Choreographing for Public Value in Digital Health?

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Abstract:

Entanglements between public and private entities in digital health are not new, yet we do not have full insight into how these public-private dances are choreographed or what notions of public value drive governments' appetite for investing into or collaborating with private digital health firms around health data. We examine key events, actors, public discussions, policy deliberations and regulations for over 30 years to find that European Union (EU) policy has paved an innovation-friendly path for technology companies entering healthcare. The recent pandemic has normalized these collaborations even further. The paper also finds that conceptualizations of public value in digital health mostly relate to economic aspects – markets, jobs and money. Other interpretations, such as public health, long-term sustainability or the common good, tend to be sidelined. The paper closes by considering whether the advent of the European Health Data Space will change this trajectory before giving suggestions on how a focus on *public health value* can be re-established.

Keywords: Digital Health, Public Health, Path-dependency, Public Value, Public-private collaborations, Covid-19 Pandemic

Introduction

In June 2023, a group of academic experts in digital health expressed their deep concern about the proposal for a European Health Data Space (EHDS), which they saw likely to be "eroding rather than increasing the public value generated through health data sharing" (Marelli et al., 2023, p. 1). Elsewhere, health researchers warned that "healthcare systems must get fair value for their data" in collaborations with industry, given the substantial data assets these systems now represent (Bradley et al., 2022). Two further prominent papers recently discussed the 'value of data' in healthcare and how it must be safeguarded for the public (Prainsack et al. 2022; Wilson et al., 2020). Social scientists are clearly concerned about public value in relation to digital health, and these concerns are particularly acute when such value is said to emanate from public-private collaborations. Yet, what public value is, how it is negotiated between public and private organizations, and how policy trajectories might influence its creation and distribution often remain vague in these expressions of concern (Wilson et al. 2020).

In this paper, we explore the imaginaries of public value that may drive governments' appetite for investing into or collaborating with private digital health firms, and we highlight the long history in European Union (EU) policy to pave an innovation-friendly path for technology companies entering public health domains. We argue that this trajectory has led policymakers to a relatively one-dimensional conceptualization of public value where economic aspects such as job creation are in focus but where other aspects of public value – the enhancement of healthcare services, equality in access, digital literacy etc. - are often left underdetermined. This problem has been exacerbated during the recent Covid-19 pandemic when governments sought help from big tech companies, such as Google and Apple (or "Gapple"), to implement a digital infrastructure for contact tracing apps (Milne and Costa, 2020; Peek, Sujan and Scott, 2020). Lanzing, Lievevrouw and Siffels (2022) have labelled the push and pull between EU policies and big tech in the area of digital health as a 'techno-

tango'. We stay with this expressive image of a dance between public and private sectors but delve more deeply into who choreographs this techno-tango, through what moves and with what degrees of freedom, and most importantly with what objectives in mind. While we agree with Marelli et al. (2023) that current proposals for the EHDS only serve to cement the EU's long-term innovation-friendly trajectory, we also propose a range of measures that could be adopted to safeguard *public health value* in this and future policy proposals – but only if this value is defined and expressed.

In capitalist economies, public value and market value are often entangled (Mazzucato and Ryan-Collins, 2022), and public-private entanglements - or techno-tangoes - have become a key feature of many contemporary public health systems in Europe. Governments have a precarious balance to strike: On the one hand, the job of government is to deliver "value for and from the public "(Meynhardt, 2010, p.1277). In digital health, public value might be created, for instance, by providing digitalized healthcare services, systems and infrastructures that put public health needs and the long-term sustainability of the public health system first (Wilson et al, 2020). On the other hand, with its market- and innovation-driven mandate, the EU takes distinctive actions to fold economic value into public health – that is, it focuses on how value (and, consequently, jobs) can be created to the private sector through assets that can be exchanged in and priced through the marketplace (Asdal and Cointe, 2021). When governing for public value, states or supra-state entities such as the EU tend to act in the much-touted role of the 'entrepreneurial state' (Mazzucato 2013), but often with very different outcomes depending on what objective this state entrepreneurship is directed to. Driven to its extreme, a publicly supported "data-driven health economy" (Snell, Tarkkala and Tupasela, 2021, p. 1) transforms public assets into private ownership. The UK, for instance, has started to sell some of its NHS public health records and data to commercial businesses (Vezyridis and Timmons, 2021), and this dynamic has extended into states with a

strong tradition of choreographing public health on solidaristic principles (Snell, Tarkkala and Tupasela, 2021). Given these dynamics, (how) can public value be safeguarded in the future evolution of digital public health? We define digital public health as the "reimagination of public health using new ways of working, blending established public health wisdom with new digital concepts and tools" (Iyamu et al, 2021, p.2). Digital public health leverages a spectrum of digital health technologies, including healthcare apps, wearable technology, telemedicine, artificial intelligence, big data analytics but also social media and other internet-based innovations.

We examine the role that EU and national digital health policies and other parts of the 'entrepreneurial state' (Mazzucato, 2013) have played before and during the pandemic to choreograph these healthcare techno-tangos and which steps are amenable to change. Clearly, in public-private entanglements, history matters as path dependencies - that is, relationships, arrangements and practices that sediment over time – will be difficult to undo. But we also extrapolate into the near future, particularly through the current proposals around the EHDS, and we detail practical steps that may be implemented to prevent a narrowing of public value to economic aspects only in these proposals. Our paper thus asks: *How do EU and state policies choreograph public-private entanglements in digital public health?* and *How can this dance be reoriented towards public value, if at all?*

Public Value and Digital Public Health

For decades, digital health technologies have prompted high expectations for more patient-centred care, cost savings and quality improvements (Kraus et al, 2021; Geiger and Kjellberg, 2021). The digital revolution was to be key to creating better healthcare through the 'creative destruction of medicine' (Topol, 2012). Yet, for an equally long time, academics, social scientists and non-governmental organizations have cautioned against the expansion of

private tech firms into public health services – and the dangers of such sphere transgression (Floridi, 2020; Klein, 2020; Geiger and Gross, 2021; Sharon, 2020; Taylor 2021). Experts warn that letting tech companies extract value from public health would lead to a 'tragedy of the digital commons in health' (Prainsack, 2019; Sharon, 2018), that is a net loss to the public as a result of the privatization of public health databases and other public or individual data assets. The recent pandemic has acted as an accelerant in this matter as public-private entanglements or 'techno-tangoes' have become normalized as vehicles for scalable public health solutions including contact tracing apps and remote consultation software (Engelmann, 2022; Milne and Costa, 2020). It has also given tech companies a mandate to move further into the sphere of public health, which opened doors for widened political influence (Sharon and Koops, 2021).

This opens the question as to what public value is actually created in digital health tangoes. In public management theory, public value is defined as being "created, or captured, to the extent that public sector institutions further their democratically established goals or improve the lives of citizens" (Wilson et al., 2020 p. 4; Moore, 2012). Mazzucato and Ryan-Collins (2022, p. 346) state that public value "should be understood as a way of measuring progress towards the achievement of broad and widely accepted societal goals". Mazzucato has long been outspoken about the need for an 'entrepreneurial' state, that is a state that focuses on the proactive and 'value creating' role of public policies in making and shaping markets (Mazzucato 2013; 2016). Her view centres around the idea of value co-creation and the engagement of a multitude of stakeholders to help shape 'mission-oriented' policies. According to Mazzucato, modern capitalist economies cannot achieve broad societal goals – including the delivery of public health – without the support of the private sector. While her interventions have a tendency to disregard non-market alternatives, she also highlights the importance to scrutinize market creation carefully, warning that innovation, value creation

and extraction can tip in favour of commercial actors (Mazzucato and Perez, 2015). Other researchers too have pointed out that at a minimum, any collaboration with private partners should deliver "demonstrable public benefit and …not disproportionately reward private interests" (Bradley, 2022, p. 2).

Yet, defining, measuring and demarcating public versus private value creation is not a straightforward task, and neither is determining what the 'entrepreneurial' state or supra-state should do to safeguard the former and rein in the latter in specific domains. This conundrum is highly visible in the pharmaceutical industry, for instance, where public investments in fundamental research and development (R&D) are frequently turned into highly lucrative private pharmaceutical assets, for which the public then arguably pays twice – once in the innovation process and once when purchasing pharmaceutical end products (Bourgeron and Geiger, 2022). Similarly, in digital health, power asymmetries have been created through state-supported value extraction activities by commercial players, which have led to what Prainsack (2019) has called data 'lock-outs'- excluding the public from the digital data and information commons. In the absence of clear guidelines of who 'owns' public health data and how access and benefits should be regulated, big tech companies have staked considerable claims on shared data resources in health (Boyd and Crawford, 2012; Wilson et al., 2020). Take the Google 'Deepmind' controversy, for instance - a collaboration between Google and the Royal Free NHS Foundation Trust, which used patient data to create an app through an NHS-owned algorithm and allowed Google to stake a claim on the data for machine learning purposes (Bradley et al., 2022). Similarly, in the U.S., Google teamed up with healthcare company Ascension in 'Project Nightingale' to gain access to 50 million patients' names, diagnoses and hospitalization records, lab results, and other data such as their home address or place of employment (Ghlionn, 2021). The platform business model of big tech works by 'enabling' transactions to flow across a large number of market participants

(Deloitte, 2023). Google reportedly made $224.47 billion in profit, or three quarters of its total revenue, from selling data for advertising purposes in 2022 alone (Statista, 2023). Other companies including Amazon and Microsoft are also accessing and analyzing health data stored in the cloud (Mearian, 2019). As Bradley and colleagues (2022) have highlighted, the lack of transparency of the contractual arrangements between technology players and public bodies makes it all but impossible to assess what exactly the 'mission' is that states pursue when they become 'entrepreneurial' in relation to digital health - and what (if any) public value is created from this state entrepreneurship.

While financial public value may be built into such contracts through value sharing agreements – for instance through royalty or revenue shares, equity shares, profit shares or free and discounted products (Bradley, 2022) - the problem reaches far beyond financial issues. States accord significant public contributions to support commercial players in the healthcare space, including R&D funds, entrepreneurship and innovation supports, and knowledge sharing efforts. In the EU, the post-Covid Health4Europe programme alone has made more than €5.3billion available for public and private actors to strengthen health systems, including through digital tools [1]. Yet, many state-provided supports in healthcare are absorbed into commercial business models without specifying what contributions the state may legitimately expect in return (Swaminathan et al, 2022), particularly those that go beyond a financial share of the value created. In the area of digital health, such non-financial contributions to public value may include investments in digital and health literacy; transparent and ethical R&D that includes a fair recognition of public research contributions, for instance in the area of health artificial intelligence; and open sharing of data or at least joint data ownership. If public value in digital health is to be fostered, the entrepreneurial state needs to ensure that financial and social value truly flows back into healthcare systems.

How this may be achieved in practice remains a largely open question. Recent proposals have highlighted that public bodies should start by defining specific 'models of public value' before engaging in commercial collaborations (Wilson et al., 2020). Such models may entail interrogating the guiding principles or values "that together express what is needed for the institution to do its job well" (ibid., p. 4) and then directing commercial contracts toward strengthening and improving these values. Prainsack and colleagues (2022) proposed a 'solidarity-based data governance' model that balances public value gains against potential data harms; the authors encourage public bodies to make public supports dependent on a demonstrable net public value gain relative to risks. Importantly, these proposals move beyond 'value for money' approaches, in which a focus on financial value capture may have a crowding out effect on social values.

While we welcome recent deep engagements with the notion of public value in digital health, we would argue that their potential practical impact may be vastly enhanced through insights into how the current status quo has evolved over the years – how, in other words, the EU and its States have been regulating for (or, as the case may be, against) public value. This paper, then, intervenes through a critical historical examination of what 'public value' has been choreographed through the EU into digital health. We are drawing analytical inspiration from two sources, which we combine in our narrative below: the notion of policy imaginaries (Jasanoff and Kim, 2013) and the twin notions of path dependence and path creation, as per Karnoe and Garud (2001) and Garud, Kumaraswamy and Karnøe (2010). Combining both perspectives, histories as well as imagined futures related to public-private entanglements matter. An institutional status quo is generally slow to change once practices, infrastructures, and actor configurations have settled down, but they are not inert: any path dependencies or lock-ins can be reversed by reflective actors who are capable of 'mindful deviation' (Garud and Karnoe 2001). Consequently, policy imaginaries create path dependencies but can also

act to change history through innovative, agentic and reflective governance. New paths can of course also emerge from exogeneous shocks, which necessitate new response-repertoires. In the area of digital health, Covid-19 could be seen as such an exogeneous shock that opened up the opportunity to redistribute actor roles and values. Thus, while history matters – in our choreographic analogy, by setting up the roles and dance moves that partners ought to follow – innovation is always possible, and innovation for public value in digital health, we would argue, is not simply possible but mandatory. We pursue this reflection in our empirical materials next.

Research Approach

Our conceptual interest lies in investigating how EU states have choreographed public value into digital public health, and how these choreographies may be reoriented toward a more encompassing view of public value creation. We chose the EU as a geographical background and context for our research for multiple reasons. First, while public-private collaborations in digital health are becoming a norm worldwide (Sharon, 2018), the EU is seen to take a global leadership position in the protection of civil, democratic liberties and privacy in the digital realm (Lanzing, Lievevrouw and Siffels, 2022). At the same time, with current ambitions to build a European Health Data Space, the future choreographing of this space for public value is once again open for innovation and renewal. Urgent reflection is thus warranted.

Second, as EU citizens we have a vested interest in the future of public health in the EU. What is more, as academics, we were involved in one particular small-scale techno-tango from 2013-2017 in a research centre for digital health, which brought public and private actors together with the dual motive of providing public value to the healthcare system and 'building a market' for digital health. We gained important ethnographic insights by being

immersed in this particular pre-pandemic techno-tango (an experience we have reported on in Geiger and Gross, 2022).

We build our argument below mainly on policy documents, which we take both as mirrors and shapers of social practices, including policy imaginaries as our main objects of interest (Asdal and Reinertsen 2021). To explore these in policy documents and commercial sources, we used keywords such as digital health, connected health, electronic health (e-health), mobile health (m-health), digital medicine, telehealth, telemedicine and wearable technology in health from a body of secondary materials (see Table 1).

Table 1 – Documents Collected for the Document Analysis

Type of Document	**Texts**	**Hits**	**Time Period**
EU Policy	EU Press Releases EU Reports and Legislation	71 39	2010-2022
Contextual	Germany Ireland	14 172	2010-2022
Grey Literature	Newspapers, blogs, magazines and interviews	352	2014-2022
Total	648		

EU-related publications stemmed from tracing the EU news bulletins from 2010-2022 and searching the EU Commission website. This material amounted to 110 documents. Internet searches yielded extensive grey literature (e.g., Tech Republic, Tech Central, TechHive, TechCrunch, FastCompany, Mashable, Digital Health, MedCity News, mHealth Intelligence, Fortune, Forbes, The Wall Street Journal or Bloomberg) - 352 documents - over a 10 year-

period of researching digital health. Whilst we focused on the choreographing at EU level, we also 'zoomed' into how this choreographing is interpreted and implemented at a national level (Geiger and Bourgeron, 2023). We chose Ireland for this empirical deep dive because we had developed substantial expertise through prior research in this EU nation. Given its highly corporation-friendly government stance, Foreign Direct Investment (FDI) and corporate tax strategy, Ireland has an established history of being a 'hotspot' for public-private collaborations [2]; it also displays a heavy concentration of 'big tech' European headquarters, making its government's interpretations and local translations of EU digital policies particularly important for the rest of Europe. Our deep-dive included a search of Irish newspaper articles (e.g., The Irish Independent, Irish Times or Sunday Business Post), relevant government policies (e.g., Health Service Executive, Department of Health, Health Information and Quality Authority publications) and reports on digital health (e.g., IBEC, BioBusiness or Enterprise Ireland). Overall, 172 documents were retrieved. We triangulated these detailed national insights with selected reports from Germany. We chose Germany as a comparator not only due to our familiarity with healthcare policy in the country but also because experts see it as a frontrunner in digital health policy since the passing of the Digital Healthcare Act in 2019 (Stern et al, 2020; [3]). The 14 sources from Germany included policy documents (e.g., Bundestag publications), advisory sources (e.g., TU Berlin, Stiftung and Price Waterhouse Coopers), but also online articles (Politico, The Medical Futurist or Der Stern).

All documents were stored in NVIVO. Our data analysis focused on identifying key trends related to digital health, public-private entanglements, how value is defined and by whom, and what path dependencies may have been set. We mapped the key events, actors, public discussions, policy deliberations and regulations in digital health along a chronological timeline at the EU level, but also (selectively) at national levels (Langley, 1999). Following

the notion of value back across 30 years, we identified shifts but also continuities in policy imaginaries of public value. Four distinct phases of choreographies in digital public health emerged from this temporal analysis, and these are discussed in the findings section.

Findings

Our analysis and findings are split into four key periods: first, we focus on the *pre-2010 era* to provide context and trace the earliest roots of digital (public) health. Second, we examine the period after the 2008 recession and *before the pandemic (2010-2019),* a time in which expectations, practices and power relations in techno-tangoes were set up with lasting effects. Third, we consider *the pandemic time (2020-2022*) when boundaries rapidly and significantly shifted and techno-tangoes became a norm in the delivery of public health. The last section provides an outlook on how the *European Health Data Space* may serve to rethink the choreographing for public value.

The 1990s to 2010: The Roots of Digital Public Health

Digital technology promises have circulated in Europe as far back as the Dot.com bubble era of the late 1990s (Pilbeam and Nagle, 2009; Quinn and Turner, 2020). During that time, the European Commission advocated for eEurope, "an information society for all" and a vital enabler of the new knowledge economy [4, p.1]. Aware that data would soon start to flow in great quantities, the EU passed a directive in 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data [5]. This directive was set to let data "flow freely from one Member State to another" and make the "processing and exchange of such data considerably easier", all in the interest "to serve man" and protect the fundamental rights and freedoms of EU citizens (ibid, p2).

The dot.com bubble engendered an unprecedented appetite for technology entrepreneurship (McCullough, 2018), including in digital health start-ups. Digital entrepreneurship was highly

encouraged by the EU and its member states to explore “significant economic and social opportunities” to “create new markets” and “increase productivity and hence growth and employment throughout the economy” [4, p.2]. Public value in digital technology during this era became strongly linked with entrepreneurship activities and support. For instance, through its dedicated enterprise policy programme, the EU Commission set the tone for an “Enterprising Europe” [6, p.1] with strong repercussions into digital technologies. Each EU member state circulated the entrepreneurship ideology as a means of opportunity exploration and created multiple paths to support businesses, e.g., through favourable regulatory environments (e.g., in Denmark and Austria), tax breaks (e.g., in Ireland and Spain), access to labour resources (e.g., in the UK) and easy access to finance (e.g., in Finland) [7]. An ‘enterprising Europe’ thus, in a first instance, became a Europe where countries competed against each other for foreign direct investment and digital entrepreneurship. With its famously low corporation tax rate, by 2000, 13 of the world’s top 20 healthcare companies had plants in Ireland for instance, early digital multinationals started to settle, and the medical devices sector soon employed 7.5 percent of Ireland’s manufacturing industry workforce [8]. Given the rapid rise of digital technologies, in 2002, a EU directive concerning the processing of personal data and the protection of privacy in the electronic communications sector was set [9]. The directive acknowledged that the internet was **“**overturning traditional market structures” (ibid, p.2), and it regulated location-data, cookies, value-added services and mobile-phone applications to safeguard privacy and consent.

The rapidly improving digital infrastructure and technologies in healthcare gave rise to the earliest e-health, m-health, digital medicine and telemedicine applications (Geiger and Gross, 2017). Though labels tended to be fluid, in the imagination of policy makers eHealth opened a world where electronic health records, e-prescriptions, online support for clinical decision making and triage, telehealth including remote monitoring and video consultations, electronic

identifiers for patients and professionals, and other ways of information sharing transformed often siloed healthcare provision into one big, seamless ehealth ecosystem [10]. MHealth, in turn, emphasized the future role of mobile technologies and devices as ‘a doctor in your pocket’ (Lupton and Jutel, 2015), an avenue that had opened up in 2007 when the first smartphone was presented to the world.

In the 2000s, digital health became a focal point of interest for many national policy makers straining to contain health budgets in an ageing society - promising to tap into user-generated and real-time data; provide robust early warnings for new diseases and epidemics; establish bottom-up reporting for local, national and international systems; become an invaluable source of shared epidemic data; provide disease intelligence; and make mobile phones and devices an indispensable part of everyday health and disease management (Kostkova, 2013). Other early policy promises included patient empowerment and patient-centred care, operational efficiencies in healthcare, better quality of care, improved financial performance and motivational impacts on the workforce (Kraus et al, 2021). Commercial technology developers rode a wave of expectations to attract easy state funding to build and scale digital health technologies, which were, in the policy imaginaries of the time, to be unproblematically integrated into public health systems. A self-declared ‘forerunner’ for digital health, the Irish state provided significant supports for an ‘eHealth transformation’ through a 15-year implementation framework [11; 12]. Techno-tangoes of the time, often described in policy documents as “strategic alliances with the private sector and value for money programmes” [11, p.88], were part and parcel of the planned digital public health rollout. According to the policy documents, public value could only be achieved if a range of options, including third-party outsourcing of ICT programmes, were considered [13]. The only concerns came from Irish healthcare providers who asked for better regulation and implementation (Geiger and Gross, 2017). In Germany, by comparison, digital health was

approached by policymakers with a lot more caution, even though it had been one of the first countries in the EU to roll out an Electronic Health Card to all its citizens. Many technologies initially did not get a great deal of public attention, though with the Statutory Health Insurance Modernization Act in 2004, some health technologies became part of the health services covered under the statutory system [14]. However, given Germany's federal regulatory complexities and de-centralized decision-making processes – Länder make their own healthcare decisions and investments - many digital health initiatives ended up getting shut down over concerns about security, privacy and confidentiality [15].

Thus, public value choreographing in digital health in the 2000s was related to a policy imaginary of digital technology entrepreneurship, with governors (but to a much lesser extent healthcare providers themselves) imagining that these technologies would transform public healthcare systems wholesale in the future. These digital health imaginaries were translated through a predominantly innovation- and growth-driven focus of the 'entrepreneurial state', which vied for digital businesses in a geopolitical race for increasingly powerful digital firms' foreign direct investments. As many of the digital health deployments of the time only existed as prototypes, policy imaginaries of public value remained predominantly future-oriented with little tangible policy direction on implementation or regulation.

2011-2019: Digital health veers toward consumer value

The 2008 financial collapse had two important effects on digital health. For one, a great deal of institutional investment started to flow away from financial services into digital firms, including a substantial uptick in digital health technology investment (Geiger, 2020). And second, it consolidated a path that has been crystallizing since the bursting of the dot.com bubble in 2001: the predominance of the 'platform business model', often exemplified by firms such as Google. This highly data-hungry business model, based on the notion of global

scale, started to penetrate digital health too; Microsoft for instance launched a consumer version of an electronic health record in 2007, soon to be followed by both Google and Apple. But these platform models also drove early concerns about value creation and capture, underlining the increasingly asymmetric power relations between tech companies and the state and/or its citizens (Kenney and Zysman, 2016).

The early 2010s also saw a significant rise in state-supported technology investment and development [16; 17], and the concept of 'digital public health' started to emerge in the literature. By 2011, policymakers were highlighting the need for eHealth to transform cross-border healthcare in the EU. A detailed 8-year EHealth action plan was launched in 2012 and its implementation was delegated to national authorities [18]. Understanding that digital data involves certain threats to the public, the EU released a directive in 2011 - a precursor to the GDPR – around the protection, consent, and use of data [19]. Ireland integrated this directive into Irish law in 2011 and launched its EHealth action plan in 2013. By 2013, some large-scale software rollouts such as ePrescriptions were starting to appear across Europe, but these rollouts were extremely uneven.

In Ireland, while the state continued to bill itself as a 'digital frontrunner', public health system digitalization was far behind other European countries. No national electronic health identifier or card existed; ePrescriptions were years from being implemented; and technologies in public healthcare facilities were generally seen as 'antiquated' [20]. Putting a great deal of hope into the big tech firms that had been attracted to Ireland by a succession of governments, the Irish state invested substantial sums into a national eHealth ecosystem. This investment included €6 million in 2012 for a Digital Health Applied Research Center with the aim to access "world class clinicians, academics and patient cohorts to explore and evaluate potential connected health solutions for the global market" [21, p.1]. The Center was a state-funded experiment in choreographing digital health techno-tangoes, bringing together private

technology firms with public health bodies and providers. Whilst it unlocked some value for the commercial companies involved, it delivered very limited impact or benefit for public health – hardly any of the technologies reached the rollout stage in public health facilities (authors' ethnographic observation). More generally, a realization dawned that many digital health devices, systems and solutions lacked clinical evidence or an understanding of medical care pathways (Geiger and Kjellberg 2021; Day et al, 2022). In Germany, digital tech firms were also still struggling to break into the German healthcare system. The only patients who were seeing benefits were fee-paying private patients or those diagnosed with specific illnesses [14]. While the technology companies managed to deliver some public value in these select cases – better access to care, new diagnostics, specialized treatment and care (ibid) - the wider public saw very little benefit.

Over the course of the 2010s, as investments shifted away from public digital health toward consumer applications, stakeholders and experts alike started to voice concerns about the emergent technologies, including the security of personal information, risk of cyberattacks, interoperability issues or the absence of meaningful information from apps and devices (Mittelstadt and Floridi, 2016). Among these many issues, a broader rollout of digital solutions into the public health system was also hampered by technology-unfriendly reimbursement systems (Cozzolino and Geiger, 2023). As a consequence, many digital health companies started to focus on the easier-to-access direct-to-consumer market instead. Digital tech companies were still receiving entrepreneurship grants and supports at this point but EU governments slowly abandoned demanding 'public value' from these consumer-facing companies in return. This set in place a series of path dependencies, including the apparent acceptance by public bodies of business models built on the aggregation of consumer health data and its subsequent extraction and assetisation by private firms.

At this point, serious concerns emerged around the social costs of these 'preventive' or 'wellness' technologies and the resources they might draw from other parts of public healthcare (Geiger, 2020). As consumer technologies started to mature, it became increasingly clear that digital health raised substantial issues related to privacy, confidentiality and security, patient disenfranchisement, algorithmic bias, discrimination, and exclusion (Caulfield, Murdoch and Ogbogu, 2022; Cordeiro, 2021). Overall, it became evident that digital health had not only brought along significant ethical challenges that threatened its translation into public health, but that it had so far also failed to "contribute to the common good" (Vayena et al., 2015, p.6). And policy did not find strong answers to many of these problems: While the GDPR regulations of 2016 [23] were the EU's response to the rapid consumerization of digital technologies, the unclear legal status of much health and wellness data and geographic differences in GDPR enforcement arguably weakened the regulation's teeth. The EU's focus on privacy and consent also demonstrates that even in terms of policy imaginaries, the consumerization of digital technology was now seen as a fact.

Undeterred by these public concerns, investments into (consumerized) digital health continued apace [24]. 'Big tech' in particular now started to focus on healthcare as a domain where data were starting to become a considerable economic asset. Policymakers in the EU were aware that data was now flowing with great volume and velocity, and that this data represented a considerable commercial but also potential public 'value-add' [25]. Concerns about the data extraction activities of tech firms as well as the emergent commercialization of health were side-lined, however. Instead, the EU chose to focus on issues such as interoperability and standardization, monitoring and assessment, knowledge exchange and global cooperation - as can be seen in its Ehealth Network plan 2015-2018 [26]. Policy choreographies continued to be guided by an imaginary that a blend of public investment

and private technology would eventually improve healthcare in the EU, but this imaginary was largely blind to the one space where aggregated public health data was already of economic value: the digital lives of consumers. In 2019, an entity entitled Connecting Europe Facility (CEF) made available €500million funding for telecoms, including open data for ehealth [27]. The award criteria related to technical relevance, quality and efficiency of the technology and the team, and impact and sustainability beyond the initial funding (ibid). Criteria such as effects on public health or shared value remained unmentioned once again.

Thus, the 'consumerization' of digital health in the 2010s was at least partly caused by public investment patterns, entrepreneurship policies, financial supports and regulation oversights (Kavanagh, 2019; see also Kraus et al. 2021). A host of critical commentators now warned against the privatization of health, highlighting that it would create barriers to access for the more vulnerable of society and may distort the dynamics of healthcare provision itself (Christiansen, 2017; Kaihlanen et al, 2022). However, these concerns as well as ethical questions beyond privacy and consent were largely silenced in the EU's post-recessionary policy choreographing for economic growth and job creation. With this path set, any efforts to reorient digital health technologies towards public health rather than individual wellness or prevention would become an increasingly complex challenge (Braun and Hummel, 2022).

2020-2022: Choregraphing during the Pandemic Years

When the pandemic started to spread in early 2020, EU governments needed quick, drastic and large-scale containment measures, and big tech had solutions in place that were mature enough to scale technologies (Peek, Sujan and Scott, 2020). Citizens trusted the EU to safeguard their privacy, ensure data protection and balance the risks of the technology against its benefits for public health. In turn, the EU trusted big tech - particularly "Gapple" - as these

companies had already become accustomed to treading this balance (Lanzing, Lievevrouw and Siffels, 2022). And public value was indeed delivered: without Google and Apple's (or "Gapple's") joint Application Programming Interface (API), the development and rollout of contact tracing apps would have likely been infeasible (ibid). The EU's techno-tango with "Gapple" had helped to limit the spread of the Corona virus; however, it arguably also gave these companies significant economic and political clout. By April 2020, a EU-wide approach for contact tracing apps was agreed and by May, interoperability guidelines for contact tracing apps in the EU were approved [28; 29]. Consequently, the EU Commission [28, p. II] made recommendations to move towards "a common Union toolbox for the use of technology and data". To set boundaries, the EU Commission [30, p.1] recommended that "the apps will be used only for the specifically defined purposes, that they will not be used for mass surveillance, and that individuals will remain in control of their data" (ibid). The hope was that these recommendations would contain any attempts at data-grabbing whilst "making public health prevention, surveillance, and responses more effective across a wide range of challenges" (Murray et al, 2020, p. e496).

After that initial pandemic decision to choreograph the diverse tracing apps across Europe on Gapple's API, more and more techno-tango based systems were implemented, and at a swift pace too. Proximity tracing, contact tracing and warning apps were all in development or in service by June 2020 [29, 31], and by October, the EU interoperability gateway for contact tracing and warning went live. By March 2021, the EU proposed a EU Digital Covid Cert, which was fully operationalized by June 2021 [32]. Big tech's political ascendancy during the pandemic was met with a wave of ethical, moral and legal concerns. Critics pointed out that the crisis had allowed 'techno-solutionism' to thrive whilst leaving many other challenges unresolved (Marelli, Kieslich and Geiger, 2022). These challenges are related to (1) digital technology and infrastructure, (2) the wider aspects of health system including the

nature of primary care work and culture, but also patient characteristics and inequalities, and (3) issues around data privacy, inclusion, empowerment, empathy, and trust (Pagliari, 2021). Gasser et al. (2020) mapped these ethical, moral and legal challenges onto the dimensions of privacy, solidarity, autonomy, beneficence, justice, and non-maleficence. Many of these issues, such as privacy and autonomy (Costa and Milne, 2022; Fagherazzi et al., 2020; Sekalala et al. 2020) as well as non-maleficence and justice (Leach et al., 2021; Marelli, Testa and Van Hoywegen, 2021; Naude and Vinuesa, 2021), have since been further explored. In these explorations, questions such as who creates value, who extracts it and how does the public benefit now came to the fore, pointing towards more fundamental practical challenges in choreographing beneficence and solidarity into these techno-tangoes. Data solidarity for instance concerns the broad use of data to create public value and the prevention of harm caused by this use (Kitchin, 2020; McMahon, Buyx and Prainsack, 2019). In summary, the prevailing pandemic policy imaginary was one of retrenchment into proven technologies to be deployed at scale and at speed; where privacy and other ethical concerns had once slowed down the spread of digital health technologies, now countries were topping each other when it came to achieving 'efficient' rollouts.

Still dancin': The promise of a European Health Data Space

Since the depths of the pandemic in 2021, the EU has taken action to shape the first of its Data Spaces, and it chose healthcare as a domain target. In this particular policy imaginary, a European Health Data space will "create a common space where natural persons can easily control their electronic health data. It will also make it possible for researchers, innovators and policy makers to use this electronic health data in a trusted and secure way that preserves privacy" [33, p.1]. However, as Marelli et al. (2023, p.2) have recently argued, this proposal's "aim of stimulating the European economy by granting free access to citizens' health data"

fails to re-direct the Commission's digital health choreography towards the public benefit in a significant way. Many other public commentators appear critical too. This became clear during an open feedback session from December 2020 to February 2021, in which citizens and other interested groups could 'have their say' about the European Health Data space. The concerns voiced included an inconsistent digital health roll-out in the EU, the citizen's lack of access and control over their own data, fragmentation in digital standards and the lack of interoperability [34]. An argument was made that the GDPR had caused a fragmented "processing of personal health data", "leading to obstacles" and "limited access of researchers and public institutions", thus reducing the EU's "competitiveness and innovation potential at a global level" (ibid, p.3). In response, the Commission decided to relax the rules around the GDPR [35]. Yet, as Marelli et al. (2023) argue, the risks to data privacy are now much less prominent a concern than the risk of a net loss in public value in a proposal that foresees an obligation by health professionals to share patient data in order to realise (yet another) imaginary of an 'innovation-friendly' digital health ecosystem.

Whilst the European Health Data Space is not to serve as a "big European data lake" for indiscriminate use [35, p.11], the Commission decided that changes were needed to "strengthen and extend the use and re-use of health data for the purposes of research and innovation in the healthcare sector… and to contribute to the competitiveness of the EU's industry" (ibid). In a factsheet released in May 2022, the EU promised to unleash "health data from apps and medical devices" through the EHDS whilst setting up "strict rules for the use of individual's non-identifiable health data for research, innovation" [36, p.2]. While EU citizens will have access to and control over their data, the EU has also made it clear that industry will have access to anonymized data for economic value creation, for instance to "enter into new markets" and "use the data for innovation" - as long as there is some "benefit to individuals and society" (ibid). However, in a recent report the Commission had to admit

that while the use of health data for healthcare provision (so-called primary use) is well-legislated for, regulations for the use of health data for secondary purposes and processing are currently absent [37].

To this present day, it remains unclear what public value the ad-hoc technologies that were conceived in and through the pandemic have actually delivered (Poom et al, 2020), and what trade-offs in terms of political influence were accepted as a result of big tech's pandemic involvement. Yet, heavy reliance on this type of choreographing has now become the norm, and with the EHDS, the EU seems set to continue the well-worn path of focusing on innovation benefits and market value at the potential cost of public ownership and governance of health data (Klein, 2020).

Likewise in Ireland, government officials have invited digital health companies to "help shape and influence national health/enterprise policy" [38, p.1]. In its National Service Plan, the Irish government "acknowledges its legal requirement to protect and promote the health and wellbeing of the population" but to deliver healthcare and reform as promised, the Irish state will "develop and enhance relationships with our external partners" further (ibid, p.87). In its strategy statement 2021-2023, the Irish Department of Health has thus defined techno-tangoes as a strategic priority [39], and Ireland has been advertised as the 'perfect testbed' for innovation and collaborations in Europe [40]. Accordingly, digital industry players and steering groups have declared public health to be a 'collective responsibility' [41]. Even Germany, which had treaded the digital health innovation path extremely conservatively before, has now vowed to become an advocate for techno-tangoes. With its 'fast track' health app approval process, some even believe that Germany has the 'perfect future blueprint' to become a digital public health frontrunner (Stern et al, 2020). The 2021 DVPMG (Digitales-Versorgungs-und-Pflege-Modernisierungs-Gesetz) allows app providers to 'flexibly' siphon off anonymized data to support science [40]. Lastly, in the UK, Palantir Technologies, a

company that has been outspoken about its aims to profit from war and surveillance, is tipped to win the £480m bid for the UK National Health Service's overarching data platform, despite strong critical opposition [43]. It seems that in Europe, government actors have chosen to intensify their public value choreographing around big tech collaborations [44]. Given how these moves have been well practised and reinforced during the pandemic, it seems possible that the EHDS will not only fail to finally reverse a tragedy of the digital commons in health but perhaps be the key cause of it.

Discussion

When digital health first emerged in the late 1990s, it harboured great public promises (Kraus et al, 2021). These promises were so compelling that many EU member states – and the EU itself – became 'entrepreneurial' in Mazzucato's (2013) sense, supporting digital start-ups through a vast range of entrepreneurship supports, legal and financial incentives. When the dot.coms collapsed around 2000, data-hungry platforms survived as the prevailing business models, and commentators soon became concerned about the power these technology companies were gaining (Kenney and Zysman, 2016). In the crucial flourishing period of digital health technologies between 2010-2019, their rapid consumerization was state-supported, with an entrepreneurial EU in particular focusing on investment supports on the one hand and safeguarding individual privacy through the GDPR on the other. This arguably caused state entrepreneurs to lose sight of the technologies' broader potential for creating value in public health. While the pandemic years saw a slight rebalancing toward large-scale digital epidemiology applications, this was mainly driven by big tech, and EU states have continued to normalize techno-tangoes since, despite clear warnings about digital inequalities, asymmetric power relationships and the looming tragedy of the digital commons in health. With our short historical overview, we make the case that current public value discourses in digital health cannot be constructively criticized unless we understand the path-

dependencies that underpin the expectations, practices and relationships between the state and tech companies in a dance where economic values have been persistently prioritized over public health, beneficence and solidarity.

Our research complements existing insights threefold: first, it complements research on public-private partnerships and their problematic relationship with public health through historical insights (Lanzing, Lievevrouw and Siffels, 2022; Ruckenstein and Dow Shull, 2017), showcasing that the state-led actions and inactions have set up significant path-dependencies that will be challenging to break. Second, our paper contributes to research on the assetization of health data (Birch, Cochrane and Ward, 2021; Geiger and Gross, 2021; Sharon, 2020) by highlighting that governments, at least in the EU, often facilitate such data grabbing through state entrepreneurship. Finally, our paper contributes to broader discussions around the entrepreneurial state and how it creates public value (Mazzucato and Perez, 2015). Unwrapping the imaginaries set by policymakers and individual EU member states, it has become clear that we need to carefully delineate *what* public value is created when extolling the virtues of the entrepreneurial or 'mission-oriented' public hand.

The trajectory that we have traced begs the question of whether public value for public health can now be reframed. We briefly highlight three current debates in the context of digital public health in the EU both as an agenda for future research and as building blocks for 'mindful deviation' from existing paths by creative public innovators, particularly in the light of the impending implementation of the European Digital Health Space proposal of 2022.

Re-directing Value Flows back to the Public

Mariana Mazzucato has repeatedly accused states of "socialising the risks and privatising the rewards when partnering with the private sector", a practice which, in her view, has created an "unbalanced and parasitic relationship" (Mazzucato, 2022, p.2). Mazzucato is right in

pointing out that a renewed focus on public value is vital in healthcare, and existing proposals in public value theory may be of interest in reshaping public digital health. For instance, to increase public financial value, governments need to direct some of the profits generated through techno-tangoes away from shareholders and into public purses (Bradley et al., 2022). EU states may for instance include profit-sharing clauses or conditionalities into public contracts, or a set percentage of the long-discussed digital tax could be directed toward public health. At a minimum, digital tech firms should be asked to share royalties or equity with public health bodies, which can be siphoned back into addressing digital and other socio-economic inequalities in public health. For example, the AI firm Sensyne Health has a royalty share agreement with Oxford University Hospitals in a project on finding new drug targets for Asthma through genetic sequencing data [45]. Tech firms may also be incentivised to invest in publicly-owned and governed data repositories in return for selective data access; this type of private-public collaboration has worked well in the case of the Finnish population genetics programme FinnGen. Alternatively, through procurement contracts, the state could set conditions whereby any profits gained from techno-tangoes should be reinvested into R&D for longer term benefit, for instance into AI or machine learning technologies that truly serve the public healthcare system.

Public value beyond financial returns

Moving beyond economic value, public value theorists often propose an exercise in 'public value mapping' (e.g. Bozeman and Sarewitz, 2011; Slade, 2011). Such mapping exercises drill into specific and if possible measurable value elements, which are always context-specific. Prainsack and colleagues too have recently developed and launched a 'data solidarity' mapping tool, a publicly available software tool for measuring public value of specific data initiatives (El-Sayed and Prainsack, 2022). It is vital that all stakeholders are

involved in these mapping exercises, prominently including patients and healthcare providers, but also a large cross-section of the wider public, with a specific focus on potentially under-represented populations. In Ireland, for instance, in the wake of a number of scandals involving public-private collaborations through genetic data, a citizen jury took place in relation to health data sharing in 2021, with concrete recommendations as to how data sharing with private companies should be governed in future (Galasso and Geiger, 2023). Following such mapping exercises, public and patient governance and oversight mechanisms need to be established to ensure that public value is realized. Rather than continually 'fixing' the excesses of tech firms' data assetisation, by systematically introducing and enforcing such public mapping and governance, the state would become truly 'entrepreneurial', re-directing the digital health choreography toward an enlarged conception of *public health value*.

A Commons-based Approach to Health and Data

Equitable and affordable access to digital health is clearly important, and the two proposals above may not go far enough in rebalancing the share of public versus private value created in these collaborations. A growing number of scholars have thus been advocating for the establishment of digital data and information commons (e.g. Prainsack, 2019; Prainsack et al. 2022; Braun and Hummel, 2022; Galasso and Geiger, 2023). A commons-led approach means that property rights are jointly held by a group of people who can exclude others from using, governing and accessing the (data) resource. For instance, commercial players could make available the digital epidemiological data they collect to governments and policymakers, so public benefits can be derived (Lippi, Mattiuzzi and Cervellin, 2021). Or commercial and public organizations could provide disadvantaged groups and countries with access to digital tools, technologies and data, so that they can improve their public health infrastructure (Budd et al, 2020). This can be done via data-sharing pools, data cooperatives

or public data trusts (Micheli et al, 2020). An alternative to a commons-based approach is an open access regime, where resources "are not owned by anyone" and no property rights are being recognized (Prainsack, 2019, p.3). Fagherazzi et al. (2020) advocates for data sharing when it comes to digital tools providing public health benefit. Both a commons approach and open access essentially act as an antithesis to the commodification of healthcare (Gasser et al, 2020) by stemming assetization opportunities. This may also reign in any political influence that big tech has gained through their pandemic involvement.

We are aware of the practical difficulties attached to digital commons. Unlike physical commons, digital commons can exist in multiple places at once, which can make their governance challenging (McMahon, Buyx and Prainsack, 2019). Moreover, not all digital commons or open access strategies will work to address digital inequalities. Notwithstanding these practical challenges, it is vital to pay systematic attention to the issues of ownership, exclusion and public value of digital data as they are created and/or harvested both at the individual and the health systems level (Prainsack, 2019). Commons-based approaches embed data solidarity and data justice firmly at their centre (Braun and Hummel, 2022), and therefore these are important vehicles for new EU digital health policy imaginaries that are unmoored from their traditional focus on fostering private entrepreneurship and innovation.

Concluding thoughts

All public policies in the EU are shaped by imaginaries of public value, but it is only by making these imaginaries and value discourses explicit and laying them out for public scrutiny that historical path dependencies can be broken. History matters in current policy decisions, but history does not overdetermine them. The post-pandemic era can serve as an important inflection point, an opportunity to take stock and imagine digital public health afresh for new path creation or at least mindful deviation from well-worn paths. An

orientation towards the public good should be more than a corrective measure; it should be a core objective for any 'entrepreneurial state'. This will require policymakers and local governments to question who produces what value in digital health and who extracts it. We hope that our directions for future research give some guidance as to how the intersection between digital health and public value can be re-imagined going forward.

Notes

Numbers in square brackets refer to sources in the Supplemental Materials file.

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