion on the existing approaches and the main definitions used by identifying the most salient aspects of digitization-related benefits and risks analyzed in the literature. The added value of this exercise lies in the fundamental reasons that guide all researchers conducting a literature review: the creation of "a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed" (Webster and Watson, 2002, p. xiii). The literature review will lead to categories of emerging issues, that can be confronted to a more targeted literature search about them (see Table 2). In this sense, our effort to

cover a wide range of contributions gives a better overview of the literature dealing with digitization in healthcare, complements what has been observed in the theoretical discussion, and serves as a basis for a more thorough discussion on the next steps for future research.

In a third, more empirical and inductive step, we will present case studies that may show overlaps but also gaps about the issues identified in the other two steps. The cases will relate to digitization in healthcare with a mainly Belgian scope. They have been selected to maximize the diversity of involved stakeholders, of types of relationships between them, and of governance at play. The analysis is based mainly on published data, with additional details coming from interviews or personal communications. Each case will be presented with an “actor-network” diagram of involved actors (individual and organizational) and of IT systems, and a narrative highlighting the most salient issues, illustrated by boxed exhibits. Six cases had been selected in a preliminary stage: the Belgian Electronic Patient Record system, a “MedTech” startup offering a connected armband for monitoring infants with respiratory diseases, the design of COVID contact tracing apps, a collaborative e-health platform, social media use by a hospital, and online medical appointment and evaluation systems. At this stage, three have been analyzed and will be presented in this working paper.

3. THEORETICAL AND CONCEPTUAL DISCUSSION

The expected benefits of digitization in democratic societies are directly connected to two phenomena: technological developments, of course, but also (and perhaps more importantly) the redefinition of the relationship between authorities and citizens, and the respective roles assigned to them. These phenomena are complex; however, they are essential to understand how digitization of certain services (in healthcare here) are developing, what are the main stakeholders involved, how these services are implemented, what kind of tensions they face, and how the future may look like. For these reasons, we will proceed by presenting foundational concepts used in the paper.

3.1 GOVERNANCE

The evolution from traditional public administration to new modes of management has been extensively commented. Most contributions focus on the NPM movement, and then describe a shift to governance structures, based on networks, social practices and activities (e.g., Bevir, 2012). Approaches to governance differ significantly from one contribution to another. As a result, the notion has been addressed in diverse ways, although they all capture the same phenomenon, a change from purely hierarchical structures to less asymmetrical relationships between the government and the governed, and the proliferation of networks, in which non-state actors tend to play an increasing role in policymaking and decision-making. Pasquier and Villeneuve (2018) describe a deepening of democratic principles through the reinforcement of the following aspects: transparency, accountability, networks, and co-production of public services. “Democratic governance” is an umbrella term that gathers various approaches to the governance of public institutions; but regarding central elements of politico-administrative structures, the government-administration relation, and administration-citizen relationships, Pasquier and Villeneuve (2018) highlight certain core features that belong to almost all approaches to governance (Table 1).

Table 1 | Key differences between the traditional public administration, NPM and governance approaches (based on Pasquier and Villeneuve, 2018)

	Traditional PA	NPM	Governance
Politico-administrative structures	<ul style="list-style-type: none"> > Public service is an institution > Departments and ministries are large and complex > Institutions are centralized and hierarchical 	<ul style="list-style-type: none"> > Services thought as universal > Units are smaller, decentralized and autonomous > Some services are increasingly privatized 	<ul style="list-style-type: none"> > Democratic service is the norm > Structures are increasingly differentiated > Powers are given to certain units (coordination)
Government-administration relationships	<ul style="list-style-type: none"> > A logic of separation prevails > Hierarchical authority prevails 	<ul style="list-style-type: none"> > A logic of separation prevails > Contractual authority prevails 	<ul style="list-style-type: none"> > A logic of interaction prevails > Increasing role of institutional and professional authorities
Administration-citizen relationships	<ul style="list-style-type: none"> > Administrations and citizens are bound through a collective relationship 	<ul style="list-style-type: none"> > Administrations and citizens are bound through individual relationships with specific sub-groups 	<ul style="list-style-type: none"> > Administrations and citizens are bound through a holistic relationship

This more inclusive and participatory approach to state-citizens relationships has materialized in certain principles (access to information, accountability reports, etc.), but also in concrete activities. For example, participatory budgeting has gained ground in many cities around the world, from Brazil to Europe (Cabannes, 2004), and cities like Ixelles in Belgium are quite active in this field (Figure 1). Another type of activity is related to sessions open to the public, during which citizens can openly question their elected representatives. The latter can also invite citizens to participate in meetings and increase dialogue channels (ParlAmericas, 2017), who can in turn call out parliamentarians through petitions (Figure 1), for instance in the Brussels-Capital Region (democratie.brussels, 2021). In Brussels, citizens can also suggest ideas that are discussed in deliberative commissions, gathering citizens and deputies. Finally, consultations are increasingly organized to better understand the quality of life and preoccupations in some neighborhoods, and to ask citizens about their preferences for the development of their neighborhood, or a certain part of the city/region in which they live. For example, in the city of Sion (Switzerland), surveys have been sent to residents, information has been distributed, ateliers/meetings have been organized, and the results of both the survey and the urbanistic / architecture context have been presented publicly. Similar processes and projects have been supported in Europe (e.g., Urbact; see Figure 1) and in the world (The World Bank, 2021). This has been studied in the academic literature as well (Horita and Koizumi, 2009; Jin, Lee and Kim, 2018). More generally, neighborhood councils have been created in different parts of the world and can influence the level of responsiveness from municipal authorities, as shown by Bryer (2009) in the case of Los

Angeles. A trade of independent consultants specialized in facilitating participatory governance emerges (Bherer, 2021).

Figure 1 | Examples of participatory processes in a citizen-centered governance



A central addition to the literature on governance stems from Osborne’s contribution on an innovative approach called the “new public governance” (NPG). According to Osborne (2006), the traditional model of public administration has transited through the NPM movement to reach a new phase of development in which trust and/or relational contracts are central. As a key governance mechanism, these elements strongly differ from the hierarchical structure and operation mode of the classical model on the one hand, and from the market / classical contracts on the other. In addition, Osborne (2006) insists on the plurality of actors and “the plural world that now comprises the environment of public services and of [public sector organizations]” (p. 384). This plurality aspect is also central in subsequent contributions. For example, Pedersen, Sehested and Sørensen (2011) argue that the multiplicity of stakeholders, and the changing nature of their interactions, tend to redefine how coordination is viewed in public sector organizations and their environment. They highlight the predominance of the plurality of actors and linkages between these actors/organizations, the growing importance of interactive processes/communication, and the importance of context. This plurality is also connected to organizations with hybrid profiles, marked by a variety of stakeholders, multiple and conflicting goals (Mair and Mayer, 2015). All told, the wider public governance (PG) movement includes the following aspects: a focus on public services, policymaking, and democracy; the

importance of integration and coordination processes; and a key role for ethics, equity, transparency, accountability and sustainability in both decision- and policymaking (Iacovino, Barsanti and Cinquini, 2017).

As mentioned above, though, PG is often addressed through diverse approaches. In a recent book dedicated to governance, Torfing et al. (2020) present various PG “paradigms”, including the digital-era governance put forward by Dunleavy et al. (2006). The digitization process, at the heart of this conception of governance, will be detailed below. Here, we simply want to remind that digital services and technological evolution, from this point of view, is regarded as a complete transformation of the public sector, in similar proportions to the changes that have affected private companies and social life (e.g., retail industry, mass media). One of the main drivers of this approach is the development of big data. In this regard, certain authors have investigated how governments adapt to this changing landscape, how citizens react, and in which directions the relationship between the state and citizens goes (see Mergel and Bretschneider, 2013). Once again, this “paradigm” raises many issues, ranging from data protection and ethics to increased openness and coordination mechanisms.

Nevertheless, Torfing et al. (2020) present alternative PG paradigms, and show that these paradigms sometimes conflict with each other, at least regarding certain goals and means. This is the case of another approach, public value management, which insists on the necessity to produce public value. The latter concept was originally developed by Moore (1995), and later extended to governance issues by Bryson, Crosby and Bloomberg (2015), who came up with the new notion of “public value governance”. This approach is characterized by a strong societal involvement and a strong emphasis on value articulation. Finally, the NPG mentioned above is also presented by Torfing et al. (2020) as an additional, distinctive approach of PG, created to counter the problems raised by NPM. The solution provided by the defenders of NPG focuses on cross-boundary collaboration between various stakeholders, from all sectors, to generate more input and output legitimacy of public actions. This brief overview shows that there is now consensus about the nature and development of PG, and that diverse approaches are mobilized to grasp the notion. However, similar characteristics include increased levels of coordination, less centralized authority (especially compared to the Weberian model) and the growing involvement of non-state actors. The latter is directly connected to the notions of co-creation and co-production of public services to which we turn now.

3.2 CO-CREATION AND CO-PRODUCTION OF PUBLIC SERVICES

According to Ansell and Torfing (2021), new forms of PG are needed to address four main challenges of our time: A) a public service problem (*increasing citizen expectations vs. limited resources*); B) a policy problem (*political and institutional factors vs. robust policy solutions to complex societal problems*); C) a community problem (*erosion of social cohesion and social capital vs. self-organized solution for local communities*); D) a democratic problem (*political polarization and disenchantment vs. liberal representative democracy*). The authors argue that co-creation, defined as “the process through which a broad range of interdependent actors engage in distributed, cross-boundary collaboration in order to define common problems and design and implement new and better solutions” (Ansell and Torfing, 2021, p. 6), may well provide an answer to these challenges. Indeed, co-creation can bring public service delivery closer to citizens’ needs; it fosters innovation, which can

generate policy solutions to address wicked problems; it brings people together, which may in turn reinforce social cohesion; and it can finally deepen democratic participation. This positive perspective is shared by Sørensen, Bryson and Crosby (2021), who affirm that co-creation can not only enhance public value, but also that public leadership attitudes that promote citizen engagement and mobilization can help public leaders to better understand what is valuable for the general public.

Ansell and Torfing (2021) explain that the idea of co-creation emerged in the private sector, since “co-creation between firms and consumers has the potential for creating value because value creation is increasingly focused on user experience rather than on the product per se.” (p. 33). In this regard, an authentic relation between companies and consumers was sought, and consumers were to be seen as joint problem-solvers with businesses. This evolution led to the transformation from a goods-centric to a service-centric logic, also in the public sector. For instance, Gebauer, Johnson and Enquist (2010) describe how the Swiss Federal Railway company adopted a service-centric approach, increasing their demand for service users’ ideas and inputs. However, co-creation in the public sector differs from the private sector in various ways: the environment is different (less competitive), citizens are not purely consumers, and it is often a more collective effort.

An early development of the idea of co-creation stems from Ostrom’s work on co-production of public services (Ostrom et al., 1978). Co-production has been extensively discussed in the literature and analyzed through concrete cases. In their literature review on the two notions, Voorberg, Bekkers and Tummers (2015) explain that co-creation and co-production have often been defined in similar terms but note that the literature on co-creation puts more emphasis on the notion of value. Co-production has also been distinguished from co-creation by Torfing, Sørensen and Røiseland (2019), who argue that although co-production may improve service delivery, it does not engage in broader innovation dynamics. However, we will briefly discuss the concept of co-production, since it has been mentioned more often in the literature and continues to be used nowadays.

Alford (2014) revisits the notion of co-production as envisaged by Ostrom et al. (1978). He extends the preliminary work from Ostrom by pointing out that co-production results from a complex mix of factors, which go far beyond rational egoism. He also adds that the production of goods (products) should be taken into account, and not only services. Finally, he underlines the necessity to consider an increasing number of stakeholders, whose plurality sometimes makes it difficult to clearly identify the issues at stake, and especially how co-production processes develop. Bovaird and Loeffler (2012) insist on the potential for creating public value, i.e., trigger behavior change or prevent societal problems from happening in the near future. They regard co-production mainly as “the provision of services through regular, long-term relationships between professionalized service providers (in any sector) and service users or other members of the community, where all parties make substantial resource contributions”. In this sense, their definition is close to what has been mentioned about co-creation, and it is in line with the key aspects of governance presented above: the plurality of stakeholders (or “parties” here), a logic of increased openness and participation, through networks and more sustained relationships. Interestingly, they provide examples of diverse types of co-production (co-planning of policy (*deliberative participation*), co-managing of services (*parents-school governors*), co-delivery (*nurse-family partnership*), etc.). This emphasis on diverse forms of co-production, and especially the creation of public value, has been recently further developed by Osborne, Nasi and Powell (2021).

As we observe, the burgeoning of contributions around the co-production and co-creation concepts has led to refined approaches to the relationships between citizens, private actors and public organizations. It has the power to bring all parties together and convince them to work on common goals, even on polarizing issues (see Box 1). These stakeholders are now embedded in creative and innovative processes, enabled by technological innovation. Co-production and co-creation processes can be (and are) applied to multiple policies, ranging from transportation to waste management. Examples include living labs, which refer to “settings or environments for open innovation, which offer a collaborative platform for research, development, and experimentation in real-life contexts, based on specific methodologies and tools, and implemented through specific innovation projects and community building activities” (Gascó, 2017). In other words, they are aiming at co-producing innovation through exchanges between public sector organizations, citizens/civil society organizations, businesses, and non-governmental organizations. Though it is debatable whether these platforms effectively lead to co-innovative solutions (Haug and Mergel, 2021), urban living labs and policy labs have flourished over the last few years, often supported by public bodies. Examples can be found at both the local (e.g., the city of Torino) and international level (e.g., European Union). Illustrations are provided in Figure 2. As will be further developed below, it should be recognized that technological evolution plays a central role in co-creation.

Box 1 | Co-creation in government: The case of Malden, Mass. (Gouillart and Hallett, 2015)

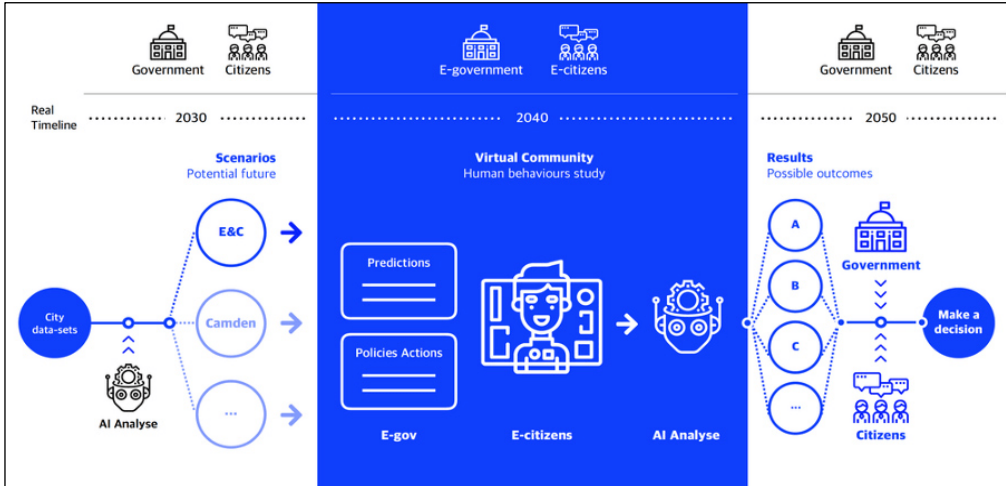
In late 2012, in Malden, a group of investors (some of them being Democrats, others being passionate Republicans) worked together on a common agenda at the local level. To this end, a fund called Co-Creation Ventures (CCV) was created. Malden was chosen as the place to conduct this kind of experiment. Malden is indeed a political melting pot, encompassing Democratic and Republican constituencies. The poverty rate was fairly high (15%), and the population was characterized by high diversity. Whereas the city mayor and the US congresswoman were Democrats, just like most other local elected officials, Malden had many Republican-leaning businesspeople, who managed to build successful companies locally.

The team that was hired to run the CCV initiative selected food service as a potential source of economic engine for Malden, by helping to create a food industry cluster in the city. A series of workshops was first conducted to gather stakeholders, coming from various communities. The city already hosted a shared kitchen, serving food trucks, and traditions related to baking, meat cooking and coffee already existed, due to past immigration from Ireland and Italy. More recent waves of immigration contributed to the variety of cuisines.

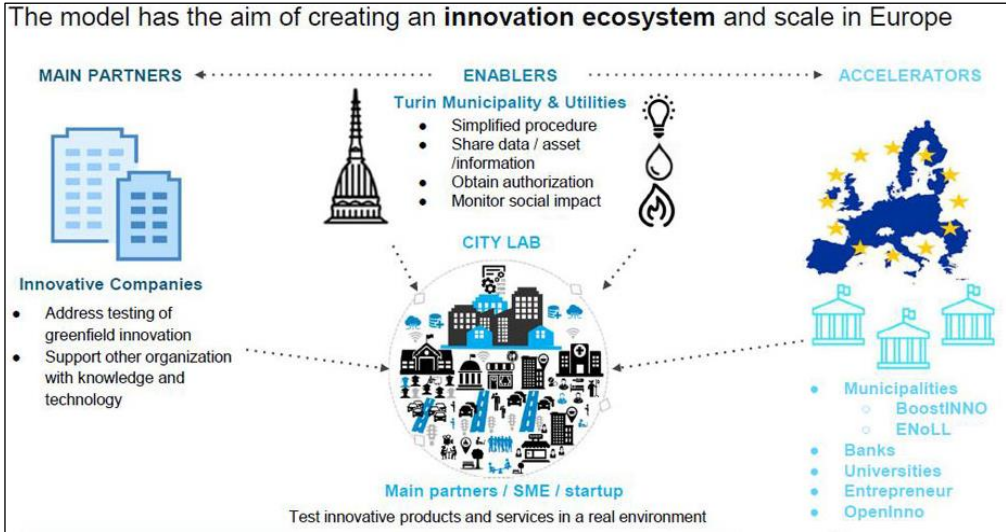
The CCV initiative used two platforms. The first, physical one consisted in the creation of a shared kitchen space called Stock Pot Malden, where food trucks and product entrepreneurs could prepare food side by side. The second, financial platform, consisted in a fund to take a minority equity in some of the small companies created. Participating businesses also received guidance from the people who run the CCV initiative (e.g., how to develop a proper business plan). Moreover, collaboration was strongly encouraged. It led to exchanges of best practices, sharing personnel resources, teaming up during certain events, etc.

The shared kitchen is now the largest food truck space in the Boston region. The effort has been praised by both Democrats and Republicans, in Malden and beyond. This example shows that co-creation initiatives can bring stakeholders together and, at the same time, reconcile goals that are typically promoted by Democrats (diversity and economic opportunity) and a more Republican approach (private capital and free-market forces).

Figure 2 | Examples of “labs” initiatives



Source: <https://www.arts.ac.uk/colleges/london-college-of-communication/business-and-innovation/industry-projects/eu-policy-lab>.



Source: <https://innovationinpolitics.eu/showroom/project/torino-city-lab/>.

3.3 DIGITIZATION IN THE PUBLIC SECTOR

Although these participatory processes are not new and have been described and analyzed extensively in pre-internet times (e.g., see Kathlene and Martin, 1991), the recent technological developments offer more possibilities to further increase the state-citizen exchanges. The usage of new technologies in the public sector follows a global trend but differs from the private sector in various ways. First, digitization in the public sector implies political ideas, interventions and ambitions that aim at reshaping public sector organizations (Plesner, Justesen and Glerup, 2018). Second, the accountability logic is completely different in the public sector, which has an impact on how the digital transformation is implemented, used and experienced by civil servants and public managers. Third, the professionalization of the structures and the training of personnel is also driven by distinctive

imperatives from the private sector and take a different form. Despite these differences, and the rapid and comparatively more enthusiastic uptake of new technologies in the private sector, governments have shown greater appetite to adopt new technological platforms and tools as well (Brown, Fishenden and Thomson, 2014). Drivers of this change are multiple and quite often overlapping; a non-exhaustive list would certainly include technological evolution, transformation of public sector organizations, a greater call for transparency and accountability, aspirations of more inclusive participation and interaction, better service accessibility, flexibility, and efficiency gains.

The development of electronic government has been extensively investigated in the literature. It refers mostly to the adoption of web platforms by government to communicate internally and externally with their citizens, and to provide dematerialized services, in addition to more “traditional”, non-digital service provision (Mabillard, 2019). Although there is no universally accepted definition of the term, the literature review conducted by Yildiz (2007) presents the key characteristics of e-government: the use of web-based applications, relationships through the use of electronic means and, in a more normative perspective, the increased efficiency in service provision, and increased levels of transparency in state-citizens relations. It should be noted here that technological evolutions, the development of the e-governance and digital-era governance approaches, and a growing focus on outcomes has redefined the way e-government has been addressed in the literature. Some authors have therefore mentioned the need to study “e-government 2.0” (Bonsón et al., 2012; Dixon, 2010), while others have adopted a larger view and focused on the open government movement, supported by ICTs. The notion of open government is further developed below.

The term “digitization” encompasses the uptake and usage of multiple technologies, including tracking devices in waste management and healthcare, digital self-service and new systems of data collection and diffusion. However, the digitization process goes beyond the adoption of a particular technology, since it focuses, in the public sector, on managerial/governmental ideas and importantly on the improvement of the state-citizen relationship (Dunleavy et al., 2006). The combination of the driving factors mentioned above and this aspiration for improved, more efficient and interactive institutions has paved the way for the development of what is usually called “open government”. Open government is based on key pillars that connect public administrations and citizens more closely, by making public bodies more transparent, participatory, and collaborative (McDermott, 2010). It builds upon existing legislations (access to information laws, *E-government Act* in the U.S. for example) and envisions new possibilities to increase openness of governments. Co-creation/co-production processes are also part of this digital transformation, as shown by the development of some co-creation initiatives, using online platforms to enable increased interactions between all parties involved (Jarke, 2019).

As presented above, digitization in the public sector has inspired several authors, who have redefined, enriched or transformed the PG paradigm. In addition, new technologies have also a direct impact on co-creation and co-production dynamics. A remarkable example of this phenomenon is the transportation map of Mexico City, which was co-produced with citizens in just two weeks – citizens/users shared their data via a dedicated mobile app (OECD, 2017). In his review of the main technological developments that influenced (and still influence) co-production and co-creation in the public sector, Lember (2018) shows that social media have been extensively investigated, as well as the technologies traditionally associated with the development of smart cities (e.g., devices, such as

sensors). Additional technologies also affect co-production indirectly: for example, through more efficient information flows, recent ICTs can help coordinate co-production processes. Finally, certain recent technologies hold the potential to transform co-creation and co-production. This is the case of telemedicine, which may enable elderly people to live more independently at home. As presented above, living, city or policy labs are an interesting bottom-up approach to co-create new technologies that will benefit a community. They can contribute to solve local issues, sometimes through the creation and usage of co-created applications (Cardullo and Kitchin, 2017).

Lember (2018) also presents evidence, key challenges and open questions raised by the rapid digitization processes currently taking place in all sectors. In public sector organizations, there is an overall highly optimistic mood; however, this should be questioned and debated, since the effects of the digitization can vary greatly according to context, the type of technology, and the issues at stake. Firstly, empowerment often supports the digital transformation. Indeed, it is expected that new technologies will generate more shared sovereignty and responsibilities between public organizations, companies and especially citizens. One of the downsides, that is not enough emphasized, is a counter-productive effect produced by the automation of processes. Kitchin (2016) writes that “automated management facilitates and produces instrumental and technocratic forms of governance and government.” Secondly, digitization promises more participation and inclusiveness. However, digital divide and literacy often pose under-commented problems. Thirdly, new technologies are also often praised for their potential to increase efficiency. Unfortunately, on the long run, they have undermined service effectiveness in certain cases. Online meetings with prisoners are a great example: the weakening of social ties may indeed increase the likelihood of misconduct. Fourthly, the resistance of public authorities, and the limited interests of citizens, show that co-production and co-creation are not “natural” processes; and when there is a willingness to co-produce/co-create notwithstanding, the issue of implementation is not always properly addressed.

3.4 GOVERNANCE AND DIGITIZATION IN HEALTHCARE POLICIES

It seems now clear that e-governance, digitization, and co-production/co-creation are at the top of political preoccupations and academic research about public administration. In healthcare, co-creation and / or co-production have already been identified as essential to healthcare effectiveness and legitimacy, but not always in connection with digital services (See Table 2).

Table 2 | Publications focusing on co-creation/co-production in healthcare policies

Article	Focus
Bowen et al. (2013)	Co-design / participatory health service design; participants' experiences and feeling about a participatory project
Donetto et al. (2015)	Experience-based co-design (participatory approach); quality of care ; Relations between citizens & public services
Hardyman et al. (2015)	Patient engagement ; value co-creation ; micro-level; services marketing and public management
Israilov and Cho (2017)	Relationships between health care professionals and patients; shared decision-making ; quality improvement
Singh et al. (2017)	Political and ethical challenges of health care; issues of implementation ; development of a common vision
Balta et al. (2021)	Empowerment of stakeholders through digitization of healthcare; interactions & co-creation processes; value creation
Eriksson and Hellström (2021)	Service users and other actors collaboratively integrate diversified resources to achieve a user-centric approach to healthcare and support

There is also an ongoing practical interest about reforming healthcare systems. Box 2 summarizes the Dutch experience. As can be seen from these publications and examples, digitization is not necessarily perceived as integral to co-creation or co-production in healthcare.

Box 2 | Co-production of care services: The case of the Dutch welfare system (Nederhand and van Meerkerk, 2018)

In the Netherlands, governmental expenditures on the welfare system are usually significant. Compared to most other countries, the Dutch government spends more on welfare. With the late professionalization and privatization of certain services, the need to better codify the role of citizens in care emerged. More specifically, the role of informal actors, such as family, became central, as well as the question of their institutionalization as co-producers of care services.

The growing involvement of citizens relies on the following necessities: keeping care services affordable, aligning with changing societal demands (e.g., more customized care), responding to the challenge of an ageing population, and making the whole system more sustainable. In governmental policy letters, citizen involvement is regarded as a way to improve the efficiency of public governance, and not as an opportunity to improve the quality of democracy.

With the decentralization of the welfare system, and the delegation of competencies to the municipal level, the role of non-professionals in healthcare has been better codified, and they are now involved in both service design and implementation. In this vein, citizens are regarded as partners in service delivery, and providers are considered as complementary to the role played by citizens. The hybridization of roles thus implies a bigger role for non-professionals in healthcare, who are supporting professionals, and who can bear responsibilities when they are assigned specific tasks, in close collaboration with patients and their environment.

Conversely, digitization in healthcare has already been investigated, but more rarely in connection with co-creation or patient engagement. The issue is so broad that it has been studied in diverse fields and addressed in different ways. Reference books on the subject squarely on the subject of digitization have been published (see McLoughlin, Garrety and Wilson, 2017; Menvielle, Audrain-Pontevia and Menvielle, 2017). In the public administration (PA) / public management (PM) literature, digitization in healthcare is primarily addressed as a tool to further reinforce partnerships and encourage more participation from citizens, with the state playing the role of a facilitator (Simonet, 2011). The coordination between multiple stakeholders is also underlined by Cucciniello et al. (2015), since complex innovations require efficient coordination between the actors involved. Finally, another strand of research, more focused on new technologies, addresses the issue of state preparedness and solutions provided to crises, especially using digital means. Regarding the Covid-19 crisis, Wirtz, Müller and Weyerer (2021) argue that “governments and public administration require a comprehensive and application-oriented digital pandemic response approach to guide respective action and to cope with this major challenge in a more efficient and effective manner” (p. 903).

From a slightly different perspective, Rantamäki (2017) emphasizes the democratic potential of digitization and the possibility to reach a high level of “civicness”, i.e., the capacity of public institutions to stimulate and cultivate civility. According to her research, deliberative democracy may be reinforced by co-production in health care services, if co-production projects actively support the friendly confrontation of divergent opinions and co-creation of solutions. Finally, digitization in healthcare has also been studied through international comparisons (Kizito and Magnusson, 2020). The authors explore how healthcare policies, digitization of healthcare policies and IT policies are aligned (or not) in different settings.

While these elements already provide interesting insights into the various opportunities, benefits, risks and challenges associated with digitization in healthcare policies, research remains largely fragmented, evidence scattered, and a global picture is often missing. Our ambition is therefore to review the literature relevant to digital orientations in the healthcare policies, and to set an agenda for future research. We acknowledge that several important contributions have already been published in various fields, such as the book from Cribb (2017), who takes a broad, philosophical perspective on healthcare transformations. The book published by McLoughlin, Garrety and Wilson (2017) is also inspirational, since it addresses the issue of ethical and moral considerations related to digitization in healthcare quite extensively. Some crucial challenges facing digitization in healthcare are raised by Menvielle, Audrain-Pontevia and Menvielle (2017), and can serve as a source of inspiration for future research. However, our review of the literature will focus on contributions that have been published in scientific journals in the past ten years.

4. LITERATURE REVIEW

The conceptual discussion above highlighted the potential of studying the intersection between co-creation / co-production, related forms of governance, and the rise of digitization. The literature review complements the critical discussion above and fulfils three main objectives: A) create categories to better understand how digitization in healthcare is developed in the literature; B) compare the findings with the elements highlighted in section 3; and C) establish the basis for further

analysis in view of the case studies presented in section 5. This will confirm potential gaps and help us advance paths for future research in the field. Regarding the approach preferred, there are multiple sources of inspiration; just to cite one, Voorberg, Bekkers and Tummers (2015) conducted a literature review on co-production and co-creation that was based on the *Preferred reporting items for systematic reviews and meta-analyses*, which ensures transparency, completeness and replicability. We have used a fairly common strategy. The eligibility criteria include:

1) Publication status. Here, we focus on papers published in peer-reviewed journals only. Due to the proliferation of technical reports, official documents and conference papers on the issue of digitization in healthcare, we narrow down the search to published papers exclusively.

2) Publication year. The recent development of e-health and the technological (r)evolution led us to focus on the last decade. As a result, our literature review concentrates on contributions published between 2011 and 2021.

3) Language. Only publications in English were selected in our literature review, especially due to the difficulty to translate certain key terms.

4) Study type. Records should deal with the topic of digitization in healthcare from a public policy perspective. The inclusion of digitization in this sector alone would lead to a strand of literature focused on IT and technical considerations that go beyond this paper's scope.

5) Topic of digitization in healthcare. The keywords used include digitization, policy, health care, and public management, especially for the reason mentioned above, plus the fact that we prefer a public policy and/or management here.

6) Study design. Empirical, conceptual and theoretical studies are all included in our literature review, since we are interested in all material that will allow us to better draw a global picture and identify paths for future research.

The research has been conducted on *Google Scholar* exclusively, using the keywords mentioned above. Results from the search are presented in Table 3, gathering more than thirty references from diverse disciplines. Once again, we did not include any books nor conference papers, technical reports or official documents in the list below.

Table 3 | Main findings from the literature review (by category, study type, focus and main research disciplines)

<i>Category</i>	<i>Articles</i>	<i>Study type</i>	<i>Main focus</i>	<i>Discipline(s)</i>
Transparency and privacy	Azad et al. (2019) - A privacy-preserving framework for smart context-aware healthcare applications	General (usage of a model to guarantee privacy)	Protection of sensitive user data	Computer science
	Chang (2018) - Privacy and security concerns in online health services	Empirical analysis (regression)	Analysis of the link between use of e-health and security concerns	Economics
	Theodos and Sittig (2020) - Health information privacy laws in the digital age	General (legal considerations on e-health)	Analysis of the current legal framework and its shortcomings	Health studies / Law
	Angst (2009) - Protect my privacy or support the common-good? Ethical questions about electronic health information exchanges	General considerations on digitization by the US government in health	Balancing the public good aspect with individual interests (ethical issues)	Management
	Hausfeld and Zimmerman (2018) - You organization can and should be cyber secure!	General (creation of a technological roadmap)	Creation of a roadmap to ensure cybersecurity (practitioner perspective)	Management

	DesRoches (2020) - Healthcare in the new age of transparency	Empirical analysis (review of previous decade of research)	Analysis of transparency processes (sharing transparent medical records, including clinical notes with patients): Can it help to strengthen communication, trust in clinicians & engagement?	Medicine
	Serenko and Fan (2013) - Patients' perceptions of privacy and their outcomes in healthcare	Empirical analysis (structural equation modeling)	Develop a measurement instrument of patient perceptions of privacy in the healthcare sector & empirically investigate the outcomes of privacy	Sociology
	Jennath et al. (2020) - Blockchain for healthcare: Securing patient data and enabling trusted artificial intelligence	Proposition of a framework to ensure transparency and privacy in blockchain	Address security and privacy issues in blockchain (transparency and traceability as well)	Information technology / Management
	Harvey and Harvey (2014) - Privacy and security issues for mobile health platforms	Description and discussion of use cases from a privacy / security point of view	Examination of some of the key challenges facing mobile health with a focus on privacy and security	Information technology
Interactions with patients (digitization and care)	Steinhubl and Topol (2015) - Moving from digitalization to digitization in cardiovascular care: Why is it Important, and what could it mean for patients and providers?	General considerations on the doctor-patient relationship in a digital age	Digital healthcare can improve the doctor-patient relationship (more time for human interaction if care is supported by digital technologies)	Medicine

	Mabillard et al. (2021) - How can reasoned transparency enhance co-creation in healthcare and remedy the pitfalls of digitization in doctor-patient relationships?	General considerations on the doctor-patient relationship in a digital age	Reasoned transparency and issues of communication / trust in the patient-doctor relationship	Management / Medicine
	Andreassen et al. (2018) - Digitized patient-provider interaction: How does it matter? A qualitative meta-synthesis	Empirical analysis (qualitative)	Exploration of studies that can illuminate important aspects of social relations in contemporary society	Sociology / Technology
	Menendez et al. (2021) - The telehealth paradox in the neediest patients	General considerations on telehealth	Recognizing the opportunities provided by telehealth do not suffice / Need to engage patients	Medicine
	Vaagan et al. (2021) – A critical analysis of the digitization of healthcare communication in the EU: A Comparison of Italy, Finland, Norway, and Spain	Qualitative content analysis	Focus on organizational communication and interactions among institutions, providers, and patients	Communication
Innovation, devices and technology	Greenstein et al. (2013) - Digitization, innovation, and copyright: What is the agenda?	General (considerations about the future of digitization)	Copyright law / Economics of commons / Intellectual property	Economics
	Pianykh et al. (2020) - Improving healthcare	Empirical analysis	Analysis of AI use for predicting events and	Medicine

	operations management with machine learning		identifying key workflow drivers	
	Raghavan et al. (2021) - Public health innovation through cloud adoption: A comparative analysis of drivers and barriers in Japan, South Korea, and Singapore	Empirical analysis (qualitative)	Identification of the drivers and barriers to the adoption of cloud tech in healthcare and policy recommendations	Management
	van Velthoven, M. H. et al. (2019) - Digitization of healthcare organizations: The digital health landscape and information theory	Descriptive analysis	Understanding of the digital health landscape and initiatives from competitors	Medical Informatics
	Ali et al. (2020) - Global Interest in telehealth during COVID-19 pandemic: An Analysis of Google Trends	Empirical analysis (statistical)	Connection between the search volume / interest e-health and the number of Covid-19 cases / deaths	Medicine
	Atasoy et al. (2019) - The digitization of patient care: A review of the effects of electronic health records on health care quality and utilization	Empirical analysis (literature review)	Determination of future paths for digitization in healthcare (especially electronic health records)	Management
	Chakraborty et al. (2021) - Analysis of digital technologies as antecedent to care service transparency and orchestration	Conceptual paper & empirical analysis (structural equation modeling)	Need for a conceptual understanding and for clarifying the outcomes of digital technologies adoption on healthcare services + orchestration	Management

Briganti and Le Moine (2020) - Artificial intelligence in medicine: Today and tomorrow	General considerations on the benefits, risks, and opportunities of healthcare digitization	Discussion of the recent literature on digitization and overview of the pros and cons of digitization	Medicine
Winter and Davidson (2019) - Big data governance of personal health information and challenges to contextual integrity	Empirical analysis (case study of the NHS hospital system)	Data governance challenges for ensuring value for individual, organizational, and societal stakeholders as well as individual privacy and autonomy	Management
Kooman et al. (2020) - Wearable health devices and personal area networks: can they improve outcomes in hemodialysis patients?	General discussion of usage cases in the field of hemodialysis	Cybersecurity and data privacy must be addressed, and adequate models based on AI and mathematical analysis must be developed (signal optimization, data representation / reliability / labelling, interpretation)	Medicine
Prainsack (2020) - The value of healthcare data: to nudge, or not?	General considerations about usage of data	Policymakers should facilitate the use of healthcare data to build better institutions	Management
Bhavnani and Harzand (2018) - From false-positives to technological Darwinism: Controversies in digital health	General considerations on risks and benefits associated with devices used in healthcare	Analysis of patient and clinician engagement, sustainability, creation of new models, cost savings	Medicine
Ben-Assuli (2015) - Electronic health records,	General considerations on risks and benefits	Review of the electronic health records and health	Management

	adoption, quality of care, legal and privacy issues and their implementation in emergency departments	associated with devices used in healthcare	exchange tools: What are the benefits, concerns, and obstacles?	
	Onaya et al. (2015) - ICT trends in Japan's healthcare policy	Case study (Japan)	Latest policy trends and importance of ICT to address issues of ageing society and costs	Management
	Cucciniello et al. (2015) - Coordination mechanisms for implementing complex innovations in the health care sector	Empirical analysis (cases studies in Italy)	Contribution to the debate on coordination in healthcare policies	Management
New jobs and organizational change	Haag et al. (2018) - Digital teaching and digital medicine: A national initiative is needed	General considerations on medical education	Digital teaching and learning technologies should be updated	Medicine
	Bossen et al. (2019) - Data work in healthcare: An Introduction	Conceptual paper with implications for future healthcare data work	Healthcare organizations must re-organize around data production, including developing new technical and human resources	Management / Information studies
	Bossen et al. (2019) - The emergence of new data work occupations in healthcare: The case of medical scribes	Empirical analysis (literature review)	Investigation of emergent occupations focused on 'data work', growth and stabilization of medical scribes	Management / Information studies

Firstly, Table 3 points to the necessity of considering multiple approaches when we address the issue of digitization in healthcare. As presented in the “Discipline(s)” column, the digitization aspect of healthcare policies is tackled by multiple disciplines, focusing on a wide range of aspects, from data-related elements (privacy, storage, use, sharing, automation) to the patient-physician interaction and professional changes currently ongoing in health organizations. These aspects are addressed in all management, economics, medical, sociological, technological and legal perspectives. This points to a first comparative assessment with the critical discussion of the PA / PM theory: most contributions on digitization in healthcare policies are developed **outside** the PA / PM field. Therefore, addressing the subject requires to look into other fields of inquiry. At the same time, it shows that interdisciplinary research is best indicated to investigate this issue.

Secondly, if we compare the findings from Table 3 and the literature on governance in public policies, we observe that the dynamics of co-creation and co-production is quite absent, or at least more absent than expected when we focus on digitization in healthcare. In recent theoretical contributions on the digital shift in the public sector, stakeholders are a key concern, and the center of attention of certain key publications. However, when narrowing down the search on a specific sector (healthcare), it seems that the literature is dominated by privacy-transparency and technical concerns. This phenomenon can be partly explained by two factors: on the one hand, the enthusiasm surrounding the promises of digitization leads to focus on uptake issues, leaving certain parties (e.g., citizens) out of the picture; on the other hand, the salience of the privacy issue leads to an overrepresentation of this aspect in the current literature, trumping the co-creation/co-production issue.

Thirdly, challenges and tensions arise from Table 3. Beyond the necessity to prefer an interdisciplinary approach, gaps in the literature appear when we confront the positive, enthusiastic perspective on digitization with ethical and relational concerns. This is for instance the case of automation of data treatment and telemedicine vs. the physician-patient relationship, and more broadly the position of the “care” issue in the digital transformation of healthcare. The co-creation aspect also potentially conflicts with privacy: how to deal with patient data when engaging the patients in innovation? Finally, the focus on service providers and purely technological considerations poses the question of patient involvement in innovation and the centralization of technological development, while usage of such new technologies, from the sole point of view of developers, eludes dangerously the issue of the digital divide. Yet, this issue is central since the absence of digital literacy and access to digitized healthcare services will lead to the exclusion of a certain portion of the population from these services.

5. CASE STUDIES

To complement the theory-driven perspective, it also seemed important to ground this exploratory research empirically. At this stage, three cases have been studied: the creation of a universal Electronic Patient Record in Belgium, the development of a wearable monitoring device for babies, and the creation of COVID-19 contact tracing mobile applications. They are presented in some detail below, bearing in mind the issues already identified above, looking for overlaps but also for lacks and additions.

CASE 1: CREATING AN ELECTRONIC PATIENT RECORD WITHOUT THE PATIENT

The electronic health data interchange emerged in Belgium from the gradual interconnection of pre-existing information sources, mainly in hospitals. In that way four “hubs” were created around hospital partnerships that got integrated at the regional level. Independent labs, pharmacists, general practitioners joined at a later stage, each with their own interfaces, applications and access rights.

This diverse e-health landscape got structured under the leadership of the federal social security institutions that had developed a culture of strong IT use. Since the end of the 20th century, there has been an increasing integration of existing official data sources about citizens and corporations, through the creation of “crossroads” that managed access rights for various users and standardized data exchanges. This pattern was implemented for social insurance (pensions, unemployment...), for firms’ legal obligations, for taxes, and is also found back for healthcare (see Box 3).

Box 3 | A description of the Electronic health data landscape in Belgium

« En Belgique il y a 4 réseaux de santé : le Réseau Santé Bruxellois, le Réseau Santé Wallon et 2 réseaux locaux en Flandre : Cozo (région de Gand et Anvers), VznKUL (région de Leuven). Ils communiquent tous entre eux grâce au projet fédéral de la plateforme eHealth (projet Hub-Métahub). **Ce sont eux qui permettent le partage sécurisé de vos données de santé.** (...) Le Réseau Santé Bruxellois réunit tous les hôpitaux bruxellois privés, publics et universitaires avec les associations bruxelloises de médecine générale (...). La collaboration de tous ces acteurs incontournables des soins de santé a mené à la création de l’asbl Abrumet et au développement du Réseau Santé Bruxellois. (...)

La Belgique est particulièrement avancée dans l’e-santé et il n’y a pas d’équivalent à nos réseaux de santé dans les pays voisins. »

Réseau Santé Bruxellois, « Présentation », <https://brusselshealthnetwork.be/a-propos-d-abrumet/le-reseau-sante-bruxellois/presentation/>

This interconnection process, and the development of numerous access portals, legal structures, applications, ran parallel with an ongoing devolution of powers from the federal state towards the federated regions, adding to the number of involved actors. Nevertheless, there is a definite e-health strategy, materialized since 2013 in successive iterations of the “e-health action plan” (currently at version 3.0), that is agreed in the “Conférence interministérielle Santé publique” and signed by 8 health ministers at federal, regional and community levels.

Despite its decentralized origins, this interconnected health data landscape is therefore highly centralized, technology-driven, and accelerated by a shared understanding in the ICT policy network of state and social security institutions that there are important gains for administrative efficiency and service quality. The dominant arguments in favor of digitization are about efficiency, cost savings, effectiveness, quality of service – typical of a New Public Management rhetoric (Polet et al., 2021).

Interconnection and access rules between the various databases are crucial to the working of this networked system. Various types of healthcare practitioners and institutions have different access to patient data: a pharmacist doesn’t see the same as a GP, a nurse, or a radiology practice. Furthermore, the patient must give his explicit informed consent about sharing his data: the “informed consent” keyword is everywhere when connecting to the services as a patient. Paradoxically, the relevance and

reality of this patient consent are questionable, as it is mostly immersed in other healthcare paperwork (e.g., during hospital intake) and seems henceforth to apply very widely.

The creation of the e-health services can hardly be called collaborative, except for the fact that the core patient records databases came from hospital networks that initially emerged from interhospital collaborations. Patient involvement remains minimal and is identified as a priority (“Cluster 5”) in the latest iteration of the e-health action plan. However, the plan identifies the problem as « Les fonctionnalités et les informations disponibles pour le citoyen/patient sont encore trop limitées. » (Protocole d’accord - Plan d’actions e-Santé 2019-2021, 2019, p. 208). The proposed solutions are therefore just “more of the same”. There is no wider questioning about patient access, information or involvement, contrary to demands from patient associations or consumer unions (LUSS, 2019; Test-Achats, 2019).

Box 4 | The Belgian consumers' union demands about the e-health platform

Nos exigences :

Plus d’informations

Le citoyen doit être davantage et mieux informé à propos de l’échange électronique des données médicales et la portée de son consentement. Des brochures d’information ont déjà été diffusées, et un site web a été développé, mais une campagne d’information à grande échelle concernant l’eHealth est nécessaire.

Message concernant le consentement

Les citoyens qui n’ont pas enregistré eux-mêmes leur consentement en ligne, doivent être informés de ce consentement par mail ou lettre. Ceci afin d’éviter que les citoyens découvrent par hasard que leurs données médicales sont partagées. Dans le passé, les mutuelles ont envoyé cette confirmation pendant un moment, mais ce projet a été arrêté.

Développement d’un seul portail patients

Maintenant qu’il existe un portail unique rassemblant les infos santé de chaque citoyen, des règles nationales claires doivent être établies d’urgence pour la consultation en ligne par le patient de ses propres données. Afin que chaque citoyen de ce pays profite des mêmes droits, où qu’il vive.

Enfin, il faut un débat sociétal plus large pour déterminer quelles données médicales sont accessibles, pour quels types de prestataire de soins.

Test-achat.be (Belgian consumers’ union), « [Vos données médicales en ligne : Nos exigences](#) », 8 March 2019

There is also an increasing controversy about data protection and patient privacy. The historically distinct databases interconnected through “pipeline” crossroads tend to get merged into more centralized datawarehouses, or at least that is some actors’ concern (see Box 5). Both the integration thrust and the privacy worries have been boosted by the COVID-19 pandemic and the systems put in place to track testing and vaccinations; medical doctors have for example expressed worries about pharmacist becoming able to see the COVID vaccination status of their clients in their “Farmaflux” interface (Medi-Sphere, 2021).

Box 5 | The chair of the eHealth platform and former president of the medical doctor's union worries about data protection

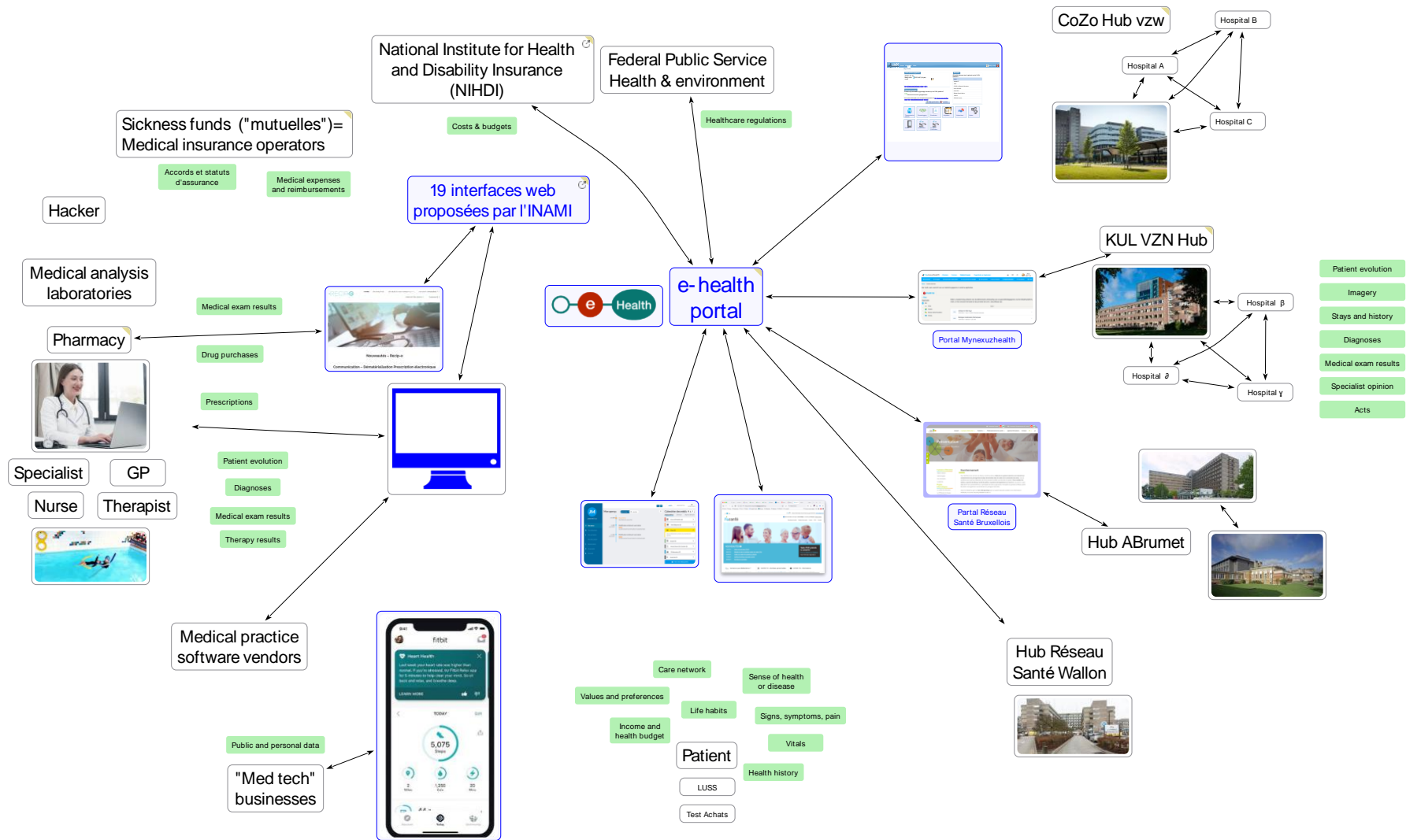
« La priorité doit rester l'étanchéité des bases de données, la décentralisation et l'autorisation du patient d'accéder à ses données. On doit, par ailleurs, insister sur le fait que les données soient bien anonymes. Il faut rester très prudent avec la pseudonymisation. » [...] « Nous avons un système qui réduit les risques d'intrusion en décentralisant les bases de données. Une tuyauterie (la plateforme eHealth) a été créée pour leur permettre la connexion entre elles. Cette tuyauterie n'héberge pas de données qui sont bien protégées puisqu'il faut donner la preuve de votre identité, de votre qualification, de votre lien thérapeutique et du consentement du malade. Cela rend donc impossible le croisement massif de données. On est en train de détricoter ce système. »

Jacques de Toeuf, président de la Plateforme eHealth et Président honoraire de l'ABSyM, [interview dans Medi-Sphere](#), 23 June 2021.

Finally, other controversies can also be found, such as the complaints by general practitioners and other independent doctors about the oligopolistic nature and increasing cost of their commercial medical practice software, leading to calls for developing an open-source alternative.

Figure 3 presents a diagram overview of individual or organizational actors (black cartridges), IT interfaces (blue), and potential information (green).

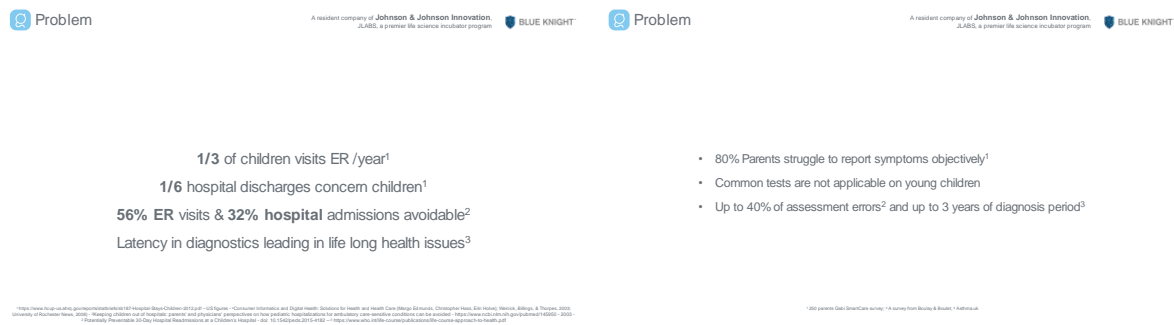
Figure 3 | The Belgian Electronic Patient Record actor-network



CASE 2: GABI SMARTCARE: “ON A MISSION TO TRANSFORM PEDIATRIC CARE”

Gabi SmartCare SA (GS) is a Belgian Medtech startup that is currently developing a system for monitoring toddlers’ and babies’ main vital signs and feed them back to doctors and parents. The impetus stems from a personal experience as told by one of Gabi’s founders, Jonathan Baut: “We nearly lost our little girl seven days after birth. She didn’t have enough oxygen in her blood and was taken to hospital emergencies. After that episode, our life changed, with episodes of anxiety and a lot of stress.” Baut’s perception was that medical follow-up lacked objective data because it is under-equipped. Acknowledging the global magnitude of the problem and the size of the market, GS was created to address it at an international scale, with early partnerships in the EU and US.

Figure 4 | Excerpts from Gabi SmartCare’s investor presentation slides



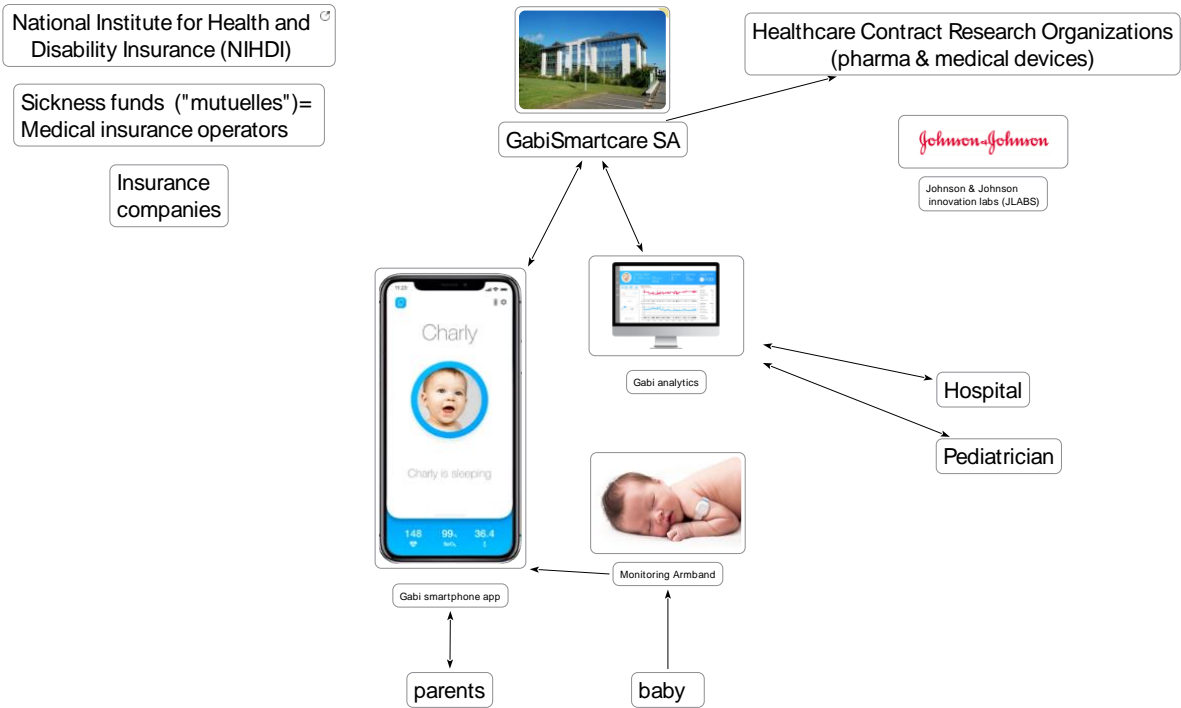
Technically, the challenge was to create a comfortable device (a wireless armband) that can be worn at home by the infant, and that continuously provides reliable data about his/her relevant vital signs. This data would then be accessible to pediatricians or hospital staff so that they can remotely monitor the infant’s health. None of this is trivial, because young children’s parameters are different from adults’, and false positive alerts need to be filtered out to reliably detect abnormal events. This amounts to creating Artificial Intelligence software to process the raw data from the armband and make it easier to interpret by medical staff, and eventually parents through their smartphone app. It also involves interfacing with professional Electronic Medical Record systems; while the Gabi analytics service is designed to be interoperable (through APIs), the heterogeneity of legacy hospital IT systems makes this integration difficult.

Defining the users and the revenues – the business model – was another important step. Healthcare research organizations (pharma, biotech, or medical device labs needing data about child patients involved in clinical trials) provide early, flexible markets. The most users however will be parents and doctors - either private-practice or hospital pediatricians. The revenues also need to be defined. GS very early chose not to sell its armband (and bundled app), unlike for example Fitbit’s activity trackers or some sort of sophisticated “babyphone 2.0”. While GS had to develop the hardware of the armband, they feel that their added value lies in the AI and analytics software to which parents and medical staff get access. GS aims at providing a “medical device as a software service” against a recurring fee. Doctors and hospitals, but also public or private health insurers, should be willing to pay for it. Indeed, in Belgium, some “mutuelles” have recently started reimbursing “prescription” health apps.

Circulating sensitive information is of course inherent to GS’s activity; but the situation is nowhere as complicated as in the case of the Belgian Electronic Patient Record. The patient (through the parents) gives explicit consent for specific uses, and the authorization can be repealed. Data would then be deleted, assuming that the data has remained within GS storage. The startup claims a “European approach” to data privacy, complies with the European General Data Protection Regulation (GDPR) and the US Health Insurance Portability and Accountability Act (HIPAA). Insurance companies, who are potential paying customers for GS services, seem to be looking for overall disease prevention rather than individual health data.

While the notion of co-creation or co-design is not used in this context, patients (over a thousand) have been extensively involved in product testing, precisely because empowering the patient – by way of the device’s sensors, interface, and the infant’s parents – is at the core of GS’s proposition. More than a hundred doctors have also been involved, and a medical advisory board has been set up. Gabi SmartCare participates in a network of Medtech startups promoted by Johnson & Johnson (“Blue Knight”) that might also provide interaction conducive to collaborative innovation in a wider sense.

Figure 5 | The actor-network about the Gabi pediatric monitoring service



Finally, it’s worth noting that while the present case study is about a startup in a niche market, there is already big business at play. In wearable connected devices alone, Fitbit has been bought by Google / Alphabet for \$2.1B in January 2021, raising public concern about privacy. Meanwhile, Apple is steadily increasing the health features on its Apple Watch, getting it approved by the US FDA as a medical device.

CASE 3: IMPLEMENTING COVID CONTACT-TRACING MOBILE APPLICATIONS IN EUROPE

Soon after the outbreak of the COVID-19 pandemic in early 2020, it became clear to governments that they would have to implement drastic public health protection measures that far exceeded anything similar in western developed countries' recent history, starting with stringent lockdowns. To limit the imposition of lockdowns, more selective policies were needed, targeting persons contaminated by the virus and their close contacts. The apparent success of such policies in South Korea or Singapore added to their appeal. In view of the end of the first lockdown in Spring 2020, implementation details of such targeted policies were being pondered.

Contact tracing can be done by investigators who interview contaminated persons about their recent "contacts" (i.e., people who shared the same space with them for long enough) or with various material supporting systems: a contact-tracing mobile application, but also video surveillance, mobile phone activity tracing, hand-filled or automated registries in restaurants, etc. Human contact-tracing has weaknesses in epidemic situations: high cost, bad scalability (the system gets overwhelmed when there are too many cases), and partial disclosure (traced persons manage their contacts' privacy as well as their own, plus they don't always know or remember next to whom they've been). In that context, some epidemiologists and data scientists pointed to the usefulness of contact-tracing mobile apps (Boos, 2020; Ferretti et al., 2020; Fraser, 2020).

The success of Asian countries like South Korea, Singapore, or China in containing the epidemic fuelled the argument in favour of technological tracing, but its modalities raised concerns over privacy. The South Korean approach blended various methods and data sources into a highly individualized approach that could be intrusive (Landau, 2021, pp. 104–106; Thibaut, 2020); cell phone data was used to retrospectively trace contaminated persons' locations and find potential contacts, a method that would be illegal in European countries. If that was not the right approach, then what could be proposed in its place?

During the months of March and April 2020, a continuous interaction and debate took place between (sometimes conflicting) expert networks, civil society (media, privacy watchdogs), Data protection authorities (DPAs), governments, and the tech industry. While this hybrid and very public (if not always transparent) process doesn't completely qualify as co-design in a formal sense, compared to most other e-health systems developments it more effectively engaged many more stakeholders (Zerdyck, 2021). Let us review the standpoints of the main stakeholder categories.

Public figures emphasized the risks of state surveillance and social harassment, based on previous Asian experience (Harari, 2020; Thibaut, 2020). While some media opinions also put forward potential benefits (Naughton, 2020), the general tone was rather guarded (Amann et al., 2021). Privacy and civil liberties watchdogs were also wary: although they generally recognized European governments' efforts to protect personal information and other liberties (for Austria: Bayer et al., 2020; for Germany: Bock et al., 2020), they too pointed to remaining risks for privacy or more generally for civil liberties, especially in view of intrusive implementation by some governments (for example for quarantine enforcement in Hungary or Poland), and the possibility of "mission creep" whereby tracing systems would in a later stage find other purposes as part of a "new normalcy" (Liva, 2020; Reich et al., 2021). IT and cryptography experts were strikingly active in that public debate, lauding the relative

transparency and privacy efforts , but pointing to data protection risks (Schneidewind, 2020). National and supranational Data Protection Authorities took the same “yes, but” perspective (Global Privacy Assembly, 2020), consistently pushing governments towards improved data protection – to the extent governments took notice.

European IT, cryptography and epidemiology experts initially convened in a consortium called PEPP-PT that advocated a “privacy by design” concept that used Bluetooth proximity sensing instead of location data, and that limited the storage of sensitive information. Different technical options were possible to that end, so a debate emerged about the degree of centralization of the system (Vaudenay, 2020). In early April, the debate evolved into a public rift among experts, resulting in media coverage that ballooned as the technical debate took on political overtones (Sfadj & Telos, 2020; Stolton, 2020). A majority of experts left the PEPP-PT initiative after signing a public petition (Collective, 2020) to create the more decentralized DP-3T protocol. Without further knowledge of the very high privacy and security standards set to these tracing apps, the expert debate could easily be misconstrued as a blanket mistrust of technology-enabled tracing.

Apple and Google took a clear stance: the chosen approach was conspicuously privacy-preserving, building on the emerging DP-3T protocol, exceeding EU GDPR standards (Bradford et al., 2020; Reich et al., 2021). This “Google-Apple Exposure Notification” (GAEN) system enabled specific Bluetooth services across Android and iOS and gave public health authority-sanctioned tracing apps (exclusively) the necessary access to these communications, even when the phone was locked or the apps weren’t running. This had the double advantage of preserving privacy by default and providing an easy technical solution for app development.

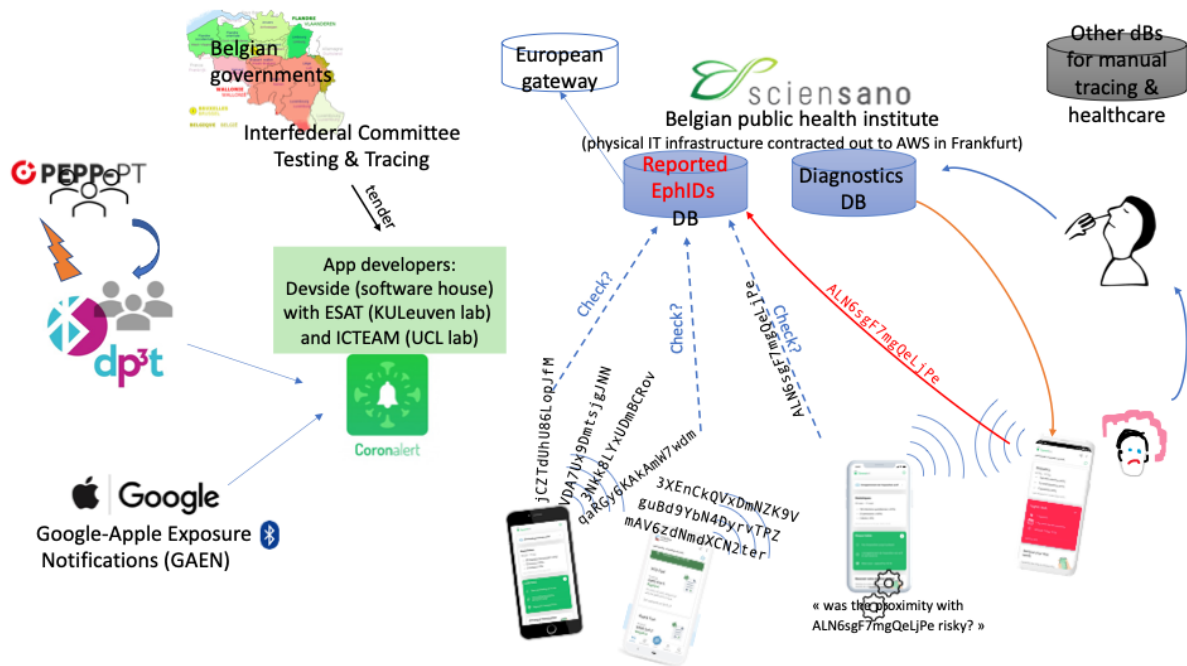
GAEN should have made app rollout easier for governments and reassured privacy-sensitive media and citizen groups. Things weren’t so simple, however. In March 2020 already, European governments and scientists had advocated an approach that should better protect privacy and individual rights (European Commission, 2020). In Europe, the legal framework was better defined than in the US (Rich, 2021), with clear institutional indications (Council of Europe, 2020; European Commission, 2020). Within this framework, many countries had started on a relatively centralized architecture: *“the United Kingdom, Germany, Hungary, Slovenia, Malta and France started to develop centralised contact tracing apps. In total, 14 countries have apps with a centralised data collection. Some countries were inspired by the Pan-European Privacy-Preserving Proximity Tracing protocol (PEPP-PT). (Council of Europe, 2020, p. 28)”*. In late spring 2020, most European countries, starting with early pioneers Austria, and including heavyweights like the UK and Germany, changed their architecture by switching to DP-3T and GAEN. While this eased (and standardized) the development of tracing apps, it came with public health tradeoffs. The tracing apps became a highly individual risk-assessment and alert tool, but harder to integrate into institutionalized contamination tracing (Landau, 2021, pp. 96, 100–101). It also showed the “platform power” of tech giants, that could fundamentally influence public health policy design without touching any data (Veale, 2020). Belgium took full advantage of the GAEN infrastructure and developed a simple standalone app, separated from the rest of the manual contact-tracing system (see Figure 6). France, by sticking to a more centralized national data storage model for sovereignty and accountability reasons (Sportisse, 2020), had to do without Google or Apple’s support. But as noted by Veale, even France didn’t legally force Apple and Google to comply with its needs, as sovereign states could in principle do.

Whatever the technical choices, citizen's uptake of tracing apps proved mostly disappointing. In the numbering done in early 2021 by the Civil Liberties Union for Europe, in most countries 15-20% of the population had downloaded the national app (the number of downloads being an upper bound for the app's effective use). A few countries had only a very marginal use (Hungary, Bulgaria, Poland). Others (UK, Finland, Denmark, Germany) had more success, led by Ireland that reached around 50% of its population, despite its collecting richer information from the users (European Liberties Platform, 2021; Landau, 2021, p. 66). But in all European countries, privacy worries remained a significant concern (for German-speaking countries, see Zimmermann et al., 2021). More generally, citizen (mis)trust and attitudes were more important than tracing system design for app uptake (Lavorigna et al., 2021; Li et al., 2021), and this defiance about data security is heightened rather than lowered in health matters and epidemic situations (Chan & Saqib, 2021).

Beyond adoption, the effectiveness of the tracing apps proves difficult to grasp. Right from the start, there was a debate about the proportion of users required to achieve significant reduction in contaminations, or even the suitability of Bluetooth radio measurements as a proxy for contamination risk (Anderson, 2020). *Ex post*, it turns out that privacy hampers the evaluation of the apps (Auffret, 2021; Landau, 2021, pp. 92–95). The available statistical information depends on the detail of the apps' implementation; the functionality of (voluntarily) sharing pseudonymized information for epidemiological research was dropped from most designs. Early review studies are inconclusive or cautiously positive (Anglemyer et al., 2020; Jenniskens et al., 2021). Based on indirect evidence, (Wymant et al., 2021) find a significant effect on infection reduction in England and Wales, and a Swiss study is also positive (Menges et al., 2021). In the Belgian case, low app uptake and lack of available data make the evaluation uncertain: there is conflicting expert opinion (Vlaams Parlement, 2021), leading to political calls to wind down the app's operation (François, 2021).

In conclusion, while COVID tracing apps were mostly devised with good intentions and sound principles, they have a hard time convincing users. Elements of co-design of the apps were not enough to allay user worries about privacy or to cater to a much wider array of adoption rationales than mere privacy (Redmiles, 2021). Co-production remains very limited by the generally low uptake, but also, in most cases (Ireland being one potential exception), by the very passive app behaviour, since user interaction is limited by privacy safeguards. Heightened privacy demands in health matters and the difficulty of impact evaluation place current mobile covid-tracing apps in a catch-22 situation with little political support.

Figure 6 | The actor-network about the Belgian "Coronalert" proximity tracing app



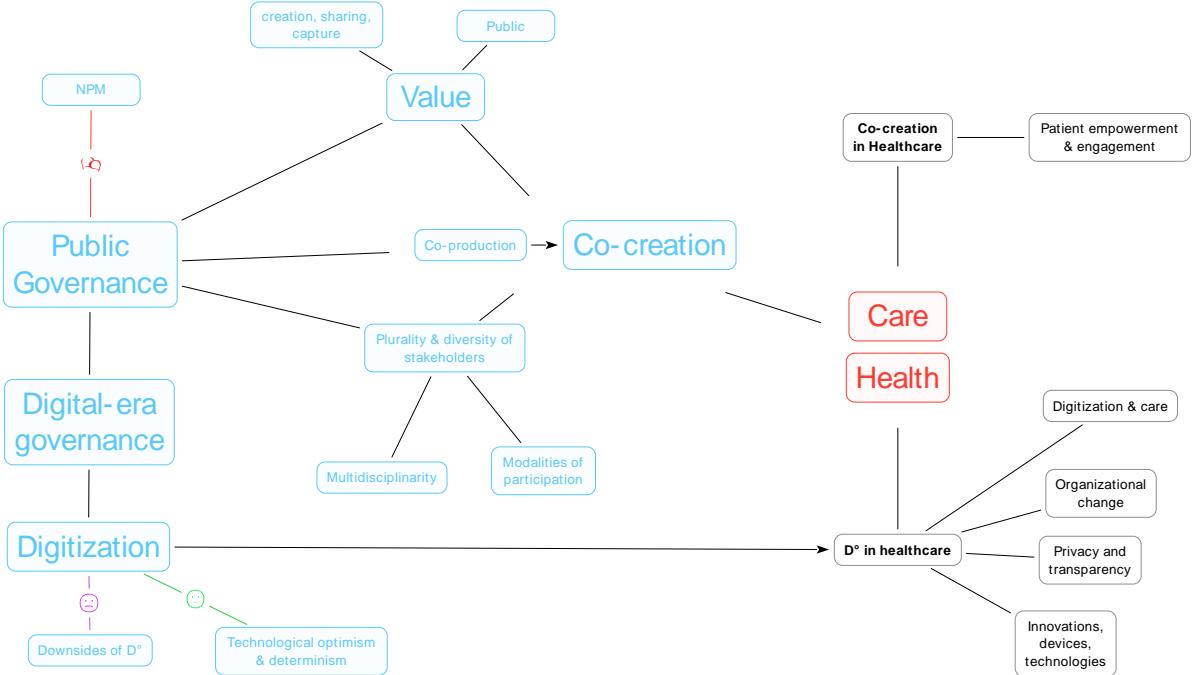
6. DISCUSSION

The focus on healthcare policies enabled us to highlight a certain number of interesting findings and to identify certain gaps. The field of healthcare is extremely rich and particularly relevant to investigate both in times of crisis (covid-19 pandemic) and on the long run since digitization in healthcare is expanding and this not expected to slow down. From an academic point of view, our interest was triggered by the fact that while the healthcare subject has already been investigated in many ways, especially regarding co-creation and co-production practices, it is crucial to encourage interdisciplinary research to better create, understand, manage, implement and evaluate technological developments in healthcare. This section provides an opportunity to present important points that have remained unidentified, under-explored or not enough analyzed (from our point of view) so far.

To support our discussion, we will summarize our findings in two successive concept maps¹. Figure 7 gives an overview of the theoretical discussion (blue items) and results from the literature review (black items), with the main concepts in larger writing. The concepts will be discussed with the aim of setting an agenda for future research, as will be developed in the conclusion. The proceeds from the first discussion on theory and the literature review will then carry over to the discussion of the three case studies (Figure 8).

¹ The diagrams presented here are not a canonical concept map in the sense of Novak & Cañas (2006). We do not start out from a given central, top-level concept, since the point is precisely to explore connections between a nexus of issues and their associated concepts. Our use is therefore more distributed, with the distance between the gathered concepts reflecting their proximity, eventually clustering into more general ideas, as proposed by Trochim (1989), but without his computational method.

Figure 7 | Concept map of the theory discussion and literature review



The **first point** refers to the gap between the promise of digitization to enhance the co-creation / co-production practices and the rather centralized processes of digital development in the healthcare sector. The lack of citizen / user / patient involvement in practice, coupled with the technical aspects of technological devices and processes, may explain why we identify this gap between the expectations raised in the contributions on (N)PG or DEG and the literature dedicated to digitization in healthcare policies. Indeed, according to our review of the literature, the patient is either absent of technological developments or regarded as a final beneficiary of such developments. We do not write here that no stakeholders are involved in the creation and distribution processes (of tools and services); rather, several actors co-contribute to these processes, including government and private companies mainly. However, if we focus on the democratization and citizen involvement components of the (N)PG / DEG paradigms, we can clearly identify a gap that should be addressed in future research: not only for specific devices, but in the digitization process as a whole. We add that the reflection about patient involvement extends to medical devices in general and is already defended in practice by the *European Patients Forum*, which advocates for more patient involvement in the EU medical devices legislation (European Patients Forum, 2015).

The **second point** relates to the low number of contributions in the field of PA / PM on the issue of digitization in healthcare compared to articles published in journals from other disciplines (ethics in medicine, medical informatics, and information systems mainly). This assessment highlights the need to conduct interdisciplinary research and to confront key concepts from the PG / DEG literature with theoretical and empirical developments observed in other fields. Technological issues, for instance, lead to problems and challenges that can be better addressed by specialists, and that can shed a different light on digitization as it is currently tackled in the PA / PM literature. The same remark applies to legal, ethical and medical issues, which can be addressed more specifically and in much more detail

in other fields of expertise. Based on our findings, a complementary approach is therefore needed to better apprehend the phenomenon of digitization in healthcare and to design better policies. It should be noted here that some interdisciplinary research initiatives have been set up recently, for instance the *Institute for Interdisciplinary Innovation in Healthcare* (i3h) at the Université Libre de Bruxelles – ULB (<https://i3health.eu/>).

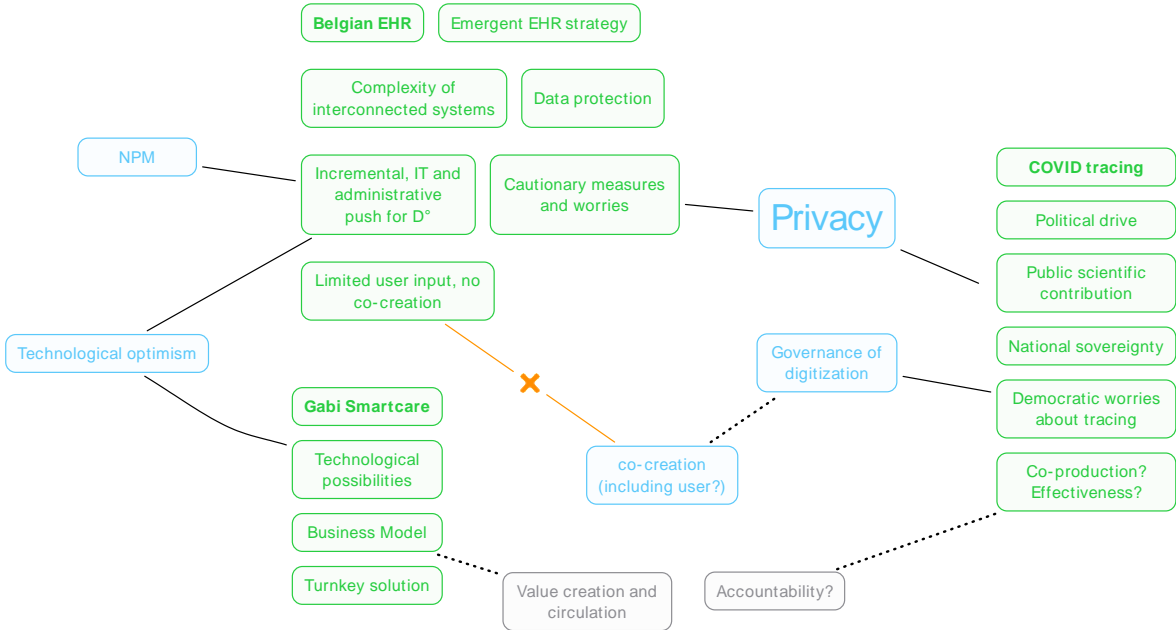
The **third point** highlights the gap between the notion of value (and especially public value) developed in the PG paradigm and what is developed in the literature on digitization in healthcare. Co-creation is expected to generate public value through the involvement of service users, for example to prevent the emergence of future societal problems. However, based on our literature review, we see that such objectives to prevent and to solve problems derive from technological tools. It seems that the main issue here is not citizen involvement, but protection of personal data. Indeed, in practice, the main topic addressed when it comes to technological devices is often privacy. Preoccupations about users' data (re)use take most of the attention, much more than user involvement in the very development of the device itself. We do not argue here that ethical concerns about the creation and usage of digital medical devices do not exist; however, in view of our findings, legal and technological concerns appear to be predominant in the literature. This observation echoes the first point mentioned above, and it is directly linked to the relatively weak presence of co-creation dynamics compared to other topics in the literature. In practice, legal developments and the existence of organizations advancing consumers' rights also support the privacy issue largely discussed in recent contributions on digitization. This is the case of the European Parliament, the Council of Europe, the European Trade Union Institute, and the International Association of Privacy Professionals, among many others.

A **fourth point** relates to the consequences of digitization on professional (medical or care) practice. Not only are the routine tasks of professionals affected by the spread of digitized tools, but they may come to challenge established competences (as when AI supports diagnostics). New jobs related to information management are needed, and more generally organizational impacts need to be assessed. Organizational transformations go beyond the internal organization of hospitals and extend to private practice that may operate in networks with customary healthcare institutions.

Finally, the **fifth point** underlines the gap that currently exists between researchers and practitioners that enthusiastically embrace new technologies and those who insist on the downsides of technological evolutions. In practice, this confrontation can be motivated by political and/or business interests vs. ethical and privacy concerns, as mentioned just above. In theory, downsides are mostly divided into two main categories: the digital divide (no access or lack of digital literacy) and the lack of transparency in the development of technological tools, algorithms in particular. Regarding the PG literature, such downsides are direct threats to the democratic aspirations of new governance paradigms. However, they do not seem to be key concerns in our review of the literature, especially in contributions that prefer a purely technological perspective. In this sense, it is necessary to encourage, once again, interdisciplinary research to reach a more comprehensive view of the opportunities, challenges and risks related to the digital transformation of healthcare services and policies. This echoes the second point of our discussion. The technological determinism identified in certain contributions include the risk, in our opinion, to evacuate democratic concerns that can impede policy implementation and/or the adoption of certain devices. Such problems would arise from political,

social or cultural concerns indirectly connected to the technology itself, but that would be underrated or not enough considered by a determinist approach to technologies and innovation.

Figure 8 | Concept map of the case analyses in relationship with the theory and literature



As for the cases, they are represented in Figure 8 by three clusters of green concepts that reflect each case’s internal consistency. Several connections emerge to topics that were also very visible in the literature and theory (in light blue).

First and foremost, **privacy** is a major concern in two of the three cases, to the extent of obfuscating other issues. This confirms that while there is now a well-established discussion about this in the healthcare digitization literature, it is a topic that deserves more general management scrutiny. “Privacy” has a tremendous impact of citizens’ attitudes and behaviors, yet at the same time it possibly does so for lack of better understanding and vocabulary (Redmiles 2021). This need for further public policy / public management research needs to be connected to other disciplines, as the cases again point to legal, medical, or IT-oriented authors and stakeholders providing input on IT governance matters beyond privacy (Delacroix & Veale 2020).

Second, **governance of health digitization** signals the expansion beyond NPM values (that are still present as IT development rationales: cost reductions, effectiveness...) to other governance concerns. The political drive in the COVID tracing apps (stemming from public health urgency, the externalities, the sovereignty issues) stands in stark contrast to the otherwise politically muted digital health development. The pandemic has moved health digitization towards markedly more public and media attention.

On a related note, participation in the guise of **co-creation involving users is conspicuously absent** in the two public-sector cases. The deficit of user engagement in the patient record and COVID tracing

cases added to the disconnection already observed in the theory and literature review point not just to a research gap, but also to the necessity of revising policy design and management methods.

Finally, we have seen that the theme of value – its “invention”, legitimation, creation, circulation, appropriation – tends to disappear from the more sectorally applied literature. This conclusion also holds when examining the cases. There is **no evidence of a strategic thinking about the “articulation of value”** (Bryson et al., 2017) from any user’s perspective. Goals and performance are expressed in operational terms, and sometimes overshadowed by privacy. The one significant exception is the way the Gabi SmartCare startup pondered about its business model, needing to understand the way value circulates between parents, pediatricians, hospitals, medical insurance providers, and how the private business could capture its share of that value. Traveling this path backwards wouldn’t do, however. While value articulation can be analyzed in “business model” terms (Pigneur et al., 2010), generalizing this to public value would risk missing collective and procedural aspects. Public value cannot be dissociated from procedural aspects of justice in the polity where it originates.

7. CONCLUSION: A RESEARCH AGENDA

To conclude, we present paths for future research. Based on the findings discussed above, we summarize the emerging agenda in five paths that we describe and then give an overview in Table 4.

A **first path** could investigate more thoroughly the co-creation processes in the healthcare sector and question the capacity of users to be involved in technical innovative processes in the early stages. We agree with the DEG literature that digitization has modified citizen relations to information, government communication, knowledge, expertise, and power significantly. Nonetheless, the power to criticize and the aspirations to participate in designing and delivering services is complex due to the highly technological nature of the devices produced. In this sense, users may be rather solicited in the co-improvement of existing platforms and devices, and smart co-usage with trusted professionals. Ways to improve these processes and to include patients potentially better at an early stage may lead to interesting research, through interviews with professionals and service developers / providers. This qualitative approach would certainly enrich the current literature on PG, which remains fragmented and sometimes quite abstract.

Correctly understanding co-creation in complex services involving many different fields of expertise and patient’s lived experience requires a high disciplinary diversity in research and a close integration. This points to a **second path**: while there are indeed many diverse disciplinary perspectives, as shown in the literature review, they are fragmented and rarely qualify as inter-disciplinary or trans-disciplinary. Far from being a merely academic issue showing in the diversity of publications or in conceptual robustness, it also translates in the diversity of research teams working together on theoretical and applied research.

A **third path** for future research could focus on the expected empowerment of the patient with the growing digitization of the healthcare sector. One could for instance question the net effect of added digital services on patients, and the potential differences that may be observed between individuals with various social and medical backgrounds. Supporters of the digital transformation often argue that new technological developments will empower the patient, that they will make public health more

participatory, and that efficiency gains will result from such innovations. Although users can effectively monitor their health through devices, the situation becomes more complex regarding decisions to be made in emergency situations or critical cases.

A related question refers to the relationship between patients and healthcare professionals. It seems obvious that digital channels have enabled patients to contact professionals more easily and to collect information that could be then discussed with these professionals. Wearable devices also give more information about one's health condition, which can be in turn included in the therapeutic relationship. However, decisions taken by algorithms in critical situations do not seem to promote patient empowerment. Rather, it creates a new form of domination that resembles but at the same time differs (due to the non-human nature of algorithms) from the paternalistic approach of medicine that prevailed decades ago. In this regard, more research on users' perceptions, transparency of algorithms and perspectives of healthcare professionals on digitization processes is needed. It is possible that the saliency of privacy concerns is the most visible expression of wider patient alienation fears.

Conversely, the mounting digitization has profound implications for the healthcare professionals, and more generally for healthcare service organizations and others that participate in service provision (e.g., suppliers, insurers). A **fourth path** would take an organizational perspective to study organizational dynamics in relation to technological change, with due attention to technological aspects (Greenhalgh & Stones, 2010; Jemine et al., 2020; Orlikowski & Scott, 2008).

A **fifth path** takes a more strategic and policy design perspective. The literature review and cases show that action and performance tend to be appreciated based on technical criteria, professional standards, or highly visible but crude criteria like privacy. Beyond those, how is value created in the value networks where numerous actors interact? Based on this, what strategies should be made explicit by implied stakeholders, and how are these strategies articulated with or regional and national health policies? What public marketing initiatives should be designed to be consistent with the strategies, and not merely limited to communication? In Belgium, there is an e-health plan, but how is it articulated with health policies and organizational strategies?

More generally, there seems to have been little public political discussion up to now about the way digitization is translated, incorporated and accounted for by governments in health policies. Up to now, that discussion has remained within the professional community, but patients need to be asked, for example about their acceptance of health information use (Caron et al., 2020). The COVID crisis has moved e-health up on social awareness and political agendas. Ultimately, the type of connected society in which we want to live deserves wider discussion.

Table 4 | Overview of core research topics

Findings (theory)	Research agenda
<p>1. Promises of DEG to develop co-creation dynamics based on digital governance Conception and development of services remains quite centralized (co-creation involving users is absent in most cases, apart from one from of device and software design, but not labelled as co-creation)</p>	<p>Key question(s): What kind of co-creation is at stake in practice? How does this centralization process take place in the organizations designing and delivering services? Methods: interviews with e-health service professionals</p>
<p>2. Digitization is mostly discussed in specialized disciplinary publications No explicit reference to governance issues in contributions published in technical journals on the one hand; on the other hand, the PM / PA publications about collaborative health rarely deal with digitization</p>	<p>Key questions: how can the diverse approaches to e-health connected? Can there be more clarity and commonality in the notions in use? Methods: literature review and concept mapping. Interdisciplinary research and conceptual clarification</p>
<p>3. Opposition between technological optimism and governance issues as perceived by the users (trust, transparency, privacy, access to services...) Privacy is a major concern in two cases. While there is a well-established discussion in the healthcare digitization literature, this issue deserves more general management scrutiny, such as the magnitude of its impact on citizens' attitudes and behaviors</p>	<p>Key questions: what kind and level of empowerment is perceived and desired for patients? Beyond the privacy obsession, how central are other preoccupations such as access, understanding, etc.? Methods: survey about social acceptability of data sharing (see Caron et al., 2020) and patient empowerment</p>
<p>4. Professional practice and healthcare organization are deeply affected by digitization. This phenomenon extends to patients - healthcare professional relationships. This has implications for governance, organization, management, training, investments, etc.</p>	<p>Key questions: What are the various impacts of digitization on healthcare practice and the care relationship? What are the management and operational implications? Methods: taxonomy and assessment of impacts on management processes and operations, case studies and action research.</p>
<p>5. There is a lack of strategic thinking about value creation through digitization. Goals and performance are expressed in operational terms, and sometimes overshadowed by privacy. But the political importance of e-health becomes clearly visible in in the COVID tracing apps, where it stands in stark contrast to the otherwise politically muted digital health development. This raises fundamental policy and governance issues at institutional level (sovereignty, democratization...)</p>	<p>Key questions: what are the main orientations of the public e-health policy in Belgium? How is Belgium addressing this issue in international comparison? Methods: Documentary analysis / potentially survey targeting key officials in charge of designing e-health policies</p>

BIBLIOGRAPHY

- Accenture (2018) *2018 Consumer survey on digital health (US results)*. Accessed July 23, 2021. https://www.accenture.com/t20180306t103559z_w_us-en_acnmedia/pdf-71/accenture-health-2018-consumer-survey-digital-health.pdf.
- Agrawal, A. (2020). COVID-19 – Driving Digitization, Digitalisation & Digital Transformation in Healthcare. *SR Vol.57(08)*. <http://nopr.niscair.res.in/handle/123456789/54822>.
- Alford, J. (2014) The multiple facets of co-production: Building on the work of Elinor Ostrom. *Public Management Review*, 16(3), 299-316.
- Amann, J., Sleight, J., & Vayena, E. (2021). Digital contact-tracing during the Covid-19 pandemic: An analysis of newspaper coverage in Germany, Austria, and Switzerland. *PLOS ONE*, 16(2), e0246524. <https://doi.org/10.1371/journal.pone.0246524>
- Anderson, R. (2020, April 12). Contact Tracing in the Real World. *Light Blue Touchpaper*. <https://www.lightbluetouchpaper.org/2020/04/12/contact-tracing-in-the-real-world/>
- Anglemeyer, A., Moore, T. H., Parker, L., Chambers, T., Grady, A., Chiu, K., Parry, M., Wilczynska, M., Flemyng, E., & Bero, L. (2020). Digital contact tracing technologies in epidemics: A rapid review. *Cochrane Database of Systematic Reviews*, 8. <https://doi.org/10.1002/14651858.CD013699>
- Ansell, C. and Torfing, J. (2021) *Public governance as co-creation. A strategy for revitalizing the public sector and rejuvenating democracy*. Cambridge: Cambridge University Press.
- Auffret, S. (2021, May 21). Contre le Covid-19, l'utilité des applications de traçage des cas contacts impossible à mesurer. *Le Monde.fr*. https://www.lemonde.fr/pixels/article/2021/05/21/covid-19-l-impossible-mesure-de-l-utilite-des-applications-de-tracage-des-cas-contacts_6080953_4408996.html.
- Balta, M., Valsecchi, R., Papadopoulos, T. and Bourne, D. J. (2021) Digitalization and co-creation of healthcare value: A case study in occupational health. *Technological Forecasting and Social Change*, 168, 120785.
- Bayer, U., Bernauer, A., Blocher, M., Gollatz, B., Judmayer, A., Koppmann, M., Kudera, C., Lohninger, T., Merzdovnik, G., Ronacher, A., & Schrems, M. (2020). *Technical and Legal Review of the Stopp Corona App by the Austrian Red Cross*.
- Bélanger, F., & Carter, L. (2009). The impact of the digital divide on e-government use. *Communications of the ACM*, 52(4), 132–135.
- Bevir, M. (2012) *Governance: A short introduction*. Oxford: Oxford University Press.
- Bherer, L. (2021). Public engagement and its practitioners: Opening up and looking beyond the black box of facilitation. *Canadian Public Administration*, 64(2), 320–326.
- Blix, M. & Levay, C. (2018) Digitalization and health care - A report to the Swedish government's expert group on public economics. https://eso.expertgrupp.se/wp-content/uploads/2019/08/Digitalization-and-health-care-2018_6-English-version.pdf.

- Bock, K., Kühne, C. R., Mühlhoff, R., Ost, M. R., Pohle, J., & Rehak, R. (2020). *Data Protection Impact Assessment for the Corona App*. FIFF, Forum of Computer Professionals for Peace and Societal Responsibility - Forum InformatikerInnen für Frieden und gesellschaftliche Verantwortung e.V. <https://www.fiff.de/dsfa-corona>
- Bonsón, E., Torres, L., Royo, S., & Flores, F. (2012). Local e-government 2.0: Social media and corporate transparency in municipalities. *Government Information Quarterly*, 29(2), 123-132.
- Boos, H.-C. (2020, April 20). *A scientist's opinion: Interview with Hans-Christian Boos about new tech normalcy* [European Science-Media Hub]. <http://sciencemediahub.eu/2020/05/18/a-scientists-opinion-interview-with-hans-christian-boos-about-new-tech-normalcy/>
- Bovaird, T., and Loeffler, E. (2012) From engagement to co-production: The contribution of users and communities to outcomes and public value. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 23(4), 1119-1138.
- Bowen, S., McSeveny, K., Lockley, E., Wolstenholme, D., Cobb, M. and Dearden, A. (2013) How was it for you? Experiences of participatory design in the UK health service. *International Journal of CoCreation in Design and the Arts*, 9(4), 230-246.
- Bradford, L., Aboy, M., & Liddell, K. (2020). COVID-19 contact tracing apps: A stress test for privacy, the GDPR, and data protection regimes. *Journal of Law and the Biosciences*, 7(1), Isaa034.
- Brown, A. W, Fishenden, J. and Thompson, M. (2014) *Digitizing government: Understanding and implementing new digital business models*. London, UK: Palgrave Macmillan.
- Bryer, T. A. (2009) Explaining responsiveness in collaboration: Administration and citizen role perceptions. *Public Administration Review*, 69(2), 271-283.
- Bryson, J. M., Crosby, B. C. and Bloomberg, L. (2015) *Public value and public administration*. Washington, DC: Georgetown University Press.
- Bryson, J., Sancino, A., Benington, J., & Sørensen, E. (2017). Towards a multi-actor theory of public value co-creation. *Public Management Review*, 19(5), 640–654.
- Cabannes, Y. (2004). Participatory budgeting: A significant contribution to participatory democracy. *Environment and Urbanization*, 16(1), 27–46.
- Cardullo, P. and Kitchin, R. (2017) Living labs, vacancy, and gentrification. *SocArVix, Center for Open Science*. Accessed July 30, 2021. <https://ideas.repec.org/p/osf/socarx/waq2e.html>.
- Caron, D. J., Montmarquette, C., Prud'homme, A., Bernardi, S., & Nicolini, V. (2020). *Projet sur l'acceptabilité sociale du partage des renseignements de santé—Enquête sur l'acceptabilité sociale du partage des renseignements de santé: Constatations, résultats et variations*. Ecole Nationale d'Administration Publique.
- Chan, E. Y., & Saqib, N. U. (2021). Privacy concerns can explain unwillingness to download and use contact tracing apps when COVID-19 concerns are high. *Computers in Human Behavior*, 119, 106718. <https://doi.org/10.1016/j.chb.2021.106718>
- Collective. (2020, April 19). *Contact Tracing Joint Statement*. <https://www.esat.kuleuven.be/cosic/sites/contact-tracing-joint-statement/>

Conférence interministérielle Santé publique, (2019). Protocole d'accord—Plan d'actions e-Santé 2019-2021.

https://www.inami.fgov.be/SiteCollectionDocuments/plan_actions_esante_actieplan_egezondheid_2019_2021.pdf.

Council of Europe. (2020). *Digital Solutions to Fight COVID-19: 2020 Data Protection Report* (p. 38).

Council of Europe. <https://www.coe.int/en/web/data-protection/-/digital-solutions-to-fight-covid-19-council-of-europe-report-on-data-protection-2020>.

Cribb, A. (2017) *Healthcare in transition – Understanding key ideas and tensions in contemporary health policy*. Bristol, UK: Bristol University Press.

Cucciniello, M., Guerrazzi, C., Nasi, G. and Ongaro, E. (2015) Coordination mechanisms for implementing complex innovations in the health care sector. *Public Management Review*, 17(7), 1040-1060.

Davis, E. L., Lucas, T. C. D., Borlase, A., Pollington, T. M., Abbott, S., Ayabina, D., Crellen, T., Hellewell, J., Pi, L., Medley, G. F., Hollingsworth, T. D., & Klepac, P. (2021). Contact tracing is an imperfect tool for controlling COVID-19 transmission and relies on population adherence. *Nature Communications*, 12(1), 5412. <https://doi.org/10.1038/s41467-021-25531-5>

Delacroix, S., & Veale, M. (2020). Smart technologies and our sense of self: Going beyond epistemic counter-profiling. In *Life and the Law in the Era of Data-Driven Agency*. Edward Elgar Publishing.

<https://www.elgaronline.com/view/edcoll/9781788971997/9781788971997.00011.xml>

democratie.brussels (2021) *La participation citoyenne en région bruxelloise*. Accessed July 21, 2021.

<https://democratie.brussels/>.

DesRoches, C. M. (2020). Healthcare in the new age of transparency. *Seminars in Dialysis*, 33(6), 533–538.

Dixon, B. E. (2010). Towards e-government 2.0: An assessment of where e-government 2.0 is and where it is headed. *Public Administration & Management*, 15(2), 418-454.

Donetto, S., Pierri, P., Tsianakas, V. and Robert, G. (2015) Experience-based co-design and healthcare improvement: Realizing participatory design in the public sector. *The Design Journal*, 18(2), 227-248.

Dunleavy, P. and Margetts H. (2015) The second wave of digital-era governance: A quasi-paradigm for government on the web. *Philosophical Transactions of the Royal Society A*, 371, 20120382.

Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New Public Management Is Dead: Long Live Digital-Era Governance. *Journal of Public Administration Research and Theory*, 16(3), 467–494.

Eriksson, E., & Hellström, A. (2021). Multi-actor Resource Integration: A Service Approach in Public Management. *British Journal of Management*, 32(2), 456–472.

European Commission (2018) *Digitising European industry: Progress so far, two years after the launch*. Luxembourg: Publications Office of the European Union.

European Commission. (2020). *Commission Recommendation of 8.4.2020 on a Common Union Toolbox for the Use of Technology and Data to Combat and Exit from the COVID-19 Crisis, in Particular Concerning Mobile Applications and the Use of Anonymised Mobility Data* (C(2020) 2296 final).

- European Commission. (2020). *Communication from the Commission—Guidance on Apps supporting the fight against COVID 19 pandemic in relation to data protection* (2020/C 124 I/01; pp. 1–9). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:C:2020:124I:TOC>
- European Commission. (2021). *Mobile contact tracing apps in EU Member States* [Text]. European Commission. https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/travel-during-coronavirus-pandemic/mobile-contact-tracing-apps-eu-member-states_en.
- European Liberties Platform. (2021, May). *COVID-19 Contact Tracing Apps in the EU*. Liberties.Eu. <https://www.liberties.eu/en/stories/trackerhub1-mainpage/43437>.
- European Patients Forum (2015) *Lack of patient involvement in the Council position on medical devices*. Accessed May 9, 2021. <https://www.eu-patient.eu/news/News-Archive/lack-of-patient-involvement-in-the-council-position-on-medical-devices/>.
- Ferretti, L., Wymant, C., Kendall, M., Zhao, L., Nurtay, A., Abeler-Dörner, L., Parker, M., Bonsall, D., & Fraser, C. (2020). Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing. *Science*, 368(6491), eabb6936.
- François, A. (2021, August 2). Groen estime que l'application Coronalert doit être progressivement abandonnée. *vrtnews.be*. <https://www.vrt.be/vrtnews/fr/2021/08/02/groen-estime-que-lapplication-coronalert-doit-etre-progressiveme/>
- Fraser, C. (2020). *Effective Configurations of a Digital Contact Tracing App: A report to NHSX* (p. 29). <https://www.research.ox.ac.uk/article/2020-04-16-digital-contact-tracing-can-slow-or-even-stop-coronavirus-transmission-and-ease-us-out-of-lockdown>
- Fraser, C., & al. (2020). *Effective Configurations of a Digital Contact Tracing App: A report to NHSX* (p. 29). <https://www.research.ox.ac.uk/article/2020-04-16-digital-contact-tracing-can-slow-or-even-stop-coronavirus-transmission-and-ease-us-out-of-lockdown>.
- Gascó, M. (2017) Living labs: Implementing open innovation in the public sector. *Government Information Quarterly*, 34(1), 90-98.
- Gebauer, H., Johnson, M., and Enquist, B. (2010) Value co-creation as a determinant of success in public transport services: A study of the Swiss federal railway operator (SBB). *Managing Service Quality: An International Journal*, 20(6), 511-530.
- Gellerstedt, M. (2016) The digitalization of health care paves the way for improved quality of life? *Systemics, Cybernetics and Informatics*, 14(5), 1-10.
- Global Privacy Assembly. (2020, March 17). *Statement by the GPA Executive Committee on the Coronavirus (COVID-19) pandemic*. <https://globalprivacyassembly.org/gpaexco-covid19/>
- Gouillart, F. and Hallett, T. (2015) Co-creation in government. *Stanford Social Innovation Review*. Accessed May 3, 2021. https://ssir.org/articles/entry/co_creation_in_government#.
- Greenhalgh, T., & Stones, R. (2010). Theorising big IT programmes in healthcare: Strong structuration theory meets actor-network theory. *Social Science & Medicine*, 70(9), 1285–1294.
- Harari, Y. N. (2020, March 20). Yuval Noah Harari: The world after coronavirus. *Financial Times*. <https://www.ft.com/content/19d90308-6858-11ea-a3c9-1fe6fedcca75>

- Hardyman, W., Daunt, K. L. and Kitchener, M. (2015) Value co-creation through patient engagement in health care: A micro-level approach and research agenda. *Public Management Review*, 17(1), 90–107.
- Haug, N. and Mergel, I. (2021) Public value co-creation in living labs—Results from three case studies. *Administrative Sciences*, 11(3), 74–95.
- Horita, M. and Koizumi, H. (2009) (Eds.) *Innovations in collaborative urban regeneration*. Cham, Switzerland: Springer.
- Iacovino, N. M., Barsanti, S. and Cinquini, L. (2017) Public organizations between Old Public Administration, New Public Management and Public Governance: The case of the Tuscany Region. *Public Organization Review*, 17(1), 61-82.
- Israilov, S. and Cho, H. J. (2017) How co-creation helped address hierarchy, overwhelmed patients, and conflicts of interest in health care quality and safety. *AMA J Ethics*, 19(11), 1139–1145.
- Jarke, J. (2019) Open government for all? Co-creating digital public services for older adults through data walks. *Online Information Review*, 43(6), 1003–1020.
- Jemine, G., Pichault, F., & Dubois, C. (2020). The politics behind design projects: When space, organization, and technology collide. *International Journal of Managing Projects in Business*, 14(3), 743–766.
- Jenniskens, K., Bootsma, M. C. J., Damen, J. A. A. G., Oerbekke, M. S., Vernooij, R. W. M., Spijker, R., Moons, K. G. M., Kretzschmar, M. E. E., & Hooft, L. (2021). Effectiveness of contact tracing apps for SARS-CoV-2: A rapid systematic review. *BMJ Open*, 11(7), e050519. <https://doi.org/10.1136/bmjopen-2021-050519>
- Jin, E., Lee, J. and Kim, D. (2018) Does resident participation in an urban regeneration project improve neighborhood satisfaction: A case study of “Amichojang” in Busan, South Korea. *Sustainability*, 10(10), 3755.
- Kathlene, L. & Martin, J. A. (1991) Enhancing citizen participation: panel designs, perspectives, and policy formation. *Journal of Policy Analysis and Management*, 10(1), 46–63.
- Kizito, M. and Magnusson, J. (2020) Ambidextrous policy: Cross-country comparison of policies for the digitalization of healthcare. *IFIP EGOV-CeDEM-ePart 2020 Conference proceedings*, 297-305.
- Landau, S. (2021). *People Count: Contact-Tracing Apps and Public Health*. MIT Press. <https://doi.org/10.7551/mitpress/14056.001.0001>
- Lavorgna, A., Ugwudike, P., Carr, L., Benitez, Y. S., & Rekha, G. S. (2021). To App or Not to App? Understanding Public Resistance to COVID-19 Digital Contact Tracing and its Criminological Relevance. *Law, Technology and Humans*, 3(2), 28–45. <https://doi.org/10.5204/lthj.2012>
- Lember, V. (2018) The increasing role of digital technologies in co-production and co-creation. In: T. Brandsen, T. Steen and B. Verschuere (Eds.), *Co-production and co-creation: Engaging citizens in public services* (pp. 115-127). Abingdon, UK: Routledge.
- Li, T., Cobb, C., Yang, J. (Junrui), Baviskar, S., Agarwal, Y., Li, B., Bauer, L., & Hong, J. I. (2021). What makes people install a COVID-19 contact-tracing app? Understanding the influence of app design and

- individual difference on contact-tracing app adoption intention. *Pervasive and Mobile Computing*, 75, 101439. <https://doi.org/10.1016/j.pmcj.2021.101439>
- Liva, G. (2020, May 18). Digital tracing, privacy and trust: The New Normalcy in Europe. *European Science-Media Hub*. <http://sciencemediahub.eu/2020/05/18/digital-tracing-privacy-and-trust-the-new-normalcy-in-europe/>
- LUSS. (2019). *Inventaire 2019 Fracture numérique et e-Santé*. Ligue des Usagers des Services de Santé. <https://www.luss.be/classement/inventaire-e-sante-et-fracture-numerique/>.
- Mabillard, V. (2019) *Les effets de la transparence sur la confiance des citoyens – Clarification conceptuelle et étude de cas empirique au niveau local*. PhD thesis, University of Lausanne.
- Mabillard, V., Demartines, N., & Joliat, G.-R. (2021). How Can Reasoned Transparency Enhance Co-Creation in Health Care and Remedy the Pitfalls of Digitization in Doctor-Patient Relationships? *International Journal of Health Policy and Management*. <https://doi.org/10.34172/ijhpm.2020.263>.
- Mair, J. and Mayer, J. (2015) Navigating institutional plurality: Organizational governance in hybrid organizations. *Organization Studies*, 36(6), 713–739.
- Maniam, A. (2020). Digitalization and Public Policy—Conceptualizing a New Space. In D. Feldner (Ed.), *Redesigning Organizations: Concepts for the Connected Society* (pp. 193–206). Springer International Publishing.
- McDermott, P. (2010) Building open government. *Government Information Quarterly*, 27(4), 401–413.
- McLoughlin, I. P., Garrety, K. and Wilson, R. (2017) *The digitalization of healthcare – Electronic records and the disruption of moral orders*. Oxford: Oxford University Press.
- Medi-Sphere. (2021, May 11). *FarmaFlux viole le RGPD dans un état de non droit (Dr David Simon)*. <https://www.medi-sphere.be/fr/debats/farmaflux-viole-le-rgpd-dans-un-etat-de-non-droit-dr-david-simon.html>.
- Meijer, A., Lorenz, L., & Wessels, M. (2021). Algorithmization of bureaucratic organizations: Using a practice lens to study how context shapes predictive policing systems. *Public Administration Review*, 81(5), 837–846.
- Menges, D., Aschmann, H., Moser, A., Althaus, C. L., & Wyl, V. von. (2021). *The role of the SwissCovid digital proximity tracing app during the pandemic response: Results for the Canton of Zurich* (p. 2021.02.01.21250972). <https://doi.org/10.1101/2021.02.01.21250972>
- Menvielle, L., Audrain-Pontevia, A.-F. and Menvielle, W. (2017) *The digitization of healthcare. New challenges and opportunities*. London, UK: Palgrave Macmillan.
- Mergel, I. and Bretschneider, K. (2013) A three-stage adoption process for social media use in government. *Public Administration Review*, 73(3), 390–400.
- Moore, M. H. (1995) *Creating public value: Strategic management in government*. Cambridge, MA: Harvard University Press.

- Naughton, J. (2020, April 11). For non-intrusive tracking of Covid-19, smartphones have to be smarter. *The Guardian*. <https://www.theguardian.com/commentisfree/2020/apr/11/for-non-intrusive-tracking-of-covid-19-smartphones-have-to-be-smarter>
- Nederhand, J. and van Meerkerk, I. (2018) Co-production of care services: Co-opting citizens in the reform agenda. In: T. Brandsen, T. Steen and B. Verschuere (Eds.), *Co-production and co-creation: Engaging citizens in public services* (pp. 37–39). Abingdon, UK: Routledge.
- Novak, J. D., & Cañas, A. J. (2006). *The Theory Underlying Concept Maps and How to Construct Them* (Technical Report IHMC CmapTools 2006-01). Florida Institute for Human and Machine Cognition.
- OECD (2017) *Observatory of Public Sector Innovation*. Paris: OECD Publishing.
- OECD (2019) *Health in the 21st century: Putting data to work for stronger health systems*. Paris: OECD Publishing.
- Orlikowski, W. J., & Scott, S. V. (2008). Sociomateriality: Challenging the Separation of Technology, Work and Organization. *The Academy of Management Annals*, 2(1), 433–474.
- Osborne, S. P. (2006) The new public governance? *Public Management Review*, 8(3), 377–387.
- Osborne, S. P., Nasi, G. and Powell, M. (2021) Beyond co-production: value creation and public services. *Public Administration*. doi: [10.1111/padm.12718](https://doi.org/10.1111/padm.12718).
- Ostrom, E., Parks, R. B., Whitaker, G. P. and Percy, S. L. (1978) The public service production process: A framework for analyzing police services. *Policy Studies Journal*, 7(s1), 381–389.
- ParlAmericas (2017) Participation citoyenne dans le processus législatif [Citizen participation in the legislative process]. Ottawa, Canada: International Secretariat of ParlAmericas.
- Pascal, C. (2017). Tapping the Full Potential of eHealth: Business Models Need Economic Assessment Frameworks. In L. Menvielle, A.-F. Audrain-Pontevia, & W. Menvielle (Eds.), *The Digitization of Healthcare: New Challenges and Opportunities* (pp. 39–58). London, UK: Palgrave Macmillan.
- Pasquier, M. & Villeneuve, J.-P. (2018). *Marketing management and communications in the public sector* (2nd ed.). Abingdon, UK: Routledge.
- Pedersen, A. R., Sehested, K. and Sørensen, E. (2011) Emerging theoretical understanding of pluricentric coordination in public governance. *The American Review of Public Administration*, 41(4), 375–394.
- Pigneur, Y., Osterwalder, A., & Clark, T. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley.
- Plesner, U., Justesen, L., & Glerup, C. (2018) The transformation of work in digitized public sector organizations. *Journal of Organizational Change Management*, 31(5), 1176–1190.
- Plume, R., Page, A. and Garelick, H. (2020) Qualitative research approaches: Application in a UK public administration context. In: E. Vigoda-Gadot and D. R. Vashdi (Eds.), *Handbook of research methods in public administration, management and policy* (pp. 139–160). Cheltenham, UK: Edward Elgar.
- Polet, C., Busschots, M., & Fiers, T. (2021, June 14). *Webinar: Efficiëntie en besparing in het Vlaamse Zorglandschap met CoZo*. Webinar over CoZo. <https://www.youtube.com/watch?v=hhHHXAWGLrU>.

- Rantamäki, N. J. (2017) Co-production in the context of Finnish social services and health care: A challenge and a possibility for a new kind of democracy. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, 28(1), 248–264.
- Redmiles, E. M. (2021). The Need for Respectful Technologies: Going Beyond Privacy. In H. Werthner, E. Prem, E. A. Lee, & C. Ghezzi (Eds.), *Perspectives on Digital Humanism* (pp. 309–313). Springer International Publishing. https://doi.org/10.1007/978-3-030-86144-5_42
- Reich, O., Aszodi, N., Galaski, J., & Konoplia, O. (2021) *COVID-19 Technology in the EU: A Bittersweet Victory for Human Rights?* Civil Liberties Union for Europe.
- Rich, J. (2021, January 28) How our outdated privacy laws doomed contact-tracing apps. *Brookings*. <https://www.brookings.edu/blog/techtank/2021/01/28/how-our-outdated-privacy-laws-doomed-contact-tracing-apps/>.
- Schneidewind, C. (2020, April 30). Contact Tracing—How does it limit privacy? *Security & Privacy TU Wien*. <https://secpriv.wien/blog/en/tracing-app/overview/>
- Sfadj, R. & Telos. (2020, June 3). Les trois erreurs qui plombent l’application StopCovid. *Slate.fr*. <http://www.slate.fr/story/191205/trois-erreurs-application-stopcovid-design-comite-choix-architecture-communication>
- Simonet, D. (2011) The new public management theory and the reform of European health care systems: An international comparative perspective. *International Journal of Public Administration*, 34(12), 815–826.
- Singh, J., Owens, J. and Cribb, A. (2017) What are the professional, political, and ethical challenges of co-creating health care systems? *AMA J Ethics*, 19(11), 1132–1138.
- Sørensen, E., Bryson, J. and Crosby, B. (2021) How public leaders can promote public value through co-creation. *Policy & Politics*, 49(2), 267–286.
- Sportisse, B. (2020, April 18). *Contact tracing, quelques éléments pour mieux comprendre les enjeux* [INRIA]. <https://www.inria.fr/fr/contact-tracing-bruno-sportisse-pdg-dinria-donne-quelques-elements-pour-mieux-comprendre-les-enjeux>
- Stebbins, R. A. (2001) *Exploratory research in the social sciences*. Thousand Oaks, CA: Sage.
- Stolton, S. (2020, April 21). EPP cite controversial PEPP-PT as example for single European COVID-19 app. *Www.Euractiv.Com*. <https://www.euractiv.com/section/digital/news/epp-cite-controversial-pepp-pt-as-example-for-single-european-covid-19-app/>
- Test-Achats. (2019, March 8) *Vos données médicales en ligne*. www.test-achats.be. <https://www.test-achats.be/sante/sante-au-quotidien/e-sante/dossier/vos-donnees-medicales-en-ligne/a-quoi-consentez-vous>.
- The World Bank (2021) *Tools for community participation: Urban regeneration*. <https://urban-regeneration.worldbank.org/node/88>.
- Thibaut, H. (2020, December 8). Covid-19: Comment une traque méthodique et intrusive a permis à la Corée du Sud de maîtriser le virus. *Le Monde.fr*. https://www.lemonde.fr/planete/article/2020/12/08/covid-19-comment-une-traque-methodique-et-intrusive-a-permis-a-la-coree-du-sud-de-maitriser-le-virus_6062564_3244.html.

- Torfig, J., Andersen, L. B., Greve, C. and Klausen, K. K. (2020) *Public governance paradigms: Competing and co-existing*. Cheltenham, UK: Edward Elgar.
- Torfig, J., Sørensen, E. and Røiseland, X. (2019) Transforming the public sector into an arena for co-creation: Barriers, drivers, benefits, and ways forward. *Administration & Society*, 51(5), 795–825.
- Trochim, W. M. K. (1989) An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, 12(1), 1–16.
- Vaudenay, S. (2020). *Centralized or Decentralized? The Contact Tracing Dilemma* (No. 531). <https://eprint.iacr.org/2020/531>
- Veale, M. (2020, July 1). Privacy is not the problem with the Apple-Google contact-tracing toolkit. *The Guardian*. <https://www.theguardian.com/commentisfree/2020/jul/01/apple-google-contact-tracing-app-tech-giant-digital-rights>
- Vlaams Parlement. (2021) *Verslag van de hoorzitting over de toekomst van het contactonderzoek* (No. 871). <https://www.vlaamsparlement.be/parlementaire-documenten/gedachtewisselingen-hoorzittingen/1512263>
- Voorberg, W. H., Bekkers, V. J. J. M. and Tummers, L. G. (2015) A Systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, 17(9), 1333–1357.
- Webster, J. and Watson, R. T. (2002) Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), xiii – xxiii.
- Wirtz, B. W., Müller, W. M. and Weyerer, J. C. (2021) Digital pandemic response systems: A strategic management framework against Covid-19. *International Journal of Public Administration*, 44(11-12), 896–906.
- Wymant, C., Ferretti, L., Tsallis, D., Charalambides, M., Abeler-Dörner, L., Bonsall, D., Hinch, R., Kendall, M., Milsom, L., Ayres, M., Holmes, C., Briers, M., & Fraser, C. (2021). The epidemiological impact of the NHS COVID-19 app. *Nature*, 594(7863), 408–412. <https://doi.org/10.1038/s41586-021-03606-z>
- Yang, K. and Miller, G. J. (Eds.) (2008) *Handbook of research methods in public administration*. Boca Raton, FL: CRC Press.
- Yildiz, M. (2007) E-government research: Reviewing the literature, limitations, and ways forward. *Government Information Quarterly*, 24(1), 646–665.
- Zerdick, T. (2021, January 4). What does COVID-19 reveal about our privacy engineering capabilities? *European Data Protection Supervisor*. https://edps.europa.eu/press-publications/press-news/blog/what-does-covid-19-reveal-about-our-privacy-engineering_en
- Zimmermann, B. M., Fiske, A., Prainsack, B., Hangel, N., McLennan, S., & Buyx, A. (2021). Early Perceptions of COVID-19 Contact Tracing Apps in German-Speaking Countries: Comparative Mixed Methods Study. *Journal of Medical Internet Research*, 23(2), e25525. <https://doi.org/10.2196/25525>