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HEALTH AND DIGITALIZATION Active Ageing, Technologies and New Contemporary Challenges***

Abstract

Covid-19 health crisis is redefining the perimeters of everyday life globally. As a result, cultural practices aimed at improving the quality of life are undergoing profound transformations, leading Social Sciences to question the current needs for digitization of the various areas of the individual and social sphere in facing the challenges of the post- coronavirus.

This work aims to develop some key issues for a better understanding of the technological transformations that are affecting physical activity practices and well-being in the post-quarantine period. In addition, we will see how the AI-oriented technologies that allow people to age and to care in their own homes, managing in an integrated way conditions of even severe disability are going to increase.

In this article we propose a review of the main technologies able to assist the weakest and first and, in our vision, to reduce the risk of Covid-19 infection, but also a happy and active ageing and health monitoring of the subject at risk, stimulating him/her to those motor activities that support a good state of health.

Keywords

Active ageing; Covid-19; e-health; ICT.

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1. INTRODUCTION

The accelerated development of software programs, big data and machine learning is the expression of current times. The digital revolution has fostered the computerization of production processes, boosted digitalization in public administration, bridged the gaps of communication flows and global transport networks.

The digitalization has been a tool in our hands for several years; it plausibly determines our behaviors, affects our way of seeing and interacting with the world, the individual way of being of individuals and their virtual representations. For these reasons, many spheres of life have been involved by a complete re-conceptualization. Given the ongoing transformations, medicine itself has been re-designed and thought according to

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the centrality of the subject, the body and the importance of care, overcoming the standardized doctor-patient relationship characterizing the recent past and, therefore, paving the way to new dialectical and operational scenarios, with immediate impact based on the potential and progress achieved in the 21st century.

The self-measurement of vital signs such as blood oxygen saturation level, body temperature, arterial blood pressure or glycemia – to mention the most common measurements available to all – have widened new theoretical debate in social sciences concerning the rising autonomy of the subject-patient. Hence, what dominates is a wellness-centered vision, the generalized enhancement of the quality of life, which are rigorously topical and definitely impact on the scientific community and collective imagination. Marco Esposito is right to state that “recent pandemic upheavals have imprinted concrete directions and actual acceleration to the debate on Big Data processing (e.g. their use in the epidemiological tracing) [and] on the developments of AI (for instance, aimed at predicting viral cycles)”¹.

Artificial intelligence is constantly progressing and automated data analysis confirms this rapidly growing trend. In the last decade, the deployment of AI has spread throughout all areas of daily life, with particular relevance within telemedicine: “we refer to clinical trials, where the improvement of the experimental design through a more appropriate (‘intelligent’) case-control matching is capable to reduce the rate – still surprisingly high – of wrong interpretation of data (Chakradhar, 2017; Smalley, 2017), or to imaging reading through artificially boosted systems that enables an early detection of cases otherwise unrecognized and, in some cases, to provide a timely diagnosis and to allow an immediate treatment [...] (Colombo, Rozzini, 2019: 10-11)”.

AI provides not only hetero-measurements and inter-operability of data for health professionals; it has fundamentally permeated daily life through self-discipline and the individual concerns regarding one’s own health conditions. In this way, the cognitive gap between designers and users is doomed to decrease due to a “democratization” of digital consumptions. In fact, writing up an algorithm must be strategic and respond to two questions: the benefit and its correlated, that is its thorough diffusion that facilitates its global sales and mass deployment. Clearly, we know that a very acute resistance to digital penetration still exists. Since the dawn of digital information, the digital divide has been attributed to various socio-economic, geographical and educational factors². But the issue for AI in healthcare also reveals other elements that need to be considered in order to fully exploit these systems collectively.

This essay aims to develop some key issues in order to better understand the technological transformations that are increasingly influencing the contemporary health practices (e-health) and the main software programs used by citizens. Through a review of the primary technologies capable of assisting the weaker and also reducing the risk of contracting Covid-19, we will examine how AI-oriented technologies facilitate people to age and treat themselves at home, by managing, in an integrated way, severe disabilities and a happy and active ageing monitoring health conditions, stimulating activities that favor wellness.

¹ M. Esposito, “La tecnologia oltre la persona? Paradigmi contrattuali e dominio organizzativo immateriale”, *The Lab’s Quarterly*, 22, 2 (2020): 45-55 (46).

² R. Cullen, “Addressing the Digital Divide”, *Online Information Review*, 25, 5 (2001): 311-320.

2. METHODOLOGY

Immediately after the SARS-Cov2 pandemic wave all of us have felt involved both as citizens and as communication and society scholars. This virus has challenged many of our priorities and social beliefs, making us dwell upon the world we are going to experience tomorrow. A special attention is due to the health sector at the moment, under different perspectives. One of these is the field of e-health, a concept that encompasses more than a mere technological development. It can be defined as “an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies”³.

The e-health approach is constantly evolving and, since the early 2000s, it has developed through the implementation that digital technologies have progressively allowed. These technologies include the Internet of things (IoT), big data analytics, artificial intelligence (AI), deep learning, and blockchain technology. The application of these tools in healthcare settings facilitates the creation of a digital ecosystem, highly interconnected and able to tackle crises and emergencies, such as those caused by Covid-19⁴. A confirmation that integrated systems based on the e-health approach can facilitate the tracking of only the infected person of the spread of the virus all over the world is demonstrated by *Worldometer*⁵, that all of us have consulted during this year of pandemic for “a real-time update on the actual number of people known to have Covid-19 worldwide, including daily new cases of the disease, disease distribution by countries and severity of disease”⁶.

This essay will deal with e-health as an approach highly correlated with the evolution of digital technologies and as technical background of all the tools that assist treatment of vulnerable subjects and active ageing.

In this respect, this essay will examine the technologies of the e-health approach as fundamental according to three topics, proposing some studies which highlight their importance. The first one deals with e-health technologies as *necessary for the self-determination of the person* (par. 3), especially in the light of the user/patient participation in technology-based services, hence, beyond a passive view of the patient. The second topic proposes e-health technologies as a support for care processes, as well as to recover and maintain good health both for the most vulnerable persons and for society in general. In this respect, a specific overview will deal with wearable devices, which, more than others, are welcomed in the users’ homes as valuable and trendy items; this aspect is absolutely not to be neglected, in order to make these objects enter the persons’ lives and become a tool of personal growth.

Finally, this issue will be discussed according to the specific topic of pandemic, which, more than any other circumstance, has shed light not only on the opportunity, but also on the necessity to make technologies become an integral part of the management process of emergencies in medium-sized and large-sized healthcare settings.

³ G. Eysenbach, “How to Fight an Infodemic: The Four Pillars of Infodemic Management”, *Journal of Medical Internet Research*, 22, 6 (2020): 1-6 (1).

⁴ D.S.W. Ting *et al.*, “Digital Technology and Covid-19”, *Nature Medicine*, 26, 4 (2020): 459-461.

⁵ <https://www.worldometers.info/coronavirus/> accessed December, 18, 2020.

⁶ Ting *et al.*, “Digital Technology and Covid-19”, 459.

3. TECHNOLOGY BETWEEN SELF-DETERMINATION AND PERSONAL CARE SERVICES

The Internet emerges as a cohesion space aimed at guaranteeing integration between persons. To this extent, innovation society provides a strong contribution in the care frameworks (tele-homecare) and personal care services. Service innovation can be an opportunity for a new proximity welfare, a chance to explore the perimeters of a new sociality, of a rethinking of several frameworks of social life and the health sector, trying to promote the centrality of the individual and the protection of his/her rights.

Technology increases the impact of self-determination processes on our lives. The fact that users are involved in the development and sharing of data has positive effects on different levels of wellbeing in a real ambient. Autonomy and rationality, as sub-components of self-determination, indicate the presence of a historical and social context in which some indispensable trends in terms of social resources are originated. In this respect, paraphrasing Roberto De Vita, in the technology innovation processes the individual gains increasing importance. These processes, “in their complexity give rise, in interdependent forms, to profound transformations both in the social structure and in the existential dimension of human beings”, changing “the whole human life into ways and forms of his/her work and social relations, into urban life, into services, into everyday life experience, into the sense of perception of oneself and of one’s own identity”. The technological innovation processes “require a strong relationality, hence, they can promote the pursuance of collective objectives with an increase of actions and innovations of subjects endowed with elevated autonomy, professionalism, culture, sense of responsibility and participation”⁷.

In this analysis proposed by De Vita, the individual is a “primary value”; this mark “a new anthropological and ethical dimension that sets out subjectivity as the basis of relation and social activity as well as of a widespread policy”. With reference to the focus of this paper, in the last few years, a broad range of empirical and theoretical literature has been published on digital innovation as the essential element of healthcare systems of the 21st century. In particular, some scholars have focused on governance models conceived through technological solutions, instrumental to a better management of resources and national and international services⁸. These two studies both aim to understand how, through ICT formulas, there could be a positive response to the growing demand for services linked to chronic diseases, an improvement of the therapeutic treatment and an increase of the involvement of patients in healthcare assistance, providing them services in an effective, efficient, economic and timely way. The implementation of technology and its ongoing potential benefits in many member States of the EU are often counterbalanced by the problematic deployment of ICTs due to the rise of undesirable features, both at individual and organizational level; overcoming such difficulties requires adequate economic resources, as well as a substantial administrative and political support to what currently represent the new challenges of health and social policy in the global scenario.

Haluzá and Jungwirth noted that in contemporary societies information and com-

⁷ R. De Vita, “Trasformazione sociale, culturale, e innovazione tecnologica”, in *Tecnologia e mutamento sociale*, edited by R. De Vita, Milano: FrancoAngeli, 1990, *passim*.

⁸ On this issue, see also the essays by G. Quaglio, C. Dario, P. Stafylas, “E-Health in Europe. Current Situation and Challenges Ahead Health”, *Health Policy and Technology*, 4 (2016): 314-317; D. Haluzá, D. Jungwirth, “ICT and the Future of Health Care: Aspects of Health Promotion”, *International Journal of Medical Informatics*, 84, 1 (2015): 48-57.

munication technologies have already entered our daily life. This provides the opportunity to develop and adapt ICT solutions to all aspects of society, including health and social care, as an essential element to pursue general wellbeing. In order to face the challenges of the current progress of ICTs in medical and health fields, according to the authors, it is necessary to evaluate prevailing opinions and expectations among the stakeholders involved in the assistance and care process, so as to promote health through new e-health methodologies, whose aims are to intercept and propose solutions to social problems of public interest.

Furthermore, H.K. Andreassen, author of the essay “ICT and patient roles; contradictions in e-health policy”⁹, investigated on the way technology innovation impacts on the patient roles and makes the relation with the doctor technological. If on the one hand – the author posits – e-health favors “active ageing”, on the other hand some empirical studies highlight that e-health leads the patient to adopt a passive role, due to a “mere” submissively acceptance of the technological tool that minimizes his/her cognitive skills and abilities.

4. INTERNET COMMUNICATION TECHNOLOGY: HEALTH AND FITNESS

The field of applications that keep into account the needs of elderly persons is receiving great attention by developers and major companies, especially between the first and second half of 2020, when the “success” of these tools goes hand in hand with the limits and boundaries imposed to face-to-face communication and the fear of infection. The objective of these technologies is primarily to improve the perceived quality of life, but also to encourage the elderly to engage in new activities and stimulate their proactivity. These technologies are designed not only to tackle with a question of usability and accessibility of the devices: they also meet the needs of the elderly from the point of view of the protection of their health, management of domestic spaces, entertainment and social relations¹⁰.

In fact, there are several ways in which AI and robotics are changing health, or rather “health protection”. They can be used to improve research, in decision making and emergency management, for early detection of infections (e.g ‘Immuni’ app is designed to do it in Italian Covid-panorama), to improve diagnoses and to ensure active aging. There are many technologies designed for active aging. They belong to the so-called Internet of Medical Things (IoMT) and they are also part of those products developed for the silver economy. Technology applications and apps encourage healthier behaviour and put patients in control of their well-being. Additionally, they allow healthcare professionals to better understand needs of the people they care for, and to provide better support for staying healthy.

The link between ICT-based applications and active ageing is fundamental in current circumstances. The issue of health is here analyzed according to the anthropological challenges related to the new socio-relational framework, to be realized through the implementation of new models of care, prevention and monitoring of one’s conditions,

⁹ H.K. Andreassen, “ICT and Patient Roles; Contradictions in E-Health Policy”, *Health Policy and Technology*, 1 (2012): 86-92.

¹⁰ L. Benvenega, E. Trinca, “Physical Activity as Daily Practice. ‘Active Ageing’ between Social Needs, Technology and Quality-of-Life Improvement”, in *Sport and Quality of Life*, edited by P. Corvo and F.M. Lo Verde, New York: Springer, 2021, forthcoming.

in which technology becomes an enabling factor in home automation and care as well as in physical activity.

On the basis of transformations started in the first months of 2020 and consolidated in the current post-pandemic scenario, an increase of the primary challenges that everyone and society have to tackle is predictable. The dominant care model, supporting independent living at home of the elderly and based on family networks, informal or implicit community bonding, today is no longer feasible. In order to meet the new challenges raised by Covid-19 emergency, the development of ICTs and their implementation in the different spheres of life, ranging from the living environment to remote services and physical wellbeing, are more urgent than ever and extraordinarily relevant. For these reasons, what follows is an overview of the significance of the main software that today allow a redefinition of the relation between the individual and society, which is mediated by the deployment of artificial intelligence and its applications. Accordingly, the aim is to analyze the main technologies that are capable of guaranteeing happy and active ageing and health monitoring of high-risk subjects.

Cabrera and Malanowski¹¹ posit that technologies oriented to meet the needs of the elderly in terms of quality of life should be classified according to five categories: *health*, that includes technologies capable of guaranteeing good functionality and an adequate social support system for the older individual; *safety*, through devices that protect the physical inviolability of the person, especially in the home environment and refurbishment of spaces; *independence*, that regards the possibility to remain in their homes as long as possible, thus avoiding to move to residential aged care facilities or nursing homes; *mobility*; *participation*, that is, the possibility to have friendship relations and exchanges with other persons and make them become real for example within universities of the third-age or clubs for seniors. Nevertheless, Razzetti argues that effective communication between the individual and the machine – declined in the interaction of the subject with devices and software preparatory to independence, and to a raising living standard – requires precise peculiarities such as: digital literacy; guarantee of confidentiality of the users' personal data; user-friendliness of ICTs and deployment of existing ICT infrastructures (broadband network); bottom-down approach¹². Priority objectives, in this interactive and self-determining process, are the demand containment of hospital care services, the cost reduction of the welfare system and the “improvement of the quality of life of older adults and their caregivers”, through a preventive approach envisaging measures in terms of Active and Healthy Ageing, Self-Care and continuity of care between the individual, structures and social community¹³.

In the volume by Urbani *et al.* “technological innovation, applied to medical sciences, provides older persons with the possibility to extend their life expectancy in a better physical and mental condition”, thus allowing them “to participate fully [...] in the innovation process of industry, services and society, overcoming the limits traditionally acknowledged to issues relating to elderly people”¹⁴. Consistently, the self-measurement of biometric parameters, applied to the monitoring of health conditions and physical activity, as the foundation of LOHAS style (Lifestyle of Health and Sustainability), that

¹¹ M. Cabrera, N. Malanowski, eds., *Information and Communication Technologies for Active Ageing: Opportunities and Challenges for the European Union*, Amsterdam: IOS Press, 2009.

¹² F. Razzetti, “LTC e innovazione sociale: quali spunti dall'Europa”, paper presented at the SISIP (Società Italiana di Scienza Politica) Annual Conference, Turin, 5-7 September 2018.

¹³ Razzetti, “LTC e innovazione sociale: quali spunti dall'Europa”.

¹⁴ G. Urbani *et al.*, *L'anziano attivo. Proposte e riflessioni per la terza e la quarta età*, Torino: Fondazione Giovanni Agnelli, 1991, 112.

regulates technological innovation, AI-oriented, and Fitness, “is expanding from physical products to new forms of processes and services, [with new] ways of communicating and interacting”¹⁵. This is the core function of wearable devices, a technology that has gained success in the market and achieved great endorsement among people of all ages.

5. WEARABLE DEVICES

Analyzing the body as a tool in Bourdieusian terms¹⁶, we can consider the development of digital technologies – and their intersection with the construction of identity – as indicators of a specific cultural dimension, prevailing today¹⁷, and the result of a general and an increasingly pervasive trend to conceive the definition of the self by resorting to technological devices¹⁸. The installation of digital applications on smartphones and iWatches aiming at measuring vital parameters in order to improve performances in physical activity, or acting on prevention and surveillance of pathologies, paves the way to the quantification processes that have been in-depth investigated by the 21st century sociological literature, above all literature focused on Big Data and the importance of socio-biological tracking, in which the individual identity is seen as an accrual of information and data¹⁹. For Fabiana Leone, the use “of apps and wearable devices involves the diffusion of tracking and monitoring practices of daily activities”, that “are combined with processes through which the self is perceived as a measurable and quantifiable entity according to the information produced by digital devices. Such phenomena concern the emerging sector of Digital Health and impact on the modes through which everyday life is driven by numerical data and information (Data Driven Life; Sociology of Quantification)”²⁰.

Their progressive development in the last two decades has oriented the technology market. The large-scale design and production of wearable devices, easy to wear, user-friendly and supported by e-health and fitness mobile apps is increasing. In fact, according to “statistics provided for Android and IOS”, Leone maintains, “the number of Health & Fitness apps is, in the first case, more than 90,000 downloads, more than 65,000 in the second. These apps are diverse also according to the aspects they lay greater stress. Some of them focus on specific aspects of health, others provide a general view that keeps into account several elements, in order to maintain and boost physical wellbeing”²¹.

This exponential spread of cheap devices that produce an indefinite quantity of

¹⁵ A. Rinaldi, “Computer indossabili e indumenti smart per il design di prodotti per uno stile di vita attivo e sano per tutti”, *Rivista Italiana di Ergonomia*, 10 (2015): 44-52 (45).

¹⁶ P. Bourdieu, “Sport and Social Class”, *Information* (International Social Science Council), 17, 6 (1978): 819-840.

¹⁷ F. Leone, “L'utilizzo dei dispositivi wearables nello sport e nel fitness”, *Eracle. Journal of Sport and Social Sciences*, 1 (2018): 5-12 (5).

¹⁸ *Ibid.*

¹⁹ See, for example, M. Swan, “The Quantified Self: Fundamental Disruption in Big Data Science and Biological Discovery”, *Big Data*, 1, 2 (2013): 85-99; E. Berman, D. Hirschman, “The Sociology of Quantification: Where Are We Now?”, *Contemporary Sociology*, 47, 3 (2018): 257-266; D. Lupton, “Digital Health Technologies and Digital Data: New Ways of Monitoring, Measuring and Commodifying Human Embodiment, Health and Illness”, in *Research Handbook on Digital Transformations*, edited by F.X. Ollerros and M. Zhegu, Northampton: Edward Elgard, 2015, 174-183.

²⁰ Leone, “L'utilizzo dei dispositivi wearables nello sport e nel fitness”, 6.

²¹ *Ibid.*

personal data have somehow transformed, over the years, the healthcare system. The technological conversion, at least in the Euro-American West, has opened up to an horizon of algorithmic care of the body, weakening the communication distances between doctor and patient because the clinical data of the latter are just a click away for the former, with an easy access on centralized platform and managed by experts who daily collect the patients' information. Real virtual medical records are created with specific apps and shared with experts of the sector (from cardiologists to diabetologists, from endocrinologists to pulmonologists, etc.) and a concrete example are the following artificial intelligence systems: One Drop; Apple Watch, Quardio, Da Vinci Salute, all of them being instruments that focus on the user, who is asked to take over an active role, that is to manage one's own health and interpret one's body as a sort of machine that must work perfectly²².

From the perspective of physical activity, that is indispensable if we are keen to design a "healthy body"²³, that, qualitatively speaking, is the product of a healthy society, the deployment of sensors circumscribes the complexity of our body enhancing the unique perception and knowledge of it, and making possible new working methodologies and interaction with daily processes through the collection and transfer of data, pushing the body beyond its limits but always monitoring the performance of its vital functions. From the organization of workout sessions (Virtuagym and 8Fit) to calories burned and step counter (Huawei health and Sworkit), everything is oriented to follow a healthy lifestyle exploiting smart ageing, with regard to the latest estimates on the growth rate of the European population, whose "projections have underlined that the number of older adults will rapidly increase in the next few years and the economic impact of ageing will be substantial in all countries of the European Union through two main channels: pensions and and long-term care"²⁴. Furthermore, the loss of family ties due to the growth of migration flows or to elitist urban policies, or, even, to continuous transformations of welfare systems – as we will show in the next paragraph – have increased the number of older persons living alone in their homes²⁵ and with limited economic resources; for those persons, digital technologies, if designed according to human-centered standards, can result in individual and community benefits, with consequent cost reduction and protection of human lives.

6. E-HEALTH AND SARS-COV-2 PANDEMIC EMERGENCY

Further attention will be given below to sensitive and topical issues. We will analyze the important role of telehealth platforms in situations of pandemic emergency, such as the one we are experiencing, with the objective of guaranteeing best levels of assistance and care also when interpersonal interaction is not feasible.

The study of the repercussions at a world level of the economic, social and health crisis produced by the coronavirus is a contingency that has long been discussed within the international scientific community. Some studies have investigated the impact of pandemic on the health sector. In particular, they have tried to understand which meas-

²² V. Codeluppi, *Come la pandemia ci ha cambiato*, Roma: Carocci, 2020, 30.

²³ Bourdieu, "Sport and Social Class", 819-840.

²⁴ Rinaldi, "Computer indossabili e indumenti smart per il design di prodotti per uno stile di vita attivo e sano per tutti", 44.

²⁵ *Ibid.*

ures have been envisaged by the health sector - and which are the most plausible among them -, thus showing that a potential growth of telemedicine, in order to democratize the access to care and protect health conditions of patients at home, is a feasible solution (although a series of essential conditions are needed for its implementation).

In fact, if the final output of this process of technological conversion is the achievement of an enhancement of the population life standards – especially the older population –, its effective implementation envisages to insist on:

- a) Telematics infrastructures;
- b) workforce training Programs
- c) public investments to encourage innovation;
- d) inter-operability platforms of the clinic data;
- e) facilitated access for older patients
- f) promotion campaigns

Today, clinic interaction centered on digitalization of care brings about a threefold benefit:

- a) it helps combating the increasing demand for hospital care services required by paucisymptomatic patients or patients with mild symptoms deriving from coronavirus, and contributes to keep physical distancing avoiding close contacts;
- b) it provides patients suffering from other diseases with the possibility of being treated and receive care at home, in order to prevent infection with SARS-CoV2;
- c) surveillance through video conference represents a positive experience for patients (many of them have already experienced it), similar to an in-person meeting²⁶, despite the lack of models of empathy and solidarity characterizing the therapeutic relation in the health sector.

That being said, e-health radically reduces demands for hospitalization, therefore, sensibly decreases pressure that healthcare facilities are constantly suffering (this “can contribute to reduce – according to Marchetti and Pruneri – except for specific clinical and/or therapeutic needs, admissions to hospital emergency departments”²⁷), transferring human and economic resources to other patients with other types of needs, who perceive their right to health more difficult to be satisfied in this period. AI can support clinical decision-making and actions as well as priorities administrative tasks: to do this an implementation of big health data and predictive analysis systems are required. Using pattern recognition to identify patients at risk or contagion risks – is another area where AI is beginning to take hold in healthcare.

Certainly, the current Covid-19 epidemic is proposing unimaginable challenges until recently. The whole transition towards a “personalized” medicine, with the use of “telematics tools [...] available for tele-consultation and/or remote monitoring adapted to the needs of the clinical, family, social and healthcare contexts could allow the cre-

²⁶ G. Furlanis *et al.*, “E-Health vs Covid-19: Home Patient Telemonitoring to Maintain TIA Continuum of Care”, *Neurological Sciences*, 41, 8 (2020): 2023-2024.

²⁷ P. Marchetti, G. Pruneri, *La pandemia da SARS-CoV-2 e la gestione del paziente oncologico: la crisi e le opportunità per una medicina personalizzata*, 2020, accessed November, 24, 2020, <https://siagascot-orto.com/wp-content/uploads/2020/05/COVID.V1.01.8-020520.pdf>.

ation of effective and efficient management programs [...] for patient care”²⁸. In fact, the SARS-CoV2 health emergency can be the decisive moment to ensure the right use of telecare and mobile devices supporting the older population that needs frequent monitoring and/or medical care, involving them directly in the care process so as to make them more autonomous and improve their health conditions.

Flaminia Aperio Bella makes clear that the reasons of the growing attention to e-health are linked “to the simultaneous increase in chronic diseases, which impose to rethink the traditional healthcare models”, in favor “of solutions that help overcome the hospital-centric model to shape around the citizen/patient”, supporting the identification of care pathways²⁹.

E-Health can thus control international pandemics because it offers sustainable solutions and pays particular attention to monitoring, automatic learning of the patient and the potential of artificial intelligence, all of them supporting “the entire range of functions and operational processes that involve the health sector. Basically, it refers to the application of digital technology to health processes in order to improve the relation between cost and quality of the services, to decrease wastes, inefficiencies, to reduce differences between territories and to improve quality perceived by the citizen”³⁰.

Bending the curve in the right direction certainly requires financing, research, new political orientations, training and equity, but these investments will continue to produce more valuable performances and global protection³¹.

As Asadzadeh *et al.*³² underline, without the application of ICT and AI, crisis control and management could be difficult on a large scale. In fact, they found that IT and AI technologies were applied during the Covid pandemic in various fields, such as the accuracy of diagnosis, early detection, ensuring healthcare providers’ safety, decreasing workload, saving time and cost, and drug discovery. Above all, diagnostics was a task on which technologies helped a lot in finding the virus. Indeed, the authors report that “for example, Covid-19 symptoms are nonspecific. Hence, AI uses deep learning methods as a useful technique for accurate, timely, and sensitive extraction of unique medical images’ features that facilitate the diagnosis. Many studies have used deep learning for various aims such as lung infection quantification, improving diagnosis, detection, patient monitoring, quick screening, and drug discovery”³³. As anticipated in the introduction to this work, a disturbing factor in the application of these systems on a large scale, and therefore in a profitable range for the collectivity, is the *digital divide*. Italy in particular still has a ranking below the European average in terms of digital efficiency (according to the European standard established by the *DESI Index*). The advent of Covid-19 has therefore shed light on the importance of digital efficiency in the fight against pandemics and crisis management. In his UK study, Watts³⁴ states that: “The advent of Covid-19 has thrown a spotlight on this digital divide, most obviously in everyday domestic life – though not exclusively so. Many patients who do not have Covid-19 in the UK, fearful

²⁸ L. Tarantini *et al.*, “Essere cardiologo ai tempi del SARS-COVID-19: è tempo di riconsiderare il nostro modo di lavorare?”. *Giornale italiano di cardiologia*, 21, 5 (2020): 354-357 (357).

²⁹ F.A. Bella, “L’accesso alle tecnologie innovative nel settore salute tra universalità e limiti organizzativi (con una postilla sull’emergenza sanitaria)”, *PA Persona e Amministrazione*, 1 (2020): 219-245 (222-223).

³⁰ *Ibid.*, 223.

³¹ *Ibid.*

³² A. Asadzadeh *et al.*, “Information Technology in Emergency Management of Covid-19 Outbreak”, *Informatics in Medicine Unlocked*, 21 (2020): 1-11.

³³ *Ibid.*

³⁴ G. Watts, “Covid-19 and the Digital Divide in the UK”, *The Lancet Digital Health*, 2, 8 (2020): 395-396.

of acquiring the infection, have been reluctant to enter hospital buildings. Attendances have shown a marked fall. Many outpatient consultations can of course be done online – but only if you have access to a computer. So might deepening the concern over the consequences of digital exclusion eventually act as a spur to efforts at overcoming it?”. The author states that the countries that had experienced Sars in the early 2000s were the most digitally prepared, since they already have digital channels for tracking and managing the epidemic.

By the way, a crucial phase thus opens up, in which investment in technology will also become central to governments. The scenarios of the Covid pandemic still remain unknown and ICT could play a fundamental role.

7. CONCLUDING REMARKS

What we have observed so far aims at emphasizing that technologies enable us to drive a real change of our lives. This is possible, in particular, in contexts dominated by an accelerated technical progress and intensified specialization, in geographical and social areas where the dialectics between subject and structure proves to be dynamic, and social action – while producing change and progress – creates a new society

Essentially, this essay describes how ICTs can improve the qualities of life by supporting physical activity, which seems to be increasingly important in daily life. This study has highlighted that technologies make the healthcare system more efficient, offering an *ad-hoc* service to patients – above all vulnerable patients – in a particular historical period, in which medical care and surveillance models based on the direct relationship cannot be – at least for now – optional.

Undoubtedly, apart from what systematized so far, the use of technological progress, applied to the variants of fitness and health, needs subjective and institutional enterprise, in order to pursue a rethinking of the relation between the subject and his/her body through self-monitoring and digitalization of care, in accordance with an organic self-consciousness. However, if this consciousness induces persons to elude consultation and guidelines of healthcare professionals, there is the risk that it causes inadequate consequences.

In this respect, the scientific community agrees on the assumption that, without a suitable cultural change and targeted structural investments, technology cannot produce any positive result. On the contrary, an opposite effect with economic and financial waste is likely to occur, thus denying further and potential resources to citizens to be allocated to social and health policies.

Essentially, without a paradigm shift, new ICTs are doomed to become only an end rather than a tool for the self-determination of citizens. Similarly, the urgency of regulatory measures and institutional interventions linked to artificial intelligence are to be perceived as preparatory aspects to a healthy living. Moreover, in the development of these technologies, the ethical aspect is increasingly taken into consideration. Everywhere in the world “calls for ethics” are arising, and they are aimed at making technology as an integral part of our lives in the future, pursuing the improvement of life conditions of the individual and the community.

In conclusion, we believe that everyday life assisted by ICTs, on the basis of a high-quality standard of life, endeavors to strike a balance through constant physical activity and a better knowledge of the personal self; these are fundamental for the creation of forms of individual functionality that lead to benefits in and for the social fabric;

similarly, inter-institutional and inter-territorial coordination are essential in order to pursue a higher efficiency level in social and healthcare assistance, centered on humans, their affections and community.

In conclusion, we point out that this technological switch can be reached but we have to consider that some deterrents related to the digital divide still remain present³⁵. Internet availability in some areas of the globe (infrastructure), communication disabilities, or lack of cultural skills that justify the use of digital tools (knowledge), represent real barriers for technological solutions usage in telemedicine, digital diagnostic and treatment opportunities. ICT solutions and clinical health interoperability can offer a potential measure to face current and future health challenges, in front of a significant increase in average life expectancy globally. In fact, the interaction between health professions and patients is to be considered pivotal for the quality improvement of everyday life. Digital divide represents, especially for some categories of people, an obstacle to access to Digital Health and the conditions of well-being that technology, in the health sector, can guarantee. Some recent studies³⁶ says that Digital Divide is highly connected with age: it is specifically for the elderly that the use of technology in general, and in Health applications in particular, is difficult.

Because of that, unfair implications in some countries and in specific territories (North and South, center and periphery, young and old, educated and poorly educated etc.) and between countries are growing: diversified thresholds of telematic coverage, communication skills and instrumental resources of the population. Digital Divide, a plausible cause of social exclusion, emphasizes central aspects in democratic debate connected to the right to health, a right guaranteed in our country by the Constitution. But not only. DD emphasizes both lack of structural variables of the different geographical areas, each with its own criticalities, and cultural limits linked to the use of technological devices. Twentieth century welfare model is no longer practicable: medical prevention policies, in which digital technology plays a prominent role, must be integrate to contain costs and increase personal and community benefits.

³⁵ T. Heponiemi *et al.*, “Digital Divide in Perceived Benefits of Online Health Care and Social Welfare Services: National Cross-Sectional Survey Study”, *Journal of Medical Internet Research*, 22, 7 (2020); J. Van Dijk, *The Digital Divide*, Cambridge: Polity Press, 2019.

³⁶ D. Giansanti, G. Velcro, “The Digital Divide in the Era of Covid-19: An Investigation into an Important Obstacle to the Access to the Health by the Citizen”, *Healthcare*, 9, 371 (2021).