Technological welfare as an answer to the pandemic emergency: education and healthcare in the Italian case

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Introduction

The "forced" digitalization induced by Covid-19 raised the issue of the relationship between technology and society (Carboni 2020). The New Technologies (NTs) represent a social inclusion tool and a dangerous source of inequalities. The emergency is putting pressure on the welfare systems and is making it necessary to "govern" the processes without abandoning them to forms of technological *laissez-faire*. The pandemic has highlighted the systemic fragilities in Italian digitalization, as shown by the Digital Economy and Society Index (DESI) 2020 survey. This work will shed light on two of these fragilities: the healthcare system and the school and university distance learning. In particular, it will be investigated how these two sectors are facing the emergency in Italy.

The shock caused by Covid-19 represents a divide in the Italian transition towards the web-based integration of economic, administrative and public service processes; moreover, it highlighted the urgency of a technological welfare (Hofmann 2013). The aim of this work is to call for a reflection on the opportunity of a 4.0 national welfare plan, focusing on healthcare and education policies. A 4.0 welfare, in addition to ensuring a greater connection with citizens, could strengthen the digital services industry, the technological empowerment of human capital, the innovation of personal service activities, reducing inequalities and the digital divide. The first two sections focus on the education system, whereas the following two address the healthcare sector. The concluding remarks try to define the concept of technological welfare.

Education: digitalization of the Italian education system before Covid-19

In Italy, the 2015 National Plan of Digital School focuses on three aspects: infrastructures, digital competences of the learners, and the training of teachers. A recent study on the digitalization of the Italian school system (Agcom 2019) focused on infrastructures, learning digitalization and administrative processes. From an infrastructural point of view, the indicator used is the availability of a high speed connection: in Italy, 11,2% of schools uses a connection with a speed higher than 30 Mbps, while 97% is equipped with a general internet connection.

A recent survey (European Commission 2019) analyses in depth the Italian case in a comparative perspective. The research concerns the 28 EU countries, Norway, Iceland and Turkey and has been carried out on a sample of 400 schools for every country, examining the development of information technologies in schools. Considering the presence of schools with high digitalization, Italy exceeds the European average of the Isced 1 and 3 levels, while regarding the Isced 2 level it is slightly inferior. The best performance concerns high schools (Isced 3) that reach 86% against 72% of the European average[1]. The good infrastructural level is not combined with an equally large use of didactic technologies, highlighting regional differences regarding connectivity and didactic innovation. The lacking level of digitalization in the infrastructures of some regions increases the digital divide and inequalities.

With regard to Italian universities, a digitalization of the administrative and management processes that affected all universities was matched with a private-law strategy in the accreditation of telematic universities, that confined university e-learning to the spontaneous initiatives of individual universities. The online learning market, occupied mostly by private subjects, has transformed e-learning in the didactics of who "cannot attend school normally". After the spontaneous management of the emergency, in which universities guaranteed the didactic offer without a ministerial standard, the strategy for the restart of the Country established a blended mode method. Some universities are interpreting this concept distinguishing between activities to carry out in person (laboratories) and electronically (taught classes). Others are interpreting mixed didactic as a formula according to which the teacher works in the classroom with some students and is connected online with other students, a choice that has become an informal guideline for all Italian universities.

Distance learning and e-learning after the pandemic

The emergency has imposed an immediate reconversion of the activities to guarantee distance learning (DL) to schools and universities after the Prime Ministerial Decree of the 8th of March 2020. In mid-April, more than 90% of high school students and about 80% of middle school students followed distance lessons[2]. At the same time, the Italian universities transferred their didactics to the digital mode. However, DL is not exempt from problems. The first concerns the technological equipment: as noted by Istat (2020), in the period 2018-2019 a third of families did not have a computer or tablet at home, and only in 22% of families each of the members had a personal device. Moreover, more than 10% of children and teenagers in school age do not have a computer at home.

In addition to this, the level of digital skills is very low: Italy is at the last place in the EU for human capital in the DESI index (European Commission, 2020), and two teenagers out of three, between 14

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[1] The ISCED (International Standard Classification of Education) is a UNESCO classification for courses of studies and the related certificates. Isced 1 corresponds to primary education, Isced 2 to lower secondary education, Isced 3 to upper secondary education.

[2] Data available on the website https://www.skuola.net/news/inchiesta/didattica-a-distanza-osservatorio-skuola- bilancio-primo-mese.html

and 17 years of age, have basic technological skills or do not have any technological skills at all (Istat 2020). A further problem concerns the effectiveness of the DL, which originates from the cancellation or reduction of relationships (with teachers and peers) and the greater difficulty in motivating students, (La Fabbrica – Scuola.net 2020).

As for the university, a contrasting picture emerged from a survey (Ramella and Rostan 2020) carried out on a sample of 3,400 teachers during the lockdown. The positive aspects concern the reactive capacity of the universities that dealt with the emergency. 80% of teachers judged positively both the way in which their universities managed the transition to online teaching and the ways in which they ensured teaching continuity. The delays in starting the lessons were limited: 72% of the teachers activated the distance course by the 13th of March. Even the number of hours did not diverge from the ordinary. In three-year study courses, 86% of teachers held the same number of hours; 7% even more. In the master's degree courses, 89% held all the scheduled hours. Moreover, 80% of the teachers fully carried out the program. The transition to e-learning involves investments, programming, training of teachers, tutors and technicians, and requires a specific institutional channel to be placed in: is it complementary to traditional teaching? Or is it a substitute? For example, the blended mode version guarantees the socialization of the learning group and the legitimacy of the verification procedures. These teaching environments involve the buildings of communities of learning practices (Wenger 1998), which can only be designed with a limited number of students; a difficult condition in Italian universities. Nevertheless, 54% of the teachers interviewed during the lockdown would like part of the teaching to be carried out in "mixed form", integrating face-to- face lessons with online activities. 44% would prefer to go back to traditional teaching. This polarization risks to create resistances, especially if an equal and shared incentivization model is not found, as well as a transparent regulation of the rights of property on contents and knowledge. 31% of teachers expressed the fear that teaching materials could be disseminated improperly, that data protection is at risk and that academic authorities could reduce the teaching autonomy of teachers (Ramella and Rostan 2020).

The results show the enthusiasm for this innovation, that found a positive response, and the skepticism of those who underline the limits of the experience. The sample highlights a training deficit of university teachers, both on teaching and on new technological platforms, sometimes insufficient to manage the complexity of didactic re-engineering. Further problems, reported by 70% of teachers, concern: the little time available, the interaction difficulties with students, less access to didactic resources, difficulties to adapt their subject to online learning and to carry out practical exercises.

In Italian universities a "distance teaching" mentality prevails: it is not surprising that many universities have favoured live streaming lessons as an advanced form of online learning: 66% of teachers used them. In quality online teaching, this modality is not used as a privileged support. E-learning is not the technological version of an *ex-cathedra* lesson.

In virtual environments, in order to design training activities characterized by a significant learning (Novak 1998), an educational system that make the learners feel like the main characters and enhances their aptitude to collaborate is needed. The teacher's role, that in traditional didactics is characterized by a management and control function, is integrated in the field of "Instructional Designer" with other expertises: its role is transformed from a unidirectional source that distributes content, to a circular source that designs and builds knowledge in a multi-specialized network of skills, and delivers them in teams with tutors and mentors. The teaching is presented as the design of a cognitive experience, where the teacher and the other actors build knowledge socially. The education of teachers in e-learning goes through a training phase to enhance technological skills, and through defining a "network pedagogy" (Haughey, Anderson 1998).

Finally, another aspect to be programmed is the ability to compensate unmet professional needs and organizational gaps: the skills necessary for the implementation chain of an e-learning system give life to a differentiated range of professions, that are rarely found in Italian universities. These are professionals of educational systems assisted by ICT, content managers, software designers, internet managers, multimedia producers. In Italy, however, there are researchers specialized in teaching technologies, often placed in research centres separate from the University, that cover the role of consultants. A further aspect is the relevance of collaborative networking between national and international universities in which to exchange good practices, communication strategies and management policies oriented towards Knowledge Management. This configuration develops gradually and has to be fuelled with concrete actions, before developing any project.

Healthcare: how two Italian regional healthcare systems have responded to Covid-19

This section focuses on the healthcare system, a crucial sector profoundly hit by the Corona crisis. In particular, we address how two Italian regions responded differently to the outbreak and with different results. The analysis gives the chance to deepen better the role of territorial organizations and technology in healthcare provision.

The Italian National Health Service is based on a "universalistic institutional" principle of healthcare provision: the state is responsible for providing assistance to citizens (Vicarelli 2019). During the 1990s, the Italian health system underwent a number of reforms, triggering a process of marketization and introducing NPM-inspired management techniques. Furthermore, reforms shed light on the growing importance of territorial healthcare through the introduction of the Chronic Care Model (CCM), whose principles are the continuity of care and the integration of health and social care. The main strategy of the CCM is the integration between hospitals and primary care by enhancing the autonomy of the District as organizational "bridge" between hospitals and territorial organizations. In particular, the 1999 reform highlighted the importance of overcoming a hospital-centered idea of healthcare provision (Giarelli 2019). These settings have different traits: hospital services rely on a bureaucratic logic aimed at providing standardized services, whereas territorial organizations rely on a network logic to provide differentiated services. In particular, territorial healthcare is a "filter" to avoid to overload hospitals (Arlotti, Ranci 2020). Finally, reforms put emphasis on the autonomous role of regional governments in managing healthcare. As a result, regions adopted different ways of managing the pandemic emergency that hit hardly the country starting from the third week of February 2020; these differences reflect the organizational treats of the regional health systems (Binkin *et al.* 2020).

Three models of response have been identified (Altems 2020): a Hospital-centered approach, a Community-Home approach and an Integrated one. The first is based on testing for hospitalized or symptomatic patients only, GPs active on an individual basis, hospitalization and ICUs are largely used and the use of digital tools is limited to contact tracing. The Community-Home model consists of testing in the whole region (even for pauci-symptomatic patients), GPs organized in mobile and multiprofessional teams, limited hospitalization and use of ICUs and extensive use of digital platforms to attend to patients at home. The third is a mixed model.

Lombardy and Veneto are two of the regions where Covid-19 spread firstly in Italy, as two foci have been detected almost simultaneously in the two territories at the end of February (Binkin *et al.* 2020). The two regions have similar features under the socio-economic and political perspective: they are in the northern richest part of the country, with similar indicators of wellbeing such as life expectancy (OECD 2020); the number of acute hospital beds (3.05 in Lombardy and 3.01 in Veneto) and of adults per GP is

very similar (1400 vs. 1342) (Boldrini *et al.* 2017); both the regional governments are led by members of the right wing-party Lega.

However, the two regions addressed the Corona crisis very differently. As of July 14, 2020, Lombardy experienced 95.143 cases, 15757 deaths and 1.149.414 tests, whereas Veneto experienced 19.401 cases, 2.039 deaths and 1.069.923 tests. Lombardy tested 11,42% of the entire population, whereas Veneto 21,8%.

Even though the differences in population density of the two regions played a role, so far Veneto is addressing more successfully than Lombardy the emergency. This is due to specific features of their regional health systems. Between 2000 and 2017, Lombardy weakened significantly territorial healthcare with a special emphasis on primary care, whereas Veneto developed this sector along with home assistance.

Lombardy adopted a Hospital-Centered approach, providing hospital assistance to cases, increasing their ICUs network and testing symptomatic people only. Emergency rooms were the front line and the pandemic spread rapidly in hospital settings. Also, GPs were not provided with basic tools to prevent the spreading of the virus (masks, gloves) among them and patients.

Differently, Veneto adopted a Community-Home approach, based on extensive testing and contact tracing, transferring gradually the other patients from Covid-hospitals to non-Covid hospitals and minimizing contacts between health professionals and people through technological devices. Moreover, within the frame of Veneto's "active containment model", the regional health systems was quickly provided with masks, respirators and basic tools for massive population testing (Giarelli, Vicarelli 2020). The experiences of these regions show the importance of the roles of territorial healthcare and technology in limiting the contacts of people with healthcare organizations, turning the latter into vehicles of contagion, as happened in Lombardy.

The role of territorial healthcare and technology in healthcare provision

The pandemic has forced us to rethink about the relationship between hospital healthcare and territorial healthcare. As the case of Veneto shows, the territory is a crucial point of the healthcare system (Arlotti, Ranci 2020); therefore it seems necessary to invest substantial resources to strengthen it. In this perspective, it is necessary to consider the potential of NT for the remote management of patients, regardless of the emergency in progress. In fact, the role of digital technologies is fundamental to enhance territorial health and to ensure the continuity of care.

Before the emergency, the digitalization of Italian healthcare was lacking both from an infrastructural point of view and from that of the propensity of professionals and citizens to make use of digital services. Systemic weaknesses deal with low investments, the absence of a univocal implementation strategy and the digitization of services.

Italy invested around 22 euros per capita in digital healthcare (Politecnico di Milano 2019); a figure that is distant from countries like Denmark (70 euros per capita), Great Britain (60) and France (40). The poor computerization of the processes particularly inhibits the interconnection between the various National Health Service actors.

The implementation of technologies varies at a territorial level: 14 regions have introduced and made the Electronic Health Record (ESF) operational, but only 12 have adhered to interoperability; most of the regions that did not join it are concentrated in the south (The European House-Ambrosetti 2019). Until July 2019, 12 million people had activated the ESF. In Veneto, 77% of residents activated the ESF, followed by 58% in Tuscany and Lombardy, while the ESF has still not been introduced in 5 regions and

in one autonomous province (MEF 2019). Therefore, a univocal strategy is lacking and digitization is declining differently in regional health systems. Moreover, the gaps in terms of interoperability between regions often make procedures less homogeneous.

The emergency is transforming this scenario, requiring healthcare organizations to introduce connected care solutions with respect to access (chatbots for the self- evaluation of symptoms and apps that allow doctor-patient communication), to treatments (remote visits and consultations, AI for image analysis and diagnosis, robots for patient monitoring) and for the follow-up of patients with other chronic diseases (Politecnico di Milano 2020).

In particular, the NTs were fundamental for maintaining the doctor-patient communication; this highlighted a significant opening of the GPs towards these tools in the future perspective. In fact, in a survey conducted by the Polytechnic University of Milan (2020), it was found that more than half of the GPs did not use NT before, but say they want to do it in the future; it was also judged as a positive experience for sharing information and for responding to urgent requests.

The emergency is destined to have an impact also on the low propensity of users to use technological devices. Even in the presence of a growing trend, the standards were far from European levels as regards the use of the ESF, remote consultations and online prescriptions (The European House-Ambrosetti 2019). The above-mentioned survey (Politecnico di Milano 2020), however, found an increase in the exchange between doctors and patients via e-mail, sms and WhatsApp and the use of the electronic prescriptions. More than half of the sample of citizens got information on the virus from digital channels (mostly institutional web pages).

In conclusion, the emergency imposed a digital transition to healthcare: from a cultural point of view, its impact is marking a gradual reduction in the prejudices and resistance of doctors and citizens towards the use of NT for health purposes (Politecnico di Milano 2020). From an institutional point of view, the first steps towards consolidating telemedicine and its requirements have been made. The indications for remote assistance services during the emergency (ISS 2020) and the definition of modalities and costs of telemedicine services made by the Regions of Tuscany and Veneto are going in this direction (Politecnico di Milano 2020). These initiatives represent crucial stages for the institutional recognition of telemedicine and for the NTs in the health sector. In this sense, the NT must increasingly enter the agenda of health policies, especially with the perspective of having models of continuity of care by exploiting the territory as a "filter" to avoid massive hospitalization, and to make the principles of territorial health effective, set forth since 1978.

Concluding remarks

The pandemic has made the link between digitalization and social justice evident. The aim of an effective welfare in facing a technological change is to guarantee a high level of social protection to all citizens (Mastaganis 2018). This aim manifested itself in all its urgency during the Covid-19 emergency. The pandemic showed the need to make some essential rights universal, like healthcare assistance and education.

Technological welfare provides technology with the status of a common good, a cognitive and instrumental resource to be used through forms of access guarantees, to provide for universal capabilities in the society and in the technological economy. Some examples to qualify the idea:

(1) More technological equipment for citizens (to oppose the digital divide);

(2) Infrastructural enhancement of universities and schools, and training for e- learning teaching (enhancement of teaching technologies);

(3) Continuous training in technology and engineering strategies for administrative processes (effective e-government);

(4) Investments in technologies for the prevention, treatment and institutional consolidation of telemedicine;

In the education and training sector, technological welfare is functional to the reduction of inequalities. Technologically oriented training requires didactics aligned with changes in the perceptive fields of learners, and adequate tools to support their digitized content. Videology and learning technologies must find an institutional path that qualifies them as tools to support teaching and training. In this respect, schools, universities and vocational training are called for effective collaboration. To this end, it is necessary to define a regulatory framework to institutionally regulate the role of technologically oriented teaching, establishing precise functions, incentives and remuneration for its implementation. In this sense, the spontaneity of the didactic transition imposed by Covid-19 has made teachers and students familiar with the use of didactic technologies. However, it confirmed the technological insufficiencies of teachers and students.

Similarly, healthcare digitization has accelerated, showing the importance of NTs in strengthening territorial services. In this sense, telemedicine is the main tool to manage patients remotely, and to make the territory act as a "filter" avoiding to overload hospitals. The emergency shows the importance of technology to improve access and quality of healthcare services. From this point of view, the infrastructural strengthening of tools such as the ESF and the interoperability of databases is essential.

Addressing NTs towards a 4.0 welfare would allow an increase in the efficiency and effectiveness of many social benefits. An interconnected functioning of welfare activities would ensure better monitoring and more effective management of services aimed at limiting inequalities (De' et al. 2020). This would benefit citizens, who would be more protected, the economy, that would reduce the training gaps in job offers, and the high tech sector, which would benefit from a wider market. Furthermore, the revitalization of the welfare under a technological point of view would favour a modernization of the Public Administration. To this end, the proposal for a 4.0 welfare has to go through a shared national programmatic platform in which promoting and regulating public and private digitization, limiting dangerous technological displacements for territories, production sectors, institutions and individuals.

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