

Experience and Expectation: Digital health implementation in Portugal as present-making via futures imaginations¹

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Abstract

Traditionally, anthropological analysis has placed emphasis on traditions, customs, and cultural heritage, often overlooking the connection between present actions and future aspirations. Acknowledging the reciprocal influence of present actions in shaping the future and the impact of future visions on shaping present actions, this article aims to redress the neglect of future implications on present social practices within anthropological studies.

Through an investigation of the implementation of digital health in Portugal, utilizing discourse analysis, qualitative examination, and critical reflection, this study delves into the impact of digitization on sociotechnical systems within healthcare. It also introduces concepts pertinent to the anthropology of the future and methodological propositions for studying the future within the present context. This inquiry explores the sociotechnical imaginaries stemming from the conceptualization of digital health ideals and their realization in present contexts.

Aligned with Koselleck's philosophy of historical time, this examination reveals an essential interplay between present actions and future consequences, advocating for an anticipatory approach in anthropology. This method seamlessly integrates future considerations into present realities, augmenting our understanding of social dynamics and fostering a forward-thinking perspective. This perspective is particularly valuable for scrutinizing the intricate political economies of techno-scientific promises fostered within innovation-oriented endeavours.

The analysis, conducted across three dimensions—the utilization, reconfiguration, and evolution of the healthcare system through digitalization—highlights the intricate relationship between current healthcare practices, future aspirations, and the transformative impact of digitalization.

Keywords: Future in Present; Social Imaginations; Digital Healthcare; Anticipatory Anthropology; Sociotechnical Systems

Introduction

Since its inception, anthropology sought to know how humans foresee the future to manage their contemporary practices. The way how humans deal with temporality is a traditional anthropologists' quest which has been approached giving primacy on how the present is shaped by the past and neglecting how it is shaped by the imaginations about the future. This etiological preference is necessarily bound to ontological specificities of human history, that is, it is explained by the primacy given to experience as a means to explain particular historical phenomena.

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Traditional anthropological inquiry predominantly emphasized the influence of the past on shaping the present, attributing significance to experiential knowledge in explaining historical phenomena. However, this focus often relegated the future to the periphery of anthropological concerns, labelling it as a 'displaced temporal topic' (Munn, 1992, p. 116).

Gell's study of temporal cognition unveils a pivotal triangular connection among perception (input), memory (schema recall), and anticipation (foresight, projection) (Gell, 1992). This triangular framework illuminates the intricate relationship between memory and anticipation. Within this interstice lies the convergence of future imaginings and past mappings into perception—a space we recognize as the present, where perception unfolds. The present acts as the focal point, the vital vertex in this triangle, where the amalgamation of past and present coalesce into the actionable facets of social life.

The simultaneous existence of diverse temporal dimensions gives rise to a dense and intricate multitemporal configuration known as heterochrony (Ssorin-Chaikov, 2006). Every present action is inherently heterochronic, embodying a complex form that intertwines memory and anticipation, or experience and expectation. This concept aligns with Koselleck's (2004) philosophy of historical semantics, where actions in the present encapsulate a fusion of experience and expectation.

As a critical starting point, the present becomes a tool to scrutinize both past and future promises (Appadurai & Alexander, 2019). This implies that incorporating the future into our investigations isn't about validating the present through a teleological future, but rather, it's about recognizing the future's potential to challenge our perceptions of the past, transforming our identities and histories (Collins, 2021, p. 129). Integrating the future into anthropological studies can reshape our comprehension of current practices, influenced by both experience and expectations. Consequently, questioning past facts and future promises necessitates a critical analysis of present behaviours, which, while not wholly shaped by them, still mirror past influences and play a role in shaping (and being shaped by) future outcomes. The inverse is also true: critically questioning present behaviours implies performing a critical analysis of past facts and future imaginations.

However, this evidence has been somewhat overlooked throughout anthropology's history (and perhaps still in the present). Anthropology has often been confined by reliance on experience and has seldom delved into comprehending anticipative systems of truth, resulting in a double confinement (Appadurai, 2013). The focus on "pastness", encapsulating anthropology's fixation on the logic of reproduction, customary influences, memory dynamics, habitual persistence, everyday routines, and traditional subtleties within social life, has led to a narrow perspective on a multifaceted social reality that exists simultaneously across different spatial points (Appadurai, 2013). A parallax view of social reality offers a means to gain perspective and identify the standpoint from which reality can be perceived and constructed.

To follow this line of reasoning, this article will first introduce some lines for conceptualization and methodological insights regarding the anthropological theorization and study of the future in the present. It will subsequently explore the impact of envisaged sociotechnical futures on present behaviours by displaying perspectives and firsthand accounts illustrating how the future influences the present, drawing from interviews with prominent figures involved in

implementing digital health initiatives in Portugal. Departing from this case, the article ends with a reflection on the present-making of sociotechnical systems via futures imaginations.

1. Navigating present realities via future imaginations: vocabulary and methodological considerations

The interaction between 'experience' and 'expectation,' as highlighted by Reinhart Koselleck, constitutes an inseparable conceptual duo, with one reliant on the other (Koselleck, 2004). Experience unfolds within a defined space, while expectation extends towards a horizon. This metaphorical horizon signifies that our perceptions are bound by our past experiences, thereby shaping our expectations for the future. Consequently, any conception of the future is inherently influenced by our current understanding, leaving room for error and ineffability.

This conceptual framework is significant as it elucidates that every project encounter inherent pathologies that hinder their optimal effectiveness (Boutinet, 1990). The acknowledgment of our bounded perceptions and limited anticipations underscores the challenges faced in envisioning and executing plans or projects. And this is paramount when look to and analyse experiences and promises (Joly, 2020).

As per Koselleck (2004), experience and expectation, regarded as anthropological data, serve as fundamental elements shaping possible histories. They are inherent aspects of human existence and development. Past, present, and future intertwine as objective intersections of contingent material-semiotic structures (cf. Law, 2019).

Adams et al. (2009) assert that the future exists solely in the present moment. It influences the present in qualitatively distinct ways from how the past shapes the future. The future isn't merely a technical or neutral space; rather, it's ignited by emotions and sensations (Appadurai, 2013). It's expressed, tamed, commercialized, and colonised (Adam & Groves, 2007).

The future harbours specific visions, encompassing multiple potential outcomes in the present, leading to inclinations toward uniformity and dominance where certain future images prevail over others (Pels, 2015). The dominance of certain particular imaginations leads to the privatisation of hope (cf. Thompson & Zizek, 2013), shaping certain regimes that dictate the future's contours, effectively trapping it in the present (Strathern, 1992). This notion underscores that potential futures are influenced by prevailing forces in the present, culminating in a sociotechnical lock-in—a system perpetuating a specific social reality according to the interests of its designers. Within this context, several issues arise, including the illusion of scientific freedom.

The previous notion complements the idea that individuals engage in exploring the relationship between experience and expectation in their daily lives (Rosenberg & Harding, 2005). Building upon these concepts, it becomes evident that how individuals navigate these explorations is influenced by entities gaining advantage throughout the design process, reinforcing the concept of sociotechnical lock-ins. Contemporarily, these lock-ins are orchestrated by an anticipation framework in which digital technologies hold an edge due to their capacity to gather, analyse, and employ data in algorithmically driven programs—an advanced form of anticipatory scrutiny (Adams et al., 2009). These anticipatory audit regimes are tools used to pre-configure futures,

and, owing to various escape mechanisms (Appadurai, 1996), they exhibit a "culturally and biopolitically transnational" nature (Adams et al., 2009, p. 248).

Anticipatory audit regimes are closely linked to the Ulrichian concept of a risk society. Auditors invoke the notion of risk to persuade others to accept elite-driven future designs and adapt behaviours to prevent future crises. This utilization of audit culture in anticipating crises manages fear, constructs specific emotional responses, leading to a particular affective economy (cf. Ahmed, 2004), underpinned by a psychopolitics that persuades individuals to passively adopt these behaviours (Han, 2017).

An affective economy of this nature would enhance various facets of anticipation, encompassing injunction (a morally endorsed imposition), abduction (the methodology of anticipation), optimization (the securitization of an ideal future for each individual), preparation (prevention), and possibility (the chance to anticipate what was previously unattainable) (Adams et al., 2009). These dimensions operationalize anticipation, translating speculative ideas into practical actions, thereby materializing possibilities. Both the grand future (pertaining to the planet, humanity, life) and the small futures (pertaining to individuals) are shaped by an ethics rooted in specific narratives (such as the risk society or security), encompassing particular moralities. These moralities, in turn, operationalize an affective economy that drives and sanctions a specific form of biopolitics.

Understanding these concepts is crucial to comprehend the future as a subject of study. They enable us to perceive the future in its diverse and observable forms in the present: the future is expressed, tamed, commercialized, designed, transformed, intersected, contemplated, nurtured, transcended, contested, challenged, and more (Adam & Groves, 2007). Each of these expressions represents tangible manifestations of the future in the present. The challenge lies in how to effectively study it. Subsequently, I will outline some methodological principles or concepts that might aid in studying the future in the present.

The study of the future within anthropology has evolved through two significant phases. Initially, the focus revolved around predicting destinies by examining how various social groups interacted with and approached the future.³ However, a more recent phase emerged, especially influenced by the securitization policies that gained traction post the 9/11 crisis in the early 21st century.

³ Several notable exceptions stand out as instances where anthropology has engaged with the study of the future. However, these have primarily focused on envisioning the future rather than examining how the future actively shapes the present, as advocated in this article. Margaret Mead's work represents a significant example of such engagement, notably her seminal piece "The Contribution of Anthropology to the Science of the Future," published in 1971. Mead's approach predominantly centred on forecasting futures. This essay was featured in a volume edited by Magoroh Maruyama and Arthur Harkins in 1978 (Maruyama & Harkins, 1978), where the exploration of the future centred on diverse cultural perspectives on its conception. A compilation of Mead's essays was later assembled by Robert Textor in 2005 (Mead, 2005). Regarding the study of temporality, scholars like Johannes Fabian (1983), Collins (2008), Pels (2015), among others, have made significant contributions. Despite these works, a comprehensive theorisation of various approaches to studying the future within anthropology was yet to be fully articulated. It was Arjun Appadurai's work, particularly "The Future as Cultural Fact," that bestowed theoretical coherence upon the subject of the future in anthropology (Appadurai, 2013). However, it is important to notice that even this work primarily adopts a culturalistic perspective, overlooking the potential of the future to actively shape present actions (Pink & Salazar (2017).

Over time, growing concerns regarding the consequences of the Anthropocene on the biosphere have propelled discussions about the future to the forefront of both social sciences and Science and Technology Studies (STS) analyses. Consequently, the future has now assumed a predominant position within contemporary discourse.

Themes such as risk assessment, the audit culture, strategic planning, as well as responsive research and innovation, vividly illustrate how both the present and past exert substantial influence on the future trajectory of humanity and the biosphere. These social actions also serve as tangible demonstrations of how the future intricately impacts the present, shedding light on the complex interplay between various temporal dimensions.

An anthropology that delves into future possibilities within the present necessitates addressing emergencies (Maurer, 2005). It should strive to be interdisciplinary yet grounded in anthropological principles. This approach ought to steer clear of exclusive cultural perspectives, recognising that the future in the present pertains not only to individual concerns but also encompasses issues pertinent to the broader human species. This conceptualization aligns with the classification distinguishing between the macroscopic 'grand future' and the more localised 'small futures.'

Building upon the earlier conceptualisation of the future in the present, it is important to address certain nuances that might impact the effectiveness of our selected methodology and field approach. Below, I outline twelve principles that necessitate careful attention to conduct comprehensive research.

1. Acknowledging the undefined horizons beyond the present: acknowledging the perpetual undefined horizons beyond the present situation has always been intrinsic to human experience (Crapanzano, 2003), urging a focus on present-day practices to explore the intangible nature of the "not yet". Effectively, it's important to recognise that the future isn't solely imagined but also actively constructed in the present, constituting an essential experiential dimension (Ringel & Moghaddari, 2020; Adam & Groves, 2007). Understanding the multitemporal nature of the present is crucial. Contemporary times, characterized by novelty and constant change, discourage fixation on the past, prompting a mobilization of expectations and discouraging inaction in the present (Collins, 2008).
2. Approaching the 'not yet' through present-day practices: the "not yet" lacks empirical reality and isn't directly open to empirical study. Therefore, we should approach it through examination of present-day practices and actualities (Rosenberg & Harding, 2005). Recognizing that cultural futures are pivotal in shaping critical reflections about the present is crucial, acknowledging that this understanding forms the foundation of critical reflection about current circumstances (Collins, 2008).
3. Challenges in studying the future: the study of the future requires the application of social and cultural analysis methods and techniques (Savransky et al., 2017). However, studying the future is methodologically challenging due to the absence of direct experience (Bryant & Knight, 2019).
4. The anthropological study of the future involves cultural and a-cultural configurations: recognizing that the anthropological study of the future involves both cultural and a-

cultural configurations is essential (Appadurai, 2013; Salazar et al., 2017). Understanding that regimes of anticipation of futures are culturally and biopolitically transnational is crucial (Adams et al., 2009).

5. Comprehensive study enhances understanding of the present through a backcasting process: recognizing cultural and transnational aspects of anticipation informs critical reflections on current circumstances (Salazar et al., 2017; Adams et al., 2009). A comprehensive study of the future enhances our comprehension of the present through a backcasting process, analysing how future images influence present behaviours (Persoon & van Est, 2000).
6. Researchers from diverse cultures and disciplines engaging in the study of the future: the capacity to aspire is culturally embedded (Appadurai, 2013), so, to comprehensively understand the future in the present, it's crucial for researchers from diverse cultures and scientific disciplines to engage collaboratively in its study (Appadurai, 2013; Stoller, 2017; Maruyama & Harkins, 1978).
7. Shifting towards a cybernetics-inspired framework and new humanism: embracing a new humanism becomes imperative, shifting from the principle of natural ontology, which assumes metaphysical boundaries between matter and memory, individuals and objects, towards a cybernetics-inspired framework animated by material-semiotic structures and more-than-human commons (Wentzer & Mattingly, 2018; Dupuy, 2008; Law, 2019; Bresnihan, 2015).
8. Anthropology of the future necessitates critiquing models and considering anticipatory evocations: an anthropology of the future in the present entails engaging in an anthropology of emergency guided by a methodology of surprise, surpassing merely descriptive phenomenological and ontological approaches. It necessitates the anthropologist's involvement in critiquing the models for constructing futures within the co-design process, considering anticipatory evocations of diverse assemblages (Maurer, 2005; Salazar et al., 2017).
9. Differentiating between grand and small futures and acknowledging emotional articulation of futures: differentiating between grand and small futures acknowledges metanarratives and everyday imaginings (Rosenberg & Harding, 2005), while considering futures as emotionally articulated spaces (Appadurai, 2013). It's crucial to grasp that the future isn't a purely technical or neutral space; it's invoked through emotions and sensations. Acknowledging that the temporal context of the present situation is shaped by temporal horizons and images of the future adopted by various involved parties in the present is fundamental. These representations are partial images of the future in the present (Persoon & van Est, 2000), influencing social planning and potentially succumbing to commercialization (Adam & Groves, 2007).
10. Social engineering and acknowledging the contingent nature of the future: it is important to recognize that sociotechnical planning, often termed social engineering, serves as a political instrument aimed at regulating lives. Its primary intent is to create a standardized world and control the potential variations within that framework (Boulding, 1978). Acknowledging the contingent nature of the future allows for the

evolution of its imaginaries, demanding humility, risk-taking, and public engagement in its study (Stoller, 2017).

11. Analytical value of precepts: it is important to acknowledge that precepts hold analytical value as concepts, representing a novel class of ideas projected towards a future lacking theoretical and rational precedents but rooted in aspirational elements (Pels, 2015).
12. The dominance of specific future images and privatisation of hope: recognizing that the future nurtures distinct imaginations, coexisting with a multitude of futures in the present, entails the tendency for certain images to dominate over others, fostering hegemony and domination (Pels, 2015). It's crucial to acknowledge that the dominance of specific future images over others leads to the privatisation of hope (Thompson & Zizek, 2013), fostering the emergence or strengthening of totalitarian regimes where corporations or governments dictate the terms of the future, confining it within present constraints (Strathern, 1992).

Having these principles in mind, understanding the futures within the present requires adaptable methodologies that emphasize the tangible interplay between past, present, and future across diverse cultural landscapes. Below, various methods shed light on the immediacy and tangibility of envisioning the future in anthropology with which anthropologists are familiar.

- Immersive Ethnographic Exploration: Deeply engage in ethnographic fieldwork to grasp how societies actively shape their future within present cultural contexts. Employ participant observation, interviews, and document analysis to capture real-time perceptions and future preparations.
- Temporal Analysis: Apply historical methodologies to dissect the contemporary evolution of future-oriented thought within specific cultures or societies. Analyse present-day narratives, texts, and artifacts to uncover the ongoing evolution of future conceptions.
- Exploration of Present-Future Scenarios: Utilize methodologies from futures studies to envision and analyse potential trajectories of the present manifesting into the future. Blend qualitative and quantitative approaches to visualize multiple scenarios influenced by present social, cultural, and technological dynamics.
- Critical Evaluation of Future Narratives: Utilize critical discourse analysis to scrutinise language, media, and narratives surrounding the immediate future. Investigate how power structures shape contemporary future imaginaries, emphasizing whose perspectives are highlighted or overlooked.
- Creative Engagement and Imagination: Employ creative techniques like cultural probes or speculative design to elicit imaginative responses to the immediate future. Utilize artistic, visual, or interactive tools to stimulate discussions and reveal implicit attitudes towards present visions of the future.
- Participatory Present-Future Workshops: Engage communities in collaborative workshops or co-design sessions to envision their desired immediate futures. Encourage dialogue and co-creation of future scenarios, providing a platform for diverse present perspectives and aspirations.
- Continuous Observations and Temporal Trend Analysis: Conduct longitudinal studies or trend analysis to examine ongoing shifts in societal attitudes, behaviours, and aspirations

concerning the present and its immediate future. Use quantitative data to track evolving trends in contemporary future-oriented thinking.

- Comparative Present-Future Ethnography: Employ multi-sited ethnography to contrast and compare diverse cultural perspectives on immediate present and future visions. Explore varied contexts for a holistic understanding of the current landscape of immediate future imaginaries.

As stated before, an applied anthropological approach is paramount for the comprehensive examination and analysis of how the future materialises in the present. Anthropologists wield a crucial role within multidisciplinary teams, actively contributing to projecting and planning future scenarios. Their involvement empowers them to participate actively in shaping the future, highlighting the importance of inclusivity and a watchful eye on potential limitations or shortcomings in projects. This proactive engagement fosters a mindset of precaution and forward-thinking anticipation.

Collaboration stands as an essential element, acknowledging that no single expert can entirely claim authority over the future. The nature of futures remains partially obscured, making it impossible to predict the definitive best scenario or method to understand how the future unfolds in the present. However, this very uncertainty among researchers provides an open field for experimentation, allowing for the exploration of specific subject nuances and insights.

2. The digital transition in healthcare as the future in the present: the Portuguese case

One of the most pivotal domains for exploring the future in the present is sociotechnical innovation. I opt not to segregate the "socio" from the "technical" because, in this context, the social and technical dimensions are inherently intertwined. As revealed by the Actor-Network Theory, there exists no assemblage where human and non-human elements are entirely distinct entities (Latour, 2005). The concept of the nano-bio-info-cognitive nexus (Dupuy, 2008) elucidates the interconnectedness of all forms of life and non-life through a cybernetic unity. Consequently, metaphysical and ontological boundaries dissolve. This post-humanist perspective enables us to shift our focus from individual beings to systems, uncovering the more-than-human foundation, sometimes referred to as alterontology (Papadopoulos, 2018).

Through these concepts, the evolution of innovative sociotechnical systems necessitates an epistemic transformation that moves beyond the pure forms Latour (1993) once contemplated and highlights the imperative of addressing multitudes. These multitudes are composite and selectively evolve, implying that no singular chain of being is isolated from others; therefore, it cannot be comprehended as an objective realm in itself. An alterontologic approach empowers us to perceive practices as interconnected devices that shape forms of life characterised by the interplay between the social and the material, aiming to generate novel practices, knowledge, and technologies (Papadopoulos, 2018, p. 19).

The cybernetic nexus imparts logic to every arrangement, excluding ontological specificity from policy considerations to prevent adverse consequences for entities situated beyond ontological borders. Projecting beyond this nexus exacerbates the likelihood of risks. This serves as a vivid example of how projecting the future necessitates transforming the present. Contemporary political processes must inherently configure modes of knowledge and action based on evidence

illustrating how human actions reverberate across multiple worlds, influencing outcomes on a global scale.

The illustration of the transformative impact of the cybernetic nexus on current realities is evident in the implementation of digital health systems, whether in Portugal or abroad. A significant shift can be observed in policy development, now contingent upon the inclusion of stakeholders representing diverse socioecological spheres of action, termed as political subsystems (McCool, 1998). This approach ensures that instrumental constituencies—those who are the end-users of policies—are now actively integrated into the policy design process (Béland et al., 2018). Consequently, the entire ecosystem is engaged in envisioning future trajectories—a process that unfolds in the present. This exemplifies how the anticipation of digital health advancements in the future contributes significantly to the ongoing processes of policymaking, societal discourse, and technology development in the present context (Lösch et al., 2019).

In the following section, I aim to delve into the perspectives of a segment within the Portuguese political subsystem responsible for shaping the digital transformation in healthcare. Through observations and interviews, I endeavoured to gain insight from various stakeholders within this subsystem, seeking their perspectives on the anticipated impacts stemming from the implementation of digital health in Portugal.

The sample comprises individuals from three distinct stakeholder groups involved in shaping the Portuguese digital health system: advocacy coalitions, including politicians and technology developers; epistemic communities, consisting of researchers and philosophers; and instrumental constituencies, a relatively new group representing healthcare service users. These individuals encompass expertise from diverse scientific and non-scientific domains such as logistics, information systems, medical practitioners, business leaders, politicians, and various societal actors.

I aim to present their diverse visions of the future without compartmentalising them based on functional ontology. The premise underpinning this approach is the recognition that these three stakeholder groups collaboratively contribute to the creation and co-creation of technical and societal solutions. These solutions hold the potential to transform into specific policies governing the functionality of the digital health system.

Throughout the design process, stakeholders' perspectives and inclinations are articulated, deliberated upon, and eventually synthesised into a cohesive discourse coalition. This coalition gradually evolves into a proposed framework for policy-making, integrating perspectives from all stakeholders involved (see Howlett et al., 2015; Mukherjee & Howlett, 2015).

In line with the theoretical framework outlined earlier, we postulate that the anticipated impacts of implementing digital health are distributed across two intertwined dimensions: experiences and expectations. The first hypothesis posits that the current design of the digital health system will illuminate the realm of experiential spaces, addressing contingencies such as available resources, structural constraints, and other practical considerations. The second hypothesis suggests that certain expectations horizons will emerge, unveiling the realm of the imaginative, encompassing new needs, desired futures, and other aspirational elements.

The data analysis yielded a total of 69 registration units pertaining to future scenarios in digital health, categorized into three main areas: Utilization of the system, Reconfiguration of the

system, and Evolution of the system. The number of references within each category signifies the relative significance of the concerns. Notably, respondents expressed a higher number of concerns regarding the Utilization of the system (26 references), followed by concerns related to the Reconfiguration of the system (22 references), and lastly, concerns surrounding the Evolution of the system (21 references).

Each main category further unfolds into three subcategories. Within the Utilization category, concerns predominantly revolved around Access to health services (16 references), followed by Digital capacitation (7 references), and Inequality (3 references). In the Reconfiguration category, concerns were observed regarding the Management and governance of the system (11 references), Inventiveness (7 references), and New medicine (4 references). Lastly, the Evolution category encompassed concerns regarding Social innovation (8 references), New collaborative arrangements (7 references), and Biocommunicability (6 references).

These subcategories are substantiated by specific evidence, serving as indicators that help identify observable elements contributing to the broader issue of 'expected impacts of the implementation of digital health in Portugal.' Table 1 provides a comprehensive enumeration of the concerns related to this issue, which I will discuss in detail in the following sections.

Overall, the informants revealed to be concerned about thirty-three issues related to healthcare system digital futures.

2.1. The utilisation of healthcare as a matter of concern⁴

The participants expressed significant concern regarding access to healthcare, particularly focusing on the evolving relationship between citizens and healthcare services. These changes encompass active user involvement in various aspects, such as participating in healthcare policies, actively engaging in monitoring, preventing, and early detection of health conditions, and emphasizing concerns about well-being and overall quality of life.

It is widely acknowledged that the various forms of user engagement within a digital health ecosystem are "particularly influenced by demographic characteristics" (MH). As demographics are intricately linked with cultural phenomena, digital health landscapes will inevitably be shaped by cultural nuances. These nuances encompass proximity to healthcare services, accessibility to technology, and proficiency in digital competencies required to manage diverse health-related aspects like "personalized nutrition, utilizing artificial intelligence systems, physical training, and preventive measures for neurological issues, among others" (MH).

The anticipated and realized practices of prevention and monitoring are discernibly different from those associated with the "digitalization of aspects of quality of life for individuals not afflicted by illness but seeking to enhance their living conditions," as articulated by MH. The advent of digital transformation has brought these novel concerns to the forefront of the design process. These emerging behaviours constitute "an increasingly prominent area for preventive measures within medical systems, particularly intertwined with digitalisation and the utilization

⁴ In defence to the ethical condition of anonymity, all informants will be named by acronyms.

of extensive data based on the One Health framework, emphasizing comprehensive health, crucial for maintaining optimal quality of life" (MH).

Table 1: Inventory of Stakeholder Concerns

Categories	Subcategories	Indicators
Utilization (26 references)	Access (16 references)	• Change in the relationship between citizens and healthcare services (participation; monitoring; prevention; early detection; well-being; quality of life) • Adoption of technologies (cultural change; habit change) • Citizen-centred care • Reduction of geographical constraints (telehealth; telemedicine) • Democratization of access • Validation of information
	Capacitation (7 references)	• General literacy • Digital literacy (of citizens and healthcare professionals) • Comprehensive health education
	Inequality (3 references)	• Info-exclusion • Social exclusion • Geography
Reconfiguration (22 references)	Management and governance (11 references)	• Regulation (certification; co-payment; smart public procurement) • Data economy • Healthcare unit management (optimization of management processes; resource allocation) • Company management (new production methods; inclusion of other specialists)
	Inventiveness (7 references)	• Technological advancement (invention; innovation) • Technological employment (human resources)
	New medicine (4 references)	• Personalization • Humanization • Medical Profession (training; hybridism)
Evolution (21 references)	Social innovation (8 references)	• Participation • Intergenerational dialogue • Active aging • Age-Friendly Environments
	New collaborative arrangements (7 references)	• Responsibilisation • Co-creation • Multidisciplinarity • Consortia • Technical interoperability (data infrastructure)
	Biocommunicability (6 references)	• Social interoperability (service integration; interaction between stakeholders) • One Health • Cultural diversity

It's interesting to note that healthcare-related behaviours are being reshaped to incorporate lifelogging aspects that impact individuals' health but aren't linked to any specific disease or ailment. This shift blurs the boundary between what is considered normal and pathological.

Access to healthcare services now encompasses not just seeking assistance but also intertwines with the pursuit of an overall enhanced quality of life.

This evolving landscape heavily relies on the ubiquitous presence of technology. To enable this paradigm, a logistical apparatus is indispensable. This apparatus plays a fundamental role in establishing a framework that actualizes digital health. A key concern for current technology developers revolves around data interoperability and accessibility. For instance, the digital application SNS24, a public health system application, serves as the primary interface for individuals to access their clinical history and other healthcare service functionalities.

The adoption of such technology is more a product of cultural integration than a mere assessment of utility, as highlighted by a user:

"I use it, but why? I don't know. It's more about culture, really. It's become a habit because I've grown accustomed to it, and now, I wouldn't want anything else. Why should I bother a friend who's a doctor to change the prescription? I simply input it, and in two hours, I have the prescription delivered via SMS [text message]. Sometimes even faster, even better" (RJG).

The healthcare access culture is also perceived from a service management perspective, wherein the digital interface "reduces administrative burden for healthcare professionals [thus] must be prioritized. If we can liberate this valuable time for healthcare professionals to focus more on the individual, it's already a significant advantage" (PNA).

There's a growing recognition that "individuals are seeking alternative ways to engage with healthcare and healthcare services" (HM), such as the present and future utilization of "telehealth" (LGP). In this regard, digital health holds the potential to broaden healthcare access for individuals residing in remote geographical areas. As LRL emphasizes, "through telemedicine, we now have the capacity to conduct interventions in remote locations like in Africa, which wouldn't have been feasible without such access."

Digital technologies and applications serve as catalysts in encouraging individuals to take a more active role in managing their own healthcare. In this evolving landscape, the emphasis on the human touch in healthcare is shifting, with HM noting, "perhaps what truly matters isn't the physical contact between doctor and patient, but rather the establishment of a therapeutic relationship based on trust. This connection might well serve as the hallmark of quality within healthcare."

As a result, telehealth emerges as a pivotal tool, not only expanding healthcare accessibility for remote populations but also redefining the essence of patient-doctor relationships, underscoring the significance of trust and therapeutic rapport over physical proximity.

The digitalization of healthcare operates as a democratic force and a mitigator of inequality, effectively blurring and mitigating structural and geographical disparities, identified as primary concerns (LGP). By pre-emptively addressing citizens' needs, the digital landscape aims to circumvent situations where less-capable individuals have to actively request actions. As an illustration, LGP notes the advent of pre-filled income tax forms, which significantly streamline an operation that previously demanded substantial effort from the majority.

In establishing trust in digital healthcare access, the validation of data stands as a pivotal factor. Reflecting on the infodemic during the COVID-19 outbreak, MH underscores the challenge:

"The general populace often fails to recognize that dialogue among individuals with differing opinions is a natural part of discourse. However, the common expectation is for a single truth to prevail. Science, inherently seeking truth, sometimes grapples with complexities, relying on dialogue and validation of various hypotheses. Throughout the pandemic, diverse scientific perspectives surfaced in different media, often causing confusion among the public about what constitutes truth in such scenarios."

Therefore, the level of involvement in digital healthcare is not solely reliant on technical or scientific expertise; it is fundamentally a socio-cultural matter built upon trust. The critical imperative lies in establishing trust within the system, requiring access to verified and reliable information. Ultimately, the successful adoption of these technologies hinges upon this foundational factor of trust, as underscored by MH. As PCF aptly points out, "ultimately, if people do not embrace it, that technology becomes futile."

The socio-cultural aspect is of paramount importance. As PCF points out:

"Many solutions in hospitals and healthcare institutions are driven by the IT department, often disregarding the needs of doctors and patients. While professionals may utilize these technologies, lacking a comprehensive understanding, an untrained individual will struggle to convey the significance of sharing their data to a patient".

The proficient use of digital technologies by professionals remains a crucial concern. PCF suggests that sometimes, professionals lack the motivation or capability to effectively communicate the importance of digital health tools to patients. This communication breakdown underscores the necessity for collective engagement; policymakers, the National Health Service, healthcare providers, and universities should all play a role in addressing this communication gap.

If healthcare professionals fail to embrace and inform patients about digital health technologies, it could widen the digital divide and impede the entire healthcare process. The goal should be to prevent individuals from being left behind. As LGP articulates, "we cannot stifle progress out of concern for those who may not fully benefit from it. We have an obligation to ensure inclusion for all."

The fundamental issue lies in capacitation, focusing on the education and empowerment of both healthcare professionals and patients to prevent exclusion from the future of healthcare. "Education for integral health is crucial," emphasizes MH.

In this era of increasing participation from everyone, collective awareness becomes particularly critical. Beyond mere access to information, which is also constrained by technological factors, a significant challenge arises concerning the broad participation of all individuals. MH notes that doctors and healthcare professionals possess greater access to information and can leverage advanced information processing systems to facilitate medical analysis, a trend extending to citizens in general.

Empowerment in the medical realm entails harmonizing the advantages of in-person care with remote healthcare. This empowerment extends to citizens, especially the older population who

may not be as accustomed to the internet. "Education and training are pivotal, regardless of how much we navigate other solutions," emphasizes MH. Comprehensive health education is indispensable, rooted in the pursuit of fostering a scientific culture, deemed essential for individuals to acquire the ability to question effectively:

"Primarily, it's about equipping people with the skills to question. Digital health, with its vast information accessibility, doesn't demand citizens to know everything about oncological or neurological treatments. Instead, it emphasizes enabling people to ask pertinent questions, including doctors themselves. Therefore, fostering a scientific culture is essential for all, encompassing both medical practitioners and experts in other fields, to encourage inquiry and assist others in asking better questions" (MH).

The digital realm has laid bare the evident disparities prevalent within Portuguese society. As LRL highlights, "Most individuals excluded from the digital sphere reside outside major cities, are elderly, have lower literacy levels (especially digital literacy), possess fewer resources, and include women. In essence, all forms of social exclusion are exacerbated by digital exclusion." Consequently, digital exclusion intertwines with social exclusion, prompting the need to identify and integrate socially excluded groups into the digital world—a transition that also "serves as a social elevator", alludes LRL.

This comprehensive health education initiative should advocate for the "utilization of so-called disruptive technologies such as machine learning, artificial intelligence, advanced computing, cybersecurity, and blockchain", continues LRL. These technologies are crucial in configuring a digitally empowered healthcare system.

2.2. The healthcare system reconfiguration as a matter of concern

Digital health implementation initiatives necessitate collaborative efforts within consortia arrangements. Co-creation serves as a pivotal strategy to foster discourse coalitions focused on needs assessment, technological advancements, and policy formulation. Throughout this process, several crucial steps are undertaken, including technological validation, conceptualization, proof of concept, and preparation for certification. Consortia play a paramount role by facilitating idea sharing and fostering active participation. Collaborative creation emerges as a key approach through which digital health fosters novel modes of knowledge production and explores future scenarios. Embracing this collaborative spirit, organizations like TICE.pt, Digital Health Portugal, Health Cluster Portugal, alongside the Health Regulatory Entity, the Shared Services of the Ministry of Health (SPMS) and associated services, bring together diverse stakeholders to collectively design and develop innovative digital health solutions.

The State's assumption of health innovation co-payment stands as a crucial requirement for establishing a robust digital health ecosystem. This facilitates the involvement of recipients in fostering innovation through their needs not only informing designers but also incentivising the acquisition of technologies. As mentioned by PCF, "the technology itself, embedded in almost everything we do – it's IoT devices, it's bracelets, it's watches, it's clothing, will sooner or later lead to co-payment – because others cannot acquire – it will become a reality. I think it's really a matter of timing."

An entirely new logistics infrastructure is imperative for achieving data systems interoperability and the circulation of biometric data across borders and continents within digital health ecosystems. The implementation of submarine cable networks is foundational for this purpose, propelling what is now termed the 'data economy.' However, this evolution brings forth a 'data geopolitics' scenario due to varying data production and circulation regulations worldwide. As illustrated by JNF, this dynamic can be observed practically:

"If I have data that I want to share with a colleague in Germany, but if it is known that, on the way from Portugal to Germany, the data leaves the European Union heading to United Kingdom and re-enters, it could be a bit concerning because in that exit and re-entry, if there isn't a legal understanding of data protection equivalence between the European Union and the United Kingdom, the responsibility lies with whoever sends the data, for what may happen to the data when it's outside. It is important to internalize traffic... not letting what originates and terminates in Europe leave. In other words, what is naturally internal should remain internal, what is meant to leave should also have a strategy".

In order for this system to materialize, it is vital to establish and regulate mechanisms for collecting, donating, storing, and providing open biometric data. This empowers specialized companies and biomedical research projects by providing raw material to investigate and develop therapies and technologies that address genuine and urgent health issues of the population, as highlighted by HM. This necessitates considerations for biometric data commercialization, making data regulation imperative. The 'data economy' is anticipated to shape the future economy, as emphasized by LRL.

Geopolitical issues surrounding data commercialization are influencing a new biopolitics based on body quantification. Biometric data provides crucial information essential for designing and developing technologies and clinical research, notably in precision medicine and its biomedical applications. As per MH, this data holds significant economic value for healthcare agents and the public, impacting insurance systems and healthcare economics.

On a local scale, digital health adoption will optimize healthcare unit management processes, including resource allocation. This shift towards a value-based healthcare management model prioritizes the value of clinical acts for patients rather than the sheer volume performed in the unit. This optimization is propelled by digital health technologies and applications, streamlining hospital workflows, equipment management, and operating room space allocation, among other aspects, as highlighted by HM. It encompasses various facets beyond the conventional perception of 'digital health,' such as electronic records, patient apps, wearables, and information systems supporting management operations within healthcare units.

Artificial intelligence plays a pivotal role in this process optimization, channelling resources where they are most needed, as emphasized by HM. The incorporation of information exploitation significantly enhances the efficiency of audit culture, planning, and management within healthcare, fostering improved Portuguese hospital management through information utilization, as mentioned by HM.

Expanding beyond healthcare units, the integration of patient-centred visions advocated by digital health, precision medicine, and value-based healthcare golden triangle reconfigures the healthcare system holistically. This patient-centred approach is nurtured by the four-helix model of innovation, revolutionizing policy design and necessitating a bottom-up approach, as

referenced by PCF. However, barriers persist in implementing multidisciplinary consortia and recipient-centred processes, necessitating a shift from traditional top-down management approaches towards Agile methodologies.

Implementing Responsible Research and Innovation (RRI) becomes imperative, integrating social sciences into the innovation process to pre-emptively address risks and ethical dilemmas. However, barriers such as compliance with legislation, frameworks, certifications, and tax issues persist, hindering progress, as highlighted by PCF.

Despite these challenges, the business environment is undergoing significant reconfiguration. Digital health is central to the mindset of new startup entrepreneurs in Portugal, as PCF notes. Portuguese companies in digital health technology are internationalizing their production methods and products, expanding into international markets from regions like Coimbra, Porto, and Óbidos, instilling optimism about the future of Portuguese digital health, as expressed by PNA.

Still, the issue of Portuguese technological employment remains a significant barrier to digital health technology development due to its low salary policies. Retaining local technological talent becomes imperative, as emphasized by LRL. This aligns with her viewpoint that Portugal must retain qualified individuals rather than exporting them.

The health system's reconfiguration is fuelled by necessity and innovation, envisioning a new era of personalized and humanized medicine. This shift in healthcare emphasizes digitally categorizing genetic data and critical behaviours, enabling targeted therapies—a true representation of humanized medicine, as articulated by HM. This falls under the umbrella of personalized medicine, aiming to cater to each individual's unique healthcare needs, as echoed by RJG.

But, achieving this vision requires a novel medical profession—one that is hybrid. Altering doctors' curricula becomes imperative to align with this new medical profession, as summarized by HM:

"Personalized medicine doesn't stem from computer scientists. It doesn't come from geneticists. Personalized medicine arises from a medical act centred around a very simple question: Do we have detailed data about this case? Where are they? Can we create a specific treatment inspired by this detailed data we have about this patient? What technologies do we have to use this data? Artificial intelligence, visualization, dashboards?... This kind of healthcare professional, the professional of personalized medicine, is yet to be taught. Our doctors who graduate from medical schools don't think in terms of personalized medicine."

A 'hybrid professional' as envisioned by HM necessitates a blend of comprehensive clinical training and technological expertise. In this evolving paradigm, the role of a doctor transcends that of the "individual who solves the problem" (HM). Instead, the focus shifts toward empowering individuals to assume greater responsibility for their own well-being through technology-enabled self-care. This transformation envisions a collaborative approach where individuals, no longer mere 'patients,' collaborate with technologists and doctors, forming hybrid teams where recipients and their families actively participate in the therapeutic process.

However, the primary challenge persists in the availability of human resources. The formation of such hybrid teams demands extensive training for both professionals and recipients, along with their families, to acquire the necessary skills, particularly in framing pertinent questions, as previously highlighted. PNA highlights the existing gap between this vision and the current reality, emphasizing the substantial evolution required to configure such a system:

"We can't rely on the people who are already on the ground doing their day-to-day, the family doctor who sees two hundred families, or three hundred families, the ones they're assigned to, can't contribute a single minute of their time, at the expense of reducing the number of families they attend to, to be associated with or be in projects of implementation and innovation. So, when we want to innovate in the public service, in the State, and in Health, what we have to start thinking about is the human resources needed for project management, the people who will then implement these investments on the ground. And they're not there! They're not!"

2.3. The healthcare evolution as a matter of concern

Access to healthcare and the reconfiguration of healthcare systems represent fundamental shifts in the evolution of healthcare, both as a practice and a concept. Central to this transformation is the overarching theme of innovation. Within this ethos, social innovation emerges as a crucial component, highlighting the emphasis on active participation. Knowledge dissemination will play a pivotal role, transitioning from confined corporate and collegial environments to permeate through society as a whole. MH encapsulates this perspective with the following statement:

"We may have many doubts about our futures, but there is one doubt that I think nobody has, which is that we need more knowledge and a less corporate context concerning knowledge ownership and transfer – something that can only happen with more participation from everyone in this process".

To encourage widespread participation, there's a pressing need for an educational shift that transforms rigid programs and curricula into dynamic flows of information and active involvement, void of discrimination and segmentation. Educational systems must diversify and become inclusive, engaging individuals in shared destinies, pathways, and interests. This involves integrating social sciences into the realms of design and engineering, facilitating the co-creation of digital interfaces. STEM (Science, Technology, Engineering, and Mathematics) must progress to STEAM by integrating the Arts, advancing toward a green economy, and embodying the ethos of the New European Bauhaus, where aesthetics is a central pursuit. By merging STEM with social sciences and arts, the aim is to establish a genuine environment for Responsible Research and Innovation (RRI), breaking away from the dictatorship of expertise and re-emphasizing the sociocultural foundations that underpin all sciences, methodologies, and creative expressions. RJG, an informatics engineer, aligns with this approach when he says that his "role, as an area of computer science and computers, is to listen to what other colleagues in the societal area say is important and necessary to implement, and then look for existing technological solutions, adapt them, and respond".

An interdisciplinary dialogue is essential to develop a system of thinking and action aligned with the ideals of digital health. However, realizing this ideal necessitates embracing an integrative

dialogue between generations. Intergenerational discourse enriches discussions, especially concerning demographic shifts and the use of digital health services and participation. Incorporating the elderly into this process is crucial as they constitute the primary recipients of healthcare services. Encouraging active aging empowers older individuals to become active contributors to shaping a new paradigm of healthcare, shifting the focus from therapeutics and cures to prevention and personal responsibility for one's health. In this context, Active Assisted Living (AAL) programs play a pivotal role. AAL for the elderly entails 'active aging,' leveraging technology to effectively monitor individuals as they age, contributing significantly to prolonging their quality of life, as emphasized by JNF. This transition emphasizes well-being over disease-centric approaches.

Terms like 'responsibilisation,' 'co-creation,' 'multidisciplinarity,' and 'consortia' emerge as outcomes of new collaborative frameworks. These collaborative models are set to introduce new competencies, demanding higher standards, certifications, and requirements. This push towards excellence benefits companies offering products and services in this domain, as articulated by PCF. However, this ongoing pursuit remains a challenge to be addressed. As noted by PNA,

"in the law, it is foreseen that hospitals must be very proactive in terms of involving their users in the creation of services and even in their management. We have that aspect covered by law. Now, unfortunately, what happens? Most hospitals are not even there to do that participatory work of involving their users. Because it all starts from there, doesn't it? We see that information technology is merely a means to an end, isn't it? But if we first look at the users and manage to build more effective healthcare services, there might even be complete unnecessary use of digital. Of course, in practice, it doesn't turn out that way, and digital can come and help and enhance that... but what we have to do is involve citizens in the process of providing hospital services. And that is not happening yet. Or at least not in a widespread manner in all countries that I am aware of. On one hand, this is also somewhat related to... for example, not all hospitals have their users' association".

RJG's experience sheds light on the transformation within research projects, particularly the growing emphasis on societal aspects and ethical considerations. Over the past few decades, RJG has observed a significant shift in the approach to research initiatives. Notably, until approximately five to six years ago and the inception of Horizon 2020, there was minimal focus on the societal dimension in these projects. However, a notable change occurred, primarily influenced by Nordic countries such as Finland. These nations actively pressured the European Union to recognize and prioritize the societal aspect within research endeavours.

Consequently, there has been a widespread adoption of this societal dimension across research projects today. It's become a near-universal requirement that research initiatives must incorporate a robust societal component. This aspect doesn't solely entail societal considerations but also encompasses ethical concerns and other related facets, marking a comprehensive integration of these critical aspects into research endeavours.

The change highlighted by RJG is intertwined with the evolution of biocommunicability regimes as outlined by Briggs & Hallin (2007, 2010, 2016). It's crucial to recognize that interoperability, far from being solely a technical concern, possesses inherent social dimensions. For a digital health ecosystem to truly benefit everyone, it necessitates collaborative and interactive participation among all stakeholders. However, the current landscape doesn't sufficiently

support this level of interaction, hindering the realization of a comprehensive digital health framework.

Cultural factors, such as siloing or compartmentalization, hold significant importance and need to be addressed in the pursuit of establishing a functional digital health ecosystem. As LGP mentions, “established models are consistently challenged and overcome by reality”. This assertion indicates that the existing interoperability issues, which extend beyond the confines of a single hospital or institution, pose significant challenges. The complexities are exacerbated when considering broader scales such as regions, countries, or multiple nations with diverse cultures, data types, and operational procedures.

RJG further emphasizes this point, highlighting the intricate nature of data management in varying cultural contexts. The multifaceted nature of data and its handling across different regions or countries complicates the endeavour to achieve interoperability. This complexity is not confined to technical aspects but also pertains to the cultural, social, and structural diversity encountered across various healthcare systems and regions.

RJG sums up this point:

"My area of expertise is interoperability, but it's technical interoperability – but, there's a point that is fundamental for me, which is interoperability at the social level. I think it has to exist. Now, we're here understanding each other because we have that interoperability. It's got nothing to do with the technical side, it has to be compatible, or else we couldn't communicate. And I think that's very, very important. Because there's little awareness. I think there's very little sensitivity. For people to understand each other".

Certainly, cultural diversity must be a cornerstone consideration in the design and implementation of any program or project focused on digital health ecosystems. MH rightly emphasizes the importance of acknowledging and comprehending diverse global contexts, highlighting that “working within a multifaceted global landscape requires an open-minded approach rather than isolating within individual spheres”. This global diversity underscores the significance of digital health projects, which serve as bridges between disparate worlds, fostering a collective understanding of our shared existence.

The essence of One Health, particularly highlighted by the COVID-19 outbreak, underscores the need for a holistic approach to health that encompasses interconnectedness across humanity, animals, and ecosystems. Achieving such comprehensiveness and connectivity is greatly facilitated by digital health initiatives. The capabilities, inquiries, realizations, and imaginative aspects of digital health are pivotal components in enabling One Health's aspirations. The sheer volume of data that needs gathering, processing, analysing, and interpreting across vast scales becomes humanly impossible without the aid of artificial intelligence and digital health technologies.

Therefore, the dream of attaining health for all—humans, animals, and entire ecosystems—rests significantly upon the foundation laid by digital health. Without the advancements and innovations stemming from digital health, the realization of this ideal would be an immense challenge, if not impossible. Digital health serves as an enabler, an essential component in the pursuit of a comprehensive health framework encompassing the intricacies of our interconnected world.

3. The present-making of digital health sociotechnical system via futures imaginations.

Throughout the preceding presentation, we gained valuable insights into the forward-looking perspectives of digital health stakeholders regarding the future landscape of healthcare and its systems. Moreover, we observed the active involvement of these stakeholders in shaping the current landscape through the design and implementation of the digital health sociotechnical system. This intersection highlights how their present actions are profoundly influenced by their aspirations for the future.

In this section, I aim to consolidate the primary insights gleaned from the data, culminating in an article conclusion that delves into the intricate relationship between present actions and the fusion of experiences and expectations.

The stakeholders envisioned a future where healthcare utilization takes on new dimensions. Their insights and concerns have provided us with a unique opportunity to extract essential points, namely:

- Healthcare engagement is evolving: the shift in healthcare encompasses active user involvement in various aspects such as policymaking, monitoring, prevention, and emphasis on overall well-being and quality of life.
- Culture influences digital health: digital health landscapes are shaped by cultural nuances, including demographics, access to technology, and digital competencies affecting diverse health-related aspects.
- Digital Health functions as a social equalizer: digitalization in healthcare contributes to mitigate structural and geographical disparities, addressing concerns of inclusivity, democratization, and providing access to various population groups.
- Digital health implementation requires empowerment and education: the adoption and success of digital healthcare hinge on education and empowerment of both professionals and patients, emphasizing a shift toward a scientific culture and skill development in questioning and understanding digital health tools.

These main ideas encompass the evolving nature of healthcare engagement, the impact of culture on digital health, the role of technology in equalizing healthcare access, and the importance of education and empowerment in embracing digital health technologies for a more inclusive future.

Moreover, stakeholders envisaged a future characterized by a reconfigured healthcare system. These concerns can be distilled into the following key points:

- Digital healthcare systems require collaborative efforts and consortia: digital health initiatives necessitate collaboration among diverse stakeholders within consortia arrangements. Co-creation serves as a vital strategy fostering discourse coalitions around needs assessment, technological advancements, and policy formulation.
- State intervention in health innovation co-payment: the State's involvement in health innovation co-payment is crucial for encouraging innovation and technology adoption.
- An infrastructure for data systems interoperability and biometric data circulation is pivotal. The implementation of submarine cable networks is essential for a data

economy, but it also introduces data geopolitics due to varied data regulations worldwide.

- Biometric Data Collection and Commercialization: The need for mechanisms to collect, store, and regulate biometric data emerges as a requirement for biomedical research and therapy development. This data's economic value in healthcare and the importance of regulation in the emerging data economy are highlighted.
- Optimization of Healthcare Unit Management: digital health adoption optimizes management processes in healthcare units, transitioning to a value-based healthcare management model. It streamlines workflows, equipment management, and other operational aspects, including the integration of artificial intelligence for resource optimization.
- Challenges in policy implementation and innovation: the integration of patient-centred visions demands a shift from traditional management approaches to Agile methodologies. Responsible Research and Innovation (RRI) integrating social sciences into the innovation process face obstacles related to legislation, frameworks, and organizational capacities.
- Transformation of business environment: digital health is shaping the mindset of entrepreneurs, leading to the internationalization of Portuguese digital health companies. However, challenges in technological employment and talent retention persist within the country.
- Transition to personalized and humanized medicine: the reconfiguration of the healthcare system towards personalized medicine underscores the need for a hybrid medical profession. This profession requires a blend of clinical and technological expertise, emphasizing a collaborative approach in patient care.

These points encapsulate the key themes within the healthcare system's reconfiguration towards digital health implementation, reflecting the challenges, opportunities, and transformations in this evolving landscape.

Finally, stakeholders unanimously advocated for healthcare systems to evolve and adapt. The evolution of these systems can be outlined through the following key points:

- Healthcare evolution and innovation: the evolution of healthcare systems is integral to digital health implementation programs. Emphasis is placed on innovation, which drives the transformation of healthcare practices and concepts towards more inclusive, participatory, and knowledge-sharing frameworks.
- Shift towards social innovation and active participation: social innovation emerges as a key aspect in this transformation, highlighting the need for active participation from diverse stakeholders. The dissemination of knowledge is identified as crucial, transitioning from confined environments to society at large.
- Educational transformation for inclusivity: the educational system requires a transformative shift from rigid programs to dynamic flows of information and active engagement, fostering inclusivity and eliminating discrimination. This involves integrating social sciences into disciplines like design and engineering, leading to the evolution from STEM to STEAM.
- Intergenerational dialogue and active aging: encouraging intergenerational dialogue enriches discussions on demographic shifts and digital health use. Engaging the elderly

in healthcare initiatives, particularly through Active Assisted Living programs, emphasizes well-being over disease-centric approaches, promoting healthy aging.

- Challenges of collaborative frameworks: terms like 'responsibilisation,' 'co-creation,' 'multidisciplinarity,' and 'consortia' are outcomes of collaborative frameworks, aiming for higher standards and certifications. However, there are challenges in fully realizing these approaches, particularly in actively involving citizens in healthcare service design and management.
- Societal emphasis in research initiatives: research projects now prioritize societal aspects and ethical considerations. This marks a comprehensive integration of societal and ethical dimensions into research endeavours.
- Interoperability and cultural challenges: achieving interoperability in digital health is not merely a technical issue; it involves inherent social dimensions that require interactive participation among stakeholders. Cultural factors like siloing and diversity present challenges in establishing a functional digital health ecosystem.
- Importance of cultural diversity in digital health: cultural diversity is essential for functional digital health ecosystems. Addressing interoperability issues requires understanding and compatibility across various cultural, social, and structural contexts encountered in different healthcare systems and regions.
- Digital health as a facilitator of comprehensive health: digital health serves as an enabler for achieving comprehensive health, including humans, animals, and ecosystems. It significantly contributes to data gathering, processing, and interpreting on vast scales, a feat impossible without the aid of artificial intelligence and digital health technologies.

Let's take a brief moment to analyse how these fundamental concepts resonate with Koselleck's philosophy of historical time, a framework I've embraced as the foundation for contemplating the shaping of the future through imaginative foresight and the crafting of an anticipatory anthropology. Through the extensive data I've compiled, there emerges evidence of heterochrony, particularly within the context of digital health implementation in Portugal. Notably, this implementation vividly intertwines the facets of memory and anticipation, revealing that current digital integration encapsulates a fusion of both experiential knowledge and future expectations.

In relation to healthcare utilization, the evolution of healthcare engagement, cultural influences on digital health, efforts toward social equalization, and initiatives for education and empowerment align with the theoretical framework's dual dimensions of experience and imagination. The experiential dimension involves addressing existing practical considerations inherent in the current design of digital health systems. Simultaneously, the imaginative dimension unveils new needs and desired future outcomes in healthcare. The results underscore the pivotal role of cultural integration, trust-building, and education in the successful implementation of digital health. They highlight the necessity for inclusive approaches that take into account diverse demographics and technological accessibility. Furthermore, they emphasize the significance of effective communication, training, and mutual understanding between healthcare professionals and patients to navigate the digital health landscape proficiently.

Regarding the reconfiguration of the healthcare system, the ideas articulated by stakeholders effectively bridge the gap between current practical considerations and anticipated changes within the system. These ideas reflect the experiential and imaginative aspects of digital health

implementation. Stakeholders advocate for collaborative efforts and consortia as innovative models for healthcare system functioning, emphasizing state involvement in fostering innovation, enhancing infrastructures for biometric data availability, optimizing healthcare unit management, addressing challenges in policy implementation and innovation, and transitioning towards personalized and humanized medicine, especially through hybrid medical arrangements. Overall, concerns about the reconfiguration of the healthcare system encapsulate both experiences and expectations, encompassing current challenges, practical aspects, and aspirations while envisioning a future where digital health revolutionizes healthcare delivery towards a more personalized, collaborative, and technologically advanced model.

In the evolution of healthcare systems, stakeholders have honed their attention on illuminating experiential spaces, delving into practical considerations such as resource availability, structural constraints, and the imperative for innovation. This focus aims to adapt healthcare systems to the ever-evolving digital health landscape. Emphasizing social innovation and active participation encompasses experiences advocating for increased engagement from diverse stakeholders. It hints at emerging needs and envisioned futures, aligning seamlessly with expectations. Educational transformation, particularly integrating social sciences into STEM fields, aligns with these expectations. It foresees the emergence of novel educational paradigms and desired outcomes, centred on the imaginative realm of expectations. Intergenerational dialogue and active aging strategies underscore the importance of engaging the elderly and promoting their active involvement to reshape healthcare. This aligns with experiential spaces, addressing practical healthcare needs for an aging population, while also envisioning a future where seniors actively contribute to healthcare—a truly aspirational element. Collaborative frameworks present challenges that straddle experiences and expectations. They encompass practical challenges in involving citizens in healthcare services (experiential) while aiming for higher standards and certifications (expectational). Shifting research initiatives towards societal aspects and ethical considerations speaks to both realms. It acknowledges the current landscape by integrating societal dimensions into research while anticipating future societal and ethical dimensions. Addressing interoperability issues acknowledges current challenges in creating functional digital health ecosystems (experiential). Simultaneously, it envisions a future where cultural diversity is integral to digital health programs (expectational). The role of digital health as an enabler for comprehensive health mirrors both experiential and expectational dimensions. It emphasizes the present need for data gathering and processing while aspiring towards achieving comprehensive health across diverse ecosystems.

These categories – utilization, reconfiguration and evolution – transcend mere experience and expectation, serving as temporal aspects within the ongoing digital health implementation process. They comprehensively explore digital health implementation's multifaceted impact on healthcare systems, interweaving societal, technological, and cultural dimensions. These discussions intricately detail the transformative aspects of digital health, shedding light on practical facets (experiential spaces) and unveiling new needs, desired futures, and aspirational elements (expectational horizons).

By articulating these categories within the experience-expectation framework, a nuanced perspective on digital health's implications emerges. This approach effectively intertwines theoretical underpinnings with practical insights, stressing the need to address current challenges while aspiring towards future healthcare paradigms. The focus on inclusivity, societal participation, educational transformation, and technology's role in shaping comprehensive

healthcare systems underscores the study's depth in addressing the complexities of digital health implementation—a primary aim of an anthropology of the future.

Inconclusion: navigating the dynamic realms of digital health implementation

The exploration of digital health implementation aligns closely with the theoretical framework centred around the interaction between 'experience' and 'expectation'. As outlined by Reinhart Koselleck and echoed in the theoretical underpinnings, our perceptions of the future are intricately shaped by our past experiences. This nuanced understanding resonates throughout the analysis of healthcare's utilization, reconfiguration, and evolution within digital health initiatives.

The experiential dimension within the theoretical framework mirrors the exploration of practical considerations in the current design of digital health systems. Just as 'experience' unfolds within a defined space, the article delves into active user engagement, cultural influences, and logistical hurdles, acknowledging the constraints and contingencies within healthcare.

Simultaneously, the imaginative dimension in the theoretical framework aligns with discussions about future expectations in digital health implementation. Throughout the article, we navigated the terrain of anticipations and visionary aspirations in societal research emphasis, educational transformations, and personalized medicine. These discussions project various visions of the future, envisioning innovation and inclusivity, resonating with the theoretical emphasis on 'expectation' extending towards a horizon.

Moreover, the theoretical framework's assertion regarding the inherent pathologies in project encounters that hinder optimal effectiveness parallels the acknowledgement within the article of challenges in envisioning and executing plans or projects within the healthcare domain.

However, while the article adeptly intertwines with the theoretical framework, it does not extensively explore the depth of emotional and affective influences on future perceptions, as articulated by Adams et al. (2009) and Appadurai (1993). This limitation prompts further research avenues to delve into the affective economy within digital health initiatives and how emotions influence anticipatory actions and perceptions.

Proposed future research could focus on analysing the emotional undercurrents driving healthcare stakeholders' anticipations, studying the affective economies underpinning decision-making processes, and exploring how emotions shape the implementation and adoption of digital health technologies.

In conclusion, while in the article, I encapsulate the interplay between 'experience' and 'expectation' within digital health implementation, a more profound exploration of the emotional and affective dimensions, as highlighted in the theoretical framework, would enrich the understanding of anticipatory actions and perceptions in shaping future healthcare paradigms. This research direction holds promise in providing a more comprehensive view of the intricate dynamics between past experiences, future expectations, and emotional influences within digital health initiatives.

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